Aristotle on the Matter of the Elements

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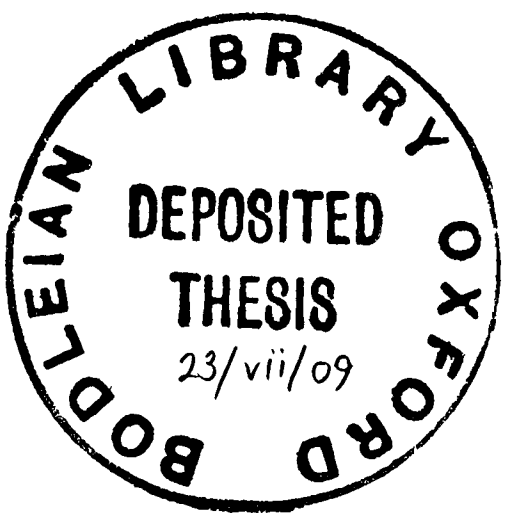

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This thesis is an investigation into the simplest material entities recognised by Aristotle's theory of nature. In general, the position I defend is that the four 'so-called elements' fire, air, water, and earth are, for Aristotle, *genuine* elements, i.e., the simplest material constituents, of bodies. In particular, I deal with two problems, the first concerning the relationship between the four 'so-called elements' and the primary contraries, hot-cold, dry-wet; and the second concerning the nature of the matter from which the latter come to be. Responses to these problems in the secondary literature tend to conclude that the contraries (usually together with 'prime matter'), are constitutive of the so-called elements. I reject this conclusion. In the first part of this thesis I consider, and dismiss, the alleged evidence that Aristotle denies to fire, air, water, and earth the status of genuine elements, and I argue that the status of the contraries as the differentiae of the elements effectively rules out the possibility that they could be the constituents of the latter. In the second part of this thesis I attempt to unpack Aristotle's assertion at *De Gen. et Cor.* II.1 that the matter of the perceptible bodies is that from which the so-called elements come to be. I argue that the matter of the perceptible bodies, although it *is* that from which the elements come to be, is not the 'matter of the elements', in the sense of a matter that *composes* the elements. On the contrary, the 'matter of the perceptible bodies', i.e., the constitutive matter of *composite* bodies, is itself composed of the elements: it is a *mixture* of the four elements. Thus the latter can be said to come to be 'from' the 'matter of the perceptible bodies', but this must be understood in a non-constitutive sense of 'from'.

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For longer quotations from the Greek, the original text is offered in an endnote which is found at the end of each chapter. The endnotes are in alphabetical order. Hence the appearance of a letter in superscript after a translated text, or occasionally after a page and line reference, indicates that the Greek text is available at the end of the chapter. Shorter quotations are found in the main body of the text or in a footnote, transliterated and italicised. Unless otherwise indicated, translations are my own.

Apart from using *De Gen. et Cor.* for *De Generatione et Corruptione*, I abbreviate titles of Aristotle's works only when cited in brackets or in footnotes. On these occasions I use the standard abbreviations:

Cat.	*Categories*
DA	*De Anima*
DC	*De Caelo*
De Long.	*De Longitudine et Brevitate Vitae*
GA	*De Generatione Animalium*
GC	*De Generatione et Corruptione*
HA	*Historia Animalium*
MA	*De Motu Animalium*
MM	*Magna Moralia*
Metaph.	*Metaphysics*
Meteor.	*Meteorologica*
EN	*Nicomachean Ethics*
PA	*Parts of Animals*
Phys.	*Physics*
Poet.	*Poetics*
Pol.	*Politics*
Rhet.	*Rhetoric*
Sens.	*De Sensu*
Top.	*Topics*

The few remaining abbreviations that the reader will find are as follows:

DK = Hermann Diels *Die Fragmente der Vorsokraiter*, 6th edition, revised by Walter Kranz, 3 vols. (6th edn. Berlin: Weidmann, 1951 (repr. Dublin/Zurich, 1966).

LSJ = Henry George Liddell and Robert Scott *A Greek-English Lexicon*, 9th edition, revised and augmented throughout by Sir Henry Stuart Jones, with the assistance of Roderick McKenzie (Oxford, Clarendon Press, 1940).

OED = Oxford English Dictionary.

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In writing a thesis for a doctorate one inevitably incurs many debts, personal as well as academic. I want to begin by acknowledging my greatest personal debt. What I owe to my wife, Chiara, is incalculable. I dedicate this thesis to her, as it would not have been possible to produce it without her unfailing support. Now that it is completed, I can try to begin the immense task of repaying her well-tried faith in me.

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This thesis, in its arguments and conclusions, is substantially the same as the final draft that Michael Frede saw and approved on August 6th 2007. I am extremely grateful to Ben Morison for immediately and eagerly agreeing to step in, after Professor Frede's untimely death, to act as supervisor to oversee the final revisions and to help my preparations for the DPhil examination. Ben's brisk optimism and sharp eye for real and potential obscurities was of great benefit.

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Introduction

1. The issues discussed in this thesis have to do with the lowest level material entities of Aristotle's physical system, but it strikes at the heart of his general theory of change, and consequently his theory of substance. For Aristotle's theory of change is of central importance to his theory of substance. This is because living organisms, such as plants and animals, are the substances with which we are most familiar; indeed, Aristotle often suggests that they are substances most of all (*Metaph.* VII.7, 1032a18-9, VII.8 1034a3-4; *DA* I.1, 412a11-16). So to understand what substance is, we must start by examining these sensible or material substances (*Metaph.* VII.3, 1029a33-b8). But perhaps the most salient thing about living organisms is that they change: they grow, they move, certain of their features are replaced with other features; and their existence is bookended by two major changes—birth and death, or generation and corruption. It makes sense, then, that the explanation of the phenomenon of change has a central place in Aristotle's theory of the nature of substance. For this reason, if the explanation of change is incoherent, in particular, if it turns out that Aristotle posits a matter from which all things come to be that is unintelligible or internally incoherent, then his theory of substance is undermined.

In this thesis I want to argue that Aristotle identifies fire, air, water, and earth as the elements, i.e., the most fundamental material constituents, of bodies. To put this another way, I want to argue that Aristotle does not identify material constituents of bodies that are simpler, or more basic, than fire, air, water, and earth. There are two major issues that must be tackled if this aim is to be successfully achieved. Firstly, the relationship between the four elements and the primary contrarieties hot and cold, dry and wet needs to be clarified. This is because the latter are often identified as the constituents of the former, and consequently more deserving of the name 'element', or *stoicheion*. Secondly, Aristotle's insistence that the elements

come to be implies that there is something that underlies them, from which they come to be. But if the elements are the most fundamental material constituents of bodies, then there cannot be some further, more basic matter from which the elements come to be. Thus the nature of the matter from which the elements come to be needs to be clarified. This thesis is duly divided into two parts: Part I deals with the first issue, Part II with the second.

In Part I, I deal with the first issue in the following way. Firstly I consider, and reject, the evidence for believing that Aristotle does not think that fire, air, water, and earth are the genuine elements of bodies, and secondly I argue that a proper understanding of the status of the contraries effectively rules out the possibility that the former are constituents of the latter. There are two major pieces of evidence to consider. There is, firstly, Aristotle's use of the phrase *ta kaloumena stoicheia*, usually translated as 'the so-called elements'. Aristotle's use of this phrase is almost universally accepted as evidence that he does not really think that the things to which this phrase refers, namely, fire, air, water, and earth, are genuine elements. In Chapter 1 I argue that the grounds for taking the phrase in this way are less than compelling. The second piece of evidence to consider is supposedly found at *De Gen. et Cor.* II.3. For here, it is claimed, Aristotle identifies the contraries hot and cold, dry and wet as the true *stoicheia.* In Chapter 2 I argue that this claim is based on a misreading of the text. I offer an alternative interpretation of *De Gen. et Cor.* II.3, according to which Aristotle's concern in this text is to clarify and qualify the extent to which he endorses the view that fire, air, water, and earth are the elements of bodies. I then proceed to examine the relationship between the contraries and the elements, in which I emphasise Aristotle's identification of the former as the differentiae of the latter. I show how this identification makes sense of Aristotle's claim that elemental change is necessary if alteration is to take place.

In Part II I deal with the second issue. I begin by drawing attention to Aristotle's assertion at *De Gen. et Cor.* II.1 that the matter of the perceptible bodies is that from which the so-called elements come to be (329a24-26). I then set about determining what the matter of

the perceptible bodies is, and how this matter can be identified as the matter from which the so-called elements come to be. Broadly speaking, commentators are split into two camps over the identity of the matter of the perceptible bodies, depending upon their acceptance or rejection of the notion of *materia prima*, or prime matter.[1] On the traditional, and still the most widely accepted, interpretation, it is thought that the matter of the perceptible bodies is a bare substratum, and this is called prime matter. This interpretation has come under attack in recent times, and the criticisms typically focus on two points: (a) the texts do not support the prime matter hypothesis, and (b) the notion of prime matter is itself incoherent.[2] The critics of the tradition are perfectly aware, however, that, if prime matter is rejected, some alternative needs to be offered as that from which the elements come to be.

Now I believe that the critics are right to question the tradition's notion of prime matter, but I find their alternatives implausible. On the other hand, however, although I reject prime matter, I think that much of what the tradition has to say about the elements is right, some of it undoubtedly so. For instance, I think the tradition is clearly right to insist that Aristotle posits a matter common to, but other than, the elements, from which the elements come to be, and that this matter is indeterminate, but inseparable from contrariety. But there is a fundamental difference between the way that the tradition understands this matter, and the way in which I think it ought to be conceived. For, on my account, the matter from which the elements come to be, i.e., the matter of the perceptible bodies, is something that comes to be from the elements. I establish this conclusion by arguing, firstly, that, although Aristotle often calls fire, air, water, and earth 'perceptible bodies', by 'the perceptible bodies' in the context of *De Gen. et Cor.* II.1, we ought rather to understand *composite*, as opposed to simple,

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[1] See King (1956), who rejected prime matter, with Solmsen's response, (1958); the debate was reopened by Charlton (1970), esp. 129-145; see the critical replies to Charlton by Robinson (1974), and Williams (1982), 211-219, as well as Charlton's own riposte (1983). Also of interest are Graham (1987), Furth (1988), esp. 221-227, and Gill (1989), esp. 243-252.

[2] So King (1956), Charlton (1970, 1982), Furth (1988), Gill (1989). Some commentators accept the traditional interpretation, but admit that the notion of prime matter is incoherent; see, for instance, Williams (1982) 218-9, and Graham (1987), and (1987b), 227-9.

bodies. Hence the matter of the perceptible bodies is not also the matter of the simple bodies, in the sense of a matter that *composes* the simple bodies. I then argue that the matter of the perceptible bodies is some mixture of the elements. It follows that that from which the elements come to be is some mixture of the elements. Defending and clarifying this conclusion is the task of the final chapter.

The interpretation I offer—that the matter of the perceptible bodies is both the product of the elements, and acts as the matter of the elements—may well seem at first blush counterintuitive. But it is so only if we think that the matter of the perceptible bodies comes to be from the elements in the same way that the elements come to be from the matter of the perceptible bodies. As I hope to show, this is not the case: we are dealing here with two different uses of 'from'—the first a constitutive use, the second non-constitutive or originative. I hope to show that interpretation I propose is well-supported by the textual evidence; it is consistent with key principles of Aristotle's system; and, moreover, it defuses a number of problems in Aristotle's *De Gen. et Cor.*

PART I

1

Aristotle's 'So-Called Elements'

Introduction to Part I

1. It might seem quite commonplace to say that Aristotle identifies fire, air, water, and earth as the 'elements' of bodies that are subject to generation and corruption. Yet there is a tradition of interpretation, already evident in the work of the sixth-century commentator Philoponus, and still widespread today, according to which Aristotle does not really believe that fire, air, water, and earth are the *true* elements of bodies. If this is correct, then what are traditionally known as the 'Aristotelian elements' are not actually *Aristotle's* elements. But is it correct? In Part I of this thesis I consider the evidence for the claim that Aristotle abandons fire, air, water, and earth in favour of other, more fundamental, 'elements', and I argue that it is not compelling. Thus the 'so-called elements' ought to be taken as genuine elements. This conclusion lays the groundwork for Part II, where I argue that the 'matter of the elements', i.e., that from which the so-called elements fire, air, water, and earth come to be, ought not to be conceived as something out of which these so-called elements are composed.

Much of Part I thus consists of an examination of the purported evidence that Aristotle identifies items other than fire, air, water, and earth as the elements of bodies. In the first chapter, I approach the problem of the identity of Aristotle's elements by considering his use of the phrase *ta kaloumena stoicheia*. This phrase, and its variant, *ta legomena stoicheia*, can be translated as 'the things that are called 'elements'', or, more commonly, 'the so-called elements'.[1] I want to consider Aristotle's use of this phrase precisely because his use of this phrase is usually taken as evidence that he doesn't think that fire, air, water, and earth, i.e., the

[1] I follow Joachim's Oxford translation of *ta kaloumena stoichiea*, i.e., with a hyphen: 'so-called', rather than 'so called'. This should not be regarded as an interpretative decision (see OED, s.v. 'so called').

things to which he uses the phrase to refer, are the genuine elements of bodies. An element of bodies is the ultimate constituent into which a body can be analysed, which is to say it is not composed of simpler, or more basic, constituents of its own (see s. **2**). But it is usually thought that Aristotle maintains that fire, air, water, and earth *can* be analysed into more basic constituents, and consequently that they are not truly elemental. So while his contemporaries, or at least *some* of them, call fire, air, water, and earth 'elements', it is thought that Aristotle himself thinks that there are other things that are more deserving of the name 'element'. His use of the phrase *ta kaloumena stoicheia* is then thought to be corroborative evidence that this is his view. In other words, when Aristotle refers to fire, air, water, and earth as *ta kaloumena stoicheia*, it is usually assumed that the qualification *kaloumena* is employed by Aristotle to signal that he thinks that the term *stoicheia* is being used improperly.

This is by far the most common explanation of Aristotle's use of this phrase.[2] The *proper* use of the term *stoicheia*, according to this explanation, has traditionally been taken to be with reference to the primary 'qualities' hot and cold, dry and wet, together with prime matter as the subject for the basic contrariety of form and privation of which these qualities are instances.[3] Even commentators who reject prime matter nevertheless identify the primary qualities as Aristotle's true *stoicheia*.[4] These items are considered the true elements of bodies because they are believed to be identified by Aristotle as the ultimate things of which fire, air, water, and earth are composed. Fire, for instance, is thought to be composed of the qualities hot and dry, or, for the tradition, of prime matter that is qualified by the qualities hot and dry.[5]

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[2] For explicit statements of this explanation, see Burnet (1892), 230, n. 3; Diels (1899), 25; Joachim (1922), 137; Ross (1936), 484; Düring (1943), 124; Kahn (1960), 120; Sokolowski (1970), 269f.; Williams (1982), 152; Graham (1987), 476, n. 5, and (2006), 39; Longrigg (1993), 151; Crubellier (2000), 142; and Rashed (2005), 152-3.

[3] See, e.g., Philoponus, *In Phys.* 16. 94.15, *In de gen. et cor.* 14.2 205.23; Joachim (1922), xxxii, xxxiii 137; A. Mansion (1945), 161-166, 241, n. 5; Cherniss (1962), 160, 171; Solmsen (1960), 351. Aristotle appears to think that all opposites are reducible to form and privation; see, e.g., *Metaph.* X.4, esp. 1055a33f.

[4] See, e.g., Furth (1988), 76-79, 221-227; for further references, see Chapter **2**, note 6. For a tidy account, and defence, of the traditional notion of prime matter, see Robinson (1974), 168.

[5] The sense in which these things compose or constitute fire, air, water, and earth is not always clear. Joachim (1922) says that the latter logically presuppose more primitive 'constitutive moments', i.e., prime matter and the contrary qualities (137, 191, 200); more recently, Eric Lewis (1996) says that the contraries are the 'ingredients' of fire, air, water, and earth, and hence can be called 'the matter of the elements' (15-22; see also 34-59). See also Chapter **2**, notes 6 and 7.

Indeed, it is often thought that Aristotle explicitly identifies the contraries as the *stoicheia* at *De Gen. et Cor* II.3.[6] To sum up, then, the most common explanation of Aristotle's use of the phrase *ta kaloumena stoicheia* is that, by using this phrase, Aristotle signals, suggests, indicates, hints or implies—or, to borrow Grice's term, *implicates*[7]—that fire, air, water, and earth are not elements strictly speaking, and this is because they reveal under analysis items that are simpler, or more fundamental, i.e., more truly *elemental.*

I reject this explanation. In the present chapter I argue that the contexts of Aristotle's use of the phrase *ta kaloumena stoicheia* do not support the view that his use of this phrase carries, or is intended to carry, the negative connotations so often attributed to it in the secondary literature. But although my aim, then, is to reject the most common explanation of *ta kaloumena stoicheia*, I also consider some alternative reasons that Aristotle might have for using the phrase. The study is guided by two questions: (i) *by whom* are the things that are called *stoicheia* called *stoicheia*? and (ii) in each context where we find this phrase, *why* is Aristotle using this phrase? My conclusions are (i) that it is a popular contemporary opinion that the elements of bodies are fire, air, water, and earth; and (ii) that Aristotle uses the phrase *ta kaloumena stoicheia* as a device that clarifies to his audience that it is *these* elements, rather than any of the other material or immaterial principles available in the philosophical marketplace, that are in question in the particular context where he uses the phrase.

In the second chapter, I examine the most significant of the alleged *direct* evidence that Aristotle identifies as the genuine elements items more fundamental than fire, air, water, and earth, and I conclude that he endorses the popular opinion—albeit not (or not always) without an important qualification. The discussion in Chapter **2** inevitably leads to the question of the precise nature of the relationship between the 'so-called elements' and the contrary 'qualities', and in the second half of that chapter I attempt to make some progress towards the clarification of this relationship.

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[6] For references, see Chapter **2**, note 13. I consider the support for this claim in Chapter **2**, s. **2.**

[7] Grice (1989), 24f. "Implicature' is a blanket word to avoid having to make choices between words like 'imply', 'suggest', 'indicate', and 'mean", 86.

Elements and 'So-Called Elements'

2.1 What is Aristotle referring to when he uses the phrase *ta kaloumena stoicheia*? If we take the phrase to mean 'what people call elements', then we are immediately brought up short by the fact that Aristotle's contemporaries use the term *stoicheion*, or 'element', in many ways. Even when we concentrate on its use in physical or metaphysical contexts,[8] the fact remains that different people call different things 'elements'. The discrepancy centres on whether the elements of things are thought to be the basic building blocks out of which each thing is composed, or the universal principles according to which the nature of each thing is known and defined. In *Metaphysics* Delta, Aristotle gives this account of the use of the term 'element':

> An element is said to be the first constituent out of which something is composed, indivisible in form into another form, for instance the elements of utterances are those out of which the utterance is composed and into which it is ultimately divisible, and which are not further divisible into utterances different in form; but if they do divide, the parts are of the same form, e.g., as a part of water is water—this is not the case for a syllable. In the same way also those who speak of the elements of bodies (*ta tôn sômatôn stoicheia*) mean the things into which bodies ultimately divide, and which are not further divisible into things other in form; and whether such things are one or many, they call these elements (V.3, 1014a31-34).[a]

According to this definition, an element of something is the most basic constituent of that thing. It is indivisible into things that are different in form, which is to say that it cannot be analysed into further constituents—or elements—of its own. Evidently there are people who use the term with reference to bodies. The elements of bodies, then, are the basic constituents of bodies (cf. *DC* III.3, 302a14-21). But Aristotle proceeds to note that the most universal things are also called 'elements'. This is because universals are one and simple and exist in many things (1014b6-7), and anything that is one, small, simple and indivisible, and with many uses, is called an 'element' (1014b3-6). Thus some say the genera are 'elements' (*stoicheia ta genê legousi tines*, 1014b10-11), because what are called 'genera' (i.e., the general kinds or categories to

[8] As opposed to its use in 'alphabetic' or 'geometric' contexts. See Crowley (2005), 370f. for clarification.

which things belong) are universal and indivisible (b9-10). Here it is usually thought that Aristotle has in mind Plato, or Platonists, and Pythagoreans.[9]

This difference over the sorts of things that are called 'elements' reflects a difficulty concerning the very nature of an element. What is an element supposed to be? In *Metaphysics* Beta Aristotle considers a series of metaphysical *aporiai* or 'puzzles', and one of these puzzles is precisely the question whether the elements or principles (*archai*)[10] of a thing are the general kinds to which the thing belongs, or the primary constituents (*enuparchonta*) out of which it is composed and which remain present in it (III.3, 998a20-b13). Obviously one's response to this puzzle will determine one's use of the term *stoicheion*. In the course of his response Aristotle identifies the *phusiologoi*, or natural philosophers, such as the Milesians and Empedocles, as exponents of the latter view (998a28-32); while his reference to 'the One or Being or the Great and Small' (998b9-10) confirms that the former is a Platonist thesis.[11] The Platonists posit the One and the Great and Small as the elements of all things (see *Metaph.* I.6, 987b18-21; cf. 988a11), and, as Aristotle puts it, some of them (*tines*) appear to use these as genera (III.3, 998b9-11). So there are some philosophers for whom the principles and elements of things are corporeal, e.g., fire, water, air, earth (998a30-1); and others for whom the principles and elements are incorporeal, e.g., the One and the Great and Small (cf. *DA*, I.2, 404b31-a1).[12] All of Aristotle's predecessors may neatly be divided along this fault-line.[13]

There is evidence in Aristotle that the Platonists call their incorporeal principles *stoicheia* (*Metaph.* XIV.1, 1087b9-10, b12-13; cf. XIII.6, 1080b6-7, XIII.7, 1081b32, XIV.3, 1091a9-10). But who refers to the primary constituents of bodies as *stoicheia*? Not the Milesians and

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[9] Ross (1924), I, 295. Cf. *Metaph.* I.5, 986a1; III. 3, 998b9-11; VII.2, 1028b25-8; XII.1, 1069a26-28.

[10] Aristotle often uses the terms *archai* and *stoicheia* interchangeably; see, for instance, *Phys.* I.1,184a23, I.2, 184b25, and esp. I.6, 189b27 with I.7, 191a15f. Cf. also *Metaph.* I.3, 983b11, I.8, 989b30. An element is a kind of principle, but not all principles are elements; *Metaph.* V.1, 1013a17-21.

[11] See Madigan (1999), 24, 68.

[12] The Pythagorean elements can also be described as incorporeal, i.e., imperceptible; see *Metaph.* I.8, 989b29-31, and the following note.

[13] Thus Sextus Empiricus, in a rather Aristotelian survey of the views regarding the elements of things (*ta tôn ontôn stoicheia*), classifies philosophers according to whether their elements are corporeal or incorporeal (*Adversus Mathematicos* IX.359=*Against the Physicists* I.359). Those who say the elements are corporeal include the Milesians, Heraclitus, Empedocles, Anaxagoras, and the Atomists (IX.360-3); those for whom they are incorporeal include Plato and the Pythagoreans (364).

Empedocles themselves, to whom this use of the term seems to be unknown. Perhaps, then, those who speak of the '*stoicheia* of bodies' are the followers of these *phusiologoi* (cf. *GC* I.1, 314a25-29). Or perhaps such things as fire, air, water, and earth have become, by Aristotle's time, the sort of things that people most often identify as the *stoicheia.* Indeed this latter suggestion receives support from Plato's *Timaeus,* in the remark that we tend unreflectively to say that fire, air, water, and earth are the *archai* and *stoicheia* of everything (48b-c).[14] We'll return to this point later (s. **5**); for now, it is sufficient to note that both corporeal and incorporeal principles are called *stoicheia* by Aristotle's contemporaries.

Aristotle's awareness of the ambiguity of the term *stoicheion* is again evident in his occasional care to specify to which kind of elements he intends to refer. In *Metaphysics* Alpha, for instance, he credits Empedocles with being the first to name fire, air, water, and earth as the elements of things, but specifies that he means *stoicheia* in the sense of the material kind (*ta hôs en hulês eidei legomena stoicheia tettara*, I.4, 985a32). This qualifier, as well as some later remarks (at I.7, 988a25-28, and I.8, 988b24), indicates that the term *stoicheia* can also refer to principles in the sense of the non-material, or incorporeal, kind. Indeed Aristotle does on occasion refer generally and inclusively to the principles of things as *stoicheia,* irrespective of whether they are corporeal or incorporeal (e.g., *Phys.* IV.1, 209a14-16). But it is important to remember that Aristotle sometimes expresses himself quite generally or non-technically, while at other times he strives to be more precise in his language. And when he is speaking in the latter mode, it is quite clear that he thinks that the proper use of *stoicheia*, in the context of physics or natural philosophy, is with reference to corporeal principles.

Strictly speaking, for Aristotle an 'element', in the context of physics, is that basic material constituent into which bodies divide, or into which bodies can be analysed (cf. *Metaph.* VII.17, 1041b31: *stoicheion d'estin eis ho diaireitai enuparchon hôs hulên*). By contrast, in *Metaphysics* Delta Aristotle states that the *other* reported use of *stoicheia*, with reference to incorporeal

[14] I discuss the significance of this passage for the usage of *stoicheion* in Crowley (2005), 378f.

principles, is a metaphorical use of the term (1014b3-6). Elsewhere he defines *metaphora* (which is not exactly equivalent to 'metaphor') as 'a word used in a strange way' (*Poetics* 1457b6ff), and by 'strange' (*xenikon*) he means 'everything apart from the ordinary' (*pan to para kurion*, 1458a23-5).[15] Thus metaphorical applications of terms are departures from the 'ordinary' usage. The 'ordinary' use is when the term is used strictly (*kuriôs*), or properly (*oikeiôs*); it expresses the actual or current sense in which everybody usually uses the word.[16] The Platonists' use of *stoicheion*, then, is not the ordinary use.

Now in the phrase *ta kaloumena stoicheia*, is *stoicheia* being used strictly or metaphorically? Usually it is fairly clear from the context in which the phrase appears that Aristotle intends *corporeal* principles. For instance, in many cases the phrase 'the so-called elements' is extended to 'the so-called elements *of bodies*' (*ta kaloumena stoicheia ton somatôn*, e.g. *GA* I.1, 715a11, *GC* II.1, 328b31; *Meteor* I.3, 339b5). As we have seen, the elements of bodies are the material constituents of bodies, e.g., such things as were posited by the Milesians and Empedocles. So the use of the extended phrase 'the so-called elements of bodies' clarifies that Aristotle has in mind the corporeal *stoicheia*, as opposed to other, Platonic or Pythagorean, principles. Other texts support this suggestion. In the *Physics*, for instance, Aristotle says that Empedocles posits 'only the so-called elements' (I.4, 187a26). Moreover, in *Metaphysics* Kappa, *ta kaloumena hupo tinôn stoicheia*, 'what are called *stoicheia* by some people', refers to the principles that are present as constituents in composite things, and these are contrasted with universals (XI.1, 1059b23f.).[17] Aristotle uses the same expression in the *Parts of Animals*, and immediately gives as examples earth, air, water, fire (II.1, 646a13).

So the 'so-called elements' are corporeal, as opposed to incorporeal, principles. Is it possible to be more specific? In the light of the examples at the end of the previous paragraph, one might presume that the phrase refers only to the 'Empedoclean' elements fire, air, water,

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[15] For further contrasts between *metaphora* and ordinary usage, see *Poet.* 21, 1457b1-4, and also 22, 1458a33, 1458b17; *Top.* IV.3, 123a33-36, 139b34, and 158b12; *Rhet.* III.10, 1410b12-13; and *MM* I. 26, 1192b15f.

[16] See, for instance, *Poet.* 21, 1457b3-4; and cf. *Rhet.* III.2, 1404b5-6. For the use of *oikeios* and *kurios*, see *Rhet.* III.2, 1404b31-32; cf. *Rhet.* III.10, 1410b12-13, and LSJ s.v. *kurios*.

[17] There may be doubts about the authenticity of *Metaph.* Kappa; see Ross (1924), I, xxv-xxvii.

and earth, i.e., taken as a quartet of elements. Certainly this is the usual presumption, particularly among those who believe that the phrase signals Aristotle's dissatisfaction with the 'Empedoclean' elements.[18] But perhaps we ought not to presume just yet that Aristotle is referring only to these elements. After all, those for whom the elements are corporeal are the *phusiologoi* in general: the Milesians, Heraclitus, Anaxagoras, and the Atomists, as well as Empedocles. The next question, then, is: does Aristotle, when he refers to the 'so-called elements', intend to refer to corporeal elements in general, or only to the Empedoclean quartet?

2.2 This question is more complex than it may seem. For, even after the metaphorical uses have been discarded, Aristotle's accounts of *stoicheion* at *Metaphysics* Delta and in *De Caelo* III.3 remain quite general, and capable of satisfaction by a variety of things. This vagueness as to the identity of the elements seems to be reflected in Aristotle's rather catholic use of the term *stoicheion* with reference to the material principles of his predecessors. Now, admittedly, fire, air, water, and earth are the things that are most frequently called *stoicheia*. Immediately after the *De Caelo* definition of *stoicheion*, Aristotle offers as examples fire and earth, because they constitute flesh and wood and other such bodies (302a21f.). But he proceeds to contrast Empedocles' elements with Anaxagoras' view regarding the principles of natural things (a28), and he refers to Anaxagoras' principles as 'elements', even though they are 'homoeomeries', i.e., such things as flesh and bone (*ta gar homoiomerê stoicheia*, 302a31, III.4, 302b13). Aristotle also refers to the atoms of Democritus as 'elements' (see, e.g., *GC* I.1, 314a18-20, *Phys.* III.4, 203a20, *DA* I.2, 404a4-5). Even when he *is* talking about Empedocles' elements, it is not necessarily the case that Aristotle is referring to the quartet of fire, air, water, and earth. On some occasions, he suggests that Empedocles reduces the four elements to two, because he opposes fire to the others (*GC* II.3, 330b19, *Metaph.* I.4, 985a33); on others, he refers also to Love and Strife (*philia*

[18] See, e.g., Philoponus *In Phys.*, 16. 94.13-15, and Ross (1936), 484.

and *neikos*), the moving forces in Empedocles' cosmology, as 'elements' (e.g., *Metaph.* XIV.4, 1091b12, and *DA* I.5, 410b6).[19]

Nevertheless, when Aristotle uses the phrase 'so-called elements' he does have a particular sub-set of corporeal elements in mind. Anaxagoras' principles, for instance, are excluded from this group: Anaxagoras posits the homoeomerous bodies and the contraries, which are explicitly distinguished by Aristotle from the so-called elements (*Phys.* I.4, 187a26). Indeed, at *De Caelo* III.4, Aristotle denies that Anaxagoras' 'elements' are really *stoicheia*, because they do not fit the definition of an element (302b14-20). The atoms of Democritus and Leucippus, by contrast, are things that might seem to meet very well the conditions for being an element. But, although Aristotle calls them 'elements', he never refers to them as '*so-called* elements'. The sort of things that are definitely included among the 'so-called elements', rather, are fire, air, water, and earth. Now that this is the case might seem to corroborate the presumption, noted earlier, that by the 'so-called elements' Aristotle is referring to the 'Empedoclean' elements. But this presumption is not quite correct; it is more accurate to say that the so-called elements are those corporeal or material principles posited by the natural philosophers, in particular the Milesians and Empedocles, but excluding Anaxagoras and the Atomists. These principles are indeed earth, water, air and fire, and Aristotle credits Empedocles as the first to say that all four are the elements of things (*Metaph.* I.4, 985a32). But Thales posits water, Anaximenes air, Heraclitus fire; Parmenides posits fire and earth, Ion of Chios fire, earth, and air (see *GC* II.1, 329a1-2). Aristotle would say of them that they posited one or more of the so-called elements, but he would not say that they posited one or more of the *Empedoclean* elements.

There is a question, however, as to whether or not the phrase *ta kaloumena stoicheia* refers to more than just fire, air, water, and earth. For Aristotle sometimes mentions a further 'element', which is said to be something else 'besides' (*para*) fire, air, water, and earth, in the

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[19] In a similar way, Aristotle uses *stoicheia* to refer to the basic principles of atomism, i.e., 'body' and 'void' (*Metaph.* 985b5). Likewise, he says that Anaxagoras speaks of two *stoicheia*, i.e., *Nous* and the indefinite mixture (*Metaph.* 989a31f.), or the One and the Other (*to hen kai to thateron*, 989b19).

sense of being different or apart from them (*GC* II.5, 332a20, *Phys.* I.6, 189b1-8). It is described as 'intermediate' (*to metaxu*) between air and water, or air and fire (*GC* II.5, 332a21).[20] This intermediate 'element' is usually thought to be a reference to Anaximander's *apeiron.* [21] Aristotle actually appears to regard it as one of the best suggestions that his predecessors made regarding the substratum of things (*Phys.* I.6, 189b1-10). But is it one of the so-called elements? At times Aristotle seems to include it among them (*Phys.* III.4, 203a17-18, *GC* II.1, 328b31-6). It seems, however, that the intermediate is offered as an *alternative* to the 'so-called elements', or an 'element' from which the so-called elements themselves come to be (see *Phys.* III.5, 204b23-24). Moreover it is conceived of as a body *separate* from perceptible contrariety (*GC* II.1, 329a8-13). Such a entity is for Aristotle impossible. A body without perceptible contrariety would be imperceptible by definition (329a10), and hence it could not be a body (see *Cat.* 8a1; *GC* 329a10-12; *DA* III.12, 434b12). So the intermediate, he argues at *De Gen. et Cor.* II.5, is either nothing at all, or else one of the four elements (332a35). Hence, strictly speaking, the intermediate is not *another* 'so-called element' in addition to fire, air, water, and earth.[22]

2.3 So much for the reference of the phrase *ta kaloumena stoicheia.* When Aristotle uses it, he is referring to fire, air, water, and earth, one, some, or all of which were named as the principles of nature by certain of his predecessors, in particular, the Milesians and Empedocles. Note, however, that we have not yet answered this question: by *whom* are fire, air, water, and earth called 'elements', i.e., *stoicheia*? For, as stated above, none of these *phusiologoi* used the term

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[20] Both possibilities are rehearsed in other texts: between fire and air (*Phys.* I.4, 187a14; *GC* II.1, 328b35; *Metaph.* I.7, 988a30), between water and air (*Phys.* III.4, 203a18, III.5, 205a27; *DC* III.5, 303b11-15; *Metaph.* I.8, 989a14). On one occasion (*Phys.* I.6, 189b3) it is placed between fire and water.

[21] See, e.g., Joachim (1922), 193-4, Williams (1982), 152-3, Rashed (2005), 152, 153, 161.

[22] Cf. Simplicius' report of Theophrastus' account of Anaximander: '[the *apeiron* is] neither water nor air *nor any of the other so-called elements*' (*in Phys.* 24.13; DK 49A9, ll.3-4; my italics). Admittedly it is not clear if Theophrastus himself is using the phrase 'so-called elements' in this way, or if Simplicius is importing the phrase into the text; cf. *In Phys* 41.17. On this fragment see Kirk, Raven, Schofield (1983), 105-6; also, Kahn (1960), 32f.

stoicheia. But before turning to consider this question, and the reasons *why* Aristotle uses this phrase, there is an important point to make about the *frequency* of Aristotle's use of this phrase.

Kahn expresses a fairly widespread opinion when he notes that Aristotle 'normally refers to these [fire, air, water, and earth] as the 'so-called elements".[23] This is something of an exaggeration. As a matter of fact, Aristotle only occasionally prefaces the term *stoicheia* with the qualification 'so-called'. Apart from the *De Gen. et Cor.*, we find the phrase *ta kaloumena stoicheia* on only *six* occasions in the entire corpus—the variant *ta legomena stoicheia* appears just three times: while in the *De Gen. et Cor.* itself, the phrase appears a mere four times. This is remarkable, considering how much of Aristotle's work in natural philosophy involves discussion of the elements of bodies. More often, Aristotle refers to fire, air, water, and earth simply as 'elements'—*stoicheia*, or *ta stoicheia tôn sômatôn*. A work from which the phrase *ta kaloumena stoicheia* is notably absent is the *De Caelo*. There Aristotle identifies fire, air, water and earth as the simple and primary bodies, and unhesitatingly refers to these four as *stoicheia* from almost the beginning of the treatise (e.g., I.3, 270a33; I.8, 276b9, 277b14, III.1, 298b10). So it is certainly not the case that Aristotle *normally* or *usually* refers to fire, air, water, and earth as the 'so-called elements'.

The 'Impropriety Explanation'

3.1 We now have a good idea about what Aristotle is saying when he uses the phrase *ta kaloumena stoicheia*, i.e. what Aristotle means by the phrase, and to what he uses it to refer. For its *literal* meaning is given by the translation 'the things that are called 'elements", and these things are the corporeal, as opposed to incorporeal, elements, and, as such, they are material and perceptible. To be more specific, these things are fire, air, water, and earth. Some questions remain, however, before we can claim to understand Aristotle fully when he uses this phrase. There is the question as to the identity of those who call these things 'elements', i.e.,

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[23] (1960), 120 and 124. Ross (1924), I, 294, says that Aristotle does so 'frequently' (see also Sokolowski (1970), 269, Crubellier (2000), 142, Graham (2006), 39); others give the impression that he does so all the time, e.g. Burnet (1892), 230, n. 3, Longrigg (1993), 151.

the question as to how this phrase is to be completed (by *whom* are these things called 'elements'?). And then there is the question as to Aristotle's reasons for using this expression to refer to this opinion about the constituents of bodies, i.e., why does he want to draw attention to this particular use of the term *stoicheia*?

To put the point in Gricean terms, we have established what is being *said*, i.e., the literal or conventional meaning of the terms or phrase used, when Aristotle uses the phrase *ta kaloumena stoicheia*; and now we need to think about the 'implicature' of Aristotle's use of this phrase—what is being 'implicated', i.e., implied, indicated, hinted, or suggested.[24] So we need to try to determine what are, or what could be, the intended implications of Aristotle's description of fire, air, water, and earth as *ta kaloumena stoicheia*, and, in particular, what, if anything, Aristotle's use of this phrase reveals about his own attitude towards the elemental status of the things that are called elements.

According to the explanation of Aristotle's use of the phrase *ta kaloumena stoicheia* that is most commonly found in the secondary literature, Aristotle is using the qualification *kaloumenos* to implicate that the term *stoicheion* is being used incorrectly or inappropriately.[25] In other words, by referring to fire, air, water, and earth as *ta kaloumena stoicheia*, Aristotle is conveying, in an indirect manner, his critical or sceptical attitude towards the opinion that fire, air, water, and earth are the elements of bodies. As such this use of *kaloumenos* corresponds to the attributive use of the English participial adjective 'so-called': for something is a 'so-called *x*' in the attributive use when it is 'called or designated by this name or term, but not properly entitled to it or correctly described by it' (OED, 2nd Edition). For ease of reference let's call this the 'impropriety explanation'. In this section I shall describe further the impropriety explanation, and its assumptions. In the following section (s. **4**) I examine the contexts of the most significant of the instances of Aristotle's use of the phrase *ta kaloumena stoicheia* with the aim of showing why the explanation ought to be rejected. I also consider whether or not one

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[24] Grice (1989), 24f., 118.

[25] For references, see note 2 above.

finds precedents in Aristotle for the use of *kaloumenos* required by the impropriety explanation (s. **4.5**). Although my overriding aim in this chapter is to present a persuasive critique of the impropriety explanation of *ta kaloumena stoicheia*, in the final section (s. **5**) I consider alternative explanations of Aristotle's use of this phrase.

3.2 On the impropriety explanation, Aristotle uses the phrase *ta kaloumena stoicheia* in order to implicate that those items that are being called *stoicheia* are incorrectly called *stoicheia.* These 'so-called elements' are fire, air, water, and earth, and they are not truly elemental because they are not truly simple; that is to say, they can be analysed into more basic constituents. Hence although they are evidently called 'elements', for Aristotle it is not these but their constituents that are the true elements.

But what are the constituents of fire, air, water, and earth? Kahn offers the following explanation:

> When [Aristotle] speaks of 'the so-called elements', he has in mind the classic tetrad of earth, water, air, and fire. Since these are for him not the true elements, he uses the word with some reserve: *ta kaloumena* (or *legomena*) *stoicheia.* What Aristotle properly designates as an 'element' is the primary, simple ingredient of a composite thing (*Met.* 1014a26ff.). In his view, the true elements of the natural world are not these concrete bodies of earth, water and the rest, but the four chief physical opposites: Hot and Cold, Dry and Wet. It is from the combination of these opposing principles that the four elemental bodies arise.[26]

This itself needs some explanation. Aristotle introduces what he calls the 'primary differentiae' at the beginning of *De Gen. et Cor.* II.2 (329b7-11, b16-18). The differentiae are the contraries hot and cold, dry and wet, and one from each pair of contraries is allotted to each element (see Ch. **2**, ss. **2.2**, **3.3**). The precise relationship between the elements and their differentiae is a disputed issue: I return to it in the next chapter. But on the interpretation offered by Kahn, which is representative of the impropriety explanation, the relationship between the contraries

[26] Kahn (1960), 120; see also 124, and in general chapter 2.

and the elements is a relationship of constituents to that which is constituted. Fire, for instance, is constituted by hot and dry, water by cold and wet; air by hot and wet, earth by cold and dry. Now, according to the definitions in *Metaphysics* V.3 and *De Caelo* III.3, an element is a basic or ultimate constituent of things, unanalysable into things different in form (see s. **2.1** above). It follows, firstly, that fire, air, water, and earth must be excluded from the status of elements;[27] and secondly, that their constituents, the contraries hot and cold, dry and wet, are more deserving of the name *stoicheia.*[28]

On the impropriety explanation, then, Aristotle uses the phrase *ta kaloumena stoicheia* because he thinks that fire, air, water, and earth can be analysed into constituents, and therefore they are not genuine elements. A plausible reason for the popularity of this explanation is that its basic premiss fits very well with the traditional interpretation of Aristotle's account of generation and corruption. The traditional interpretation is clearly disposed towards denying to fire, air, water, and earth the status of genuine elements. After all, its central claim is that the contraries hot and cold, dry and wet inform prime matter, and in this way fire, air, water, and earth come to be. But if this is the case, then clearly the latter must be composite: composites of form—the contraries—and matter—prime matter.

The interpretation of the contraries as constituents of fire, air, water, and earth is explicitly linked to the traditional doctrine of prime matter by Joachim, Ross, Cherniss, and Solmsen, to name but a few.[29] But it is certainly not exclusive to those who subscribe to the traditional doctrine. Many commentators have adopted the view that the contraries are Aristotle's true elements, while remaining silent about, or indeed sometimes explicitly eschewing, the tradition's notion of prime matter. Furth, for instance, attacks the traditional theory of prime matter, while arguing that the contraries are more fundamental than the

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[27] Kahn (1960), 124, on the definition at *Metaph.* V.3 writes: '[it is] so rigorous that the four primary bodies are not true elements for Aristotle'. See also Ross (1923), 105.
[28] Kahn (1960), 126; see also Gannagé (2005), 43, with n. 173, and 96, n. 41.
[29] Joachim (1922), 137; see also 104, 193, 200; Ross (1936) 484, and cf. (1949), 73, 168-9. Cherniss (1935) 54, 60-1, 122; and (1944) 160, 171; Solmsen (1958), 245, 249, and (1960), 351. See also Sokolowski (1970), 268-9.

elements.[30] So this view of the contraries may be called the prevailing opinion not only among those who subscribe to prime matter, but also those who may be less willing to accept the traditional interpretation.

Another source of the impropriety explanation is the purported parallel between Aristotle's treatment of fire, air, water, and earth and Plato's attitude towards these bodies as expressed in the *Timaeus*. At 48b-c, Timaeus says that people think that fire, air, water, and earth are the principles and elements of all things; but, he continues, it is not right to consider fire, air, water, and earth even as syllables, never mind *stoicheia*. These are so far from being basic that they cannot even be thought of as the first complex entities formed by the genuinely elemental bodies. Now those who subscribe to the impropriety explanation evidently presume that Aristotle has similar misgivings towards fire, air, water, and earth. Burnet, for example, finds the explanation for Aristotle's use of the phrase 'so-called elements' in the *Timaeus* passage: 'As Plato put it … they [fire, air, water, and earth] were 'not even syllables', let alone 'letters' (*stoicheia*). That is why Aristotle calls them *ta kaloumena stoicheia*'.[31] If we consider that traditionalists have often equated Plato's receptacle with prime matter,[32] then the impropriety explanation suggests a close similarity or analogy between the material structure of substance in the *Timaeus* and in the *De Gen. et Cor.* Fire, air, water, and earth are conceived of as composite bodies by Plato, but also, according to the impropriety explanation, by Aristotle; the true *stoicheia* are the things that compose them, i.e., the geometrical figures for Plato, the contraries for Aristotle; and, as the first principle of matter, there is, for Plato, the receptacle, which is identified with, or is at least analogous to, Aristotle's prime matter.[33] Not only in Plato's *Timaeus*, then, but also in Aristotle's *De Gen. et Cor.*, a distinction is being made between true and false elements. Fire, air, water, and earth are commonly, but, on this view, wrongly,

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[30] (1988), 77, 223. Furth insists that Aristotle is being most 'consistent' when he refers to fire, air, water, and earth as the 'so-called elements'.

[31] (1892), 230, n. 3. See also Diels, (1899), 25, and Longrigg (1993), 151.

[32] Perhaps few would explicitly identify Plato's receptacle with Aristotle's matter today; but, for a recent statement in support of the identification, see Dillon (2003), 25, n. 50.

[33] Cf. Solmsen (1958), 244, and Owens (1966), 200-1, n. 12.

thought to be the elements of bodies, and hence they are described by Aristotle as the 'so-called elements', i.e., what some people *erroneously* call 'elements'.[34]

3.3 For the impropriety explanation to be acceptable, however, it seems that there ought to be reasons to think that in those contexts where the phrase *ta kaloumena stoicheia* is employed, it is at least plausible, and preferably likely, that the work it is expected to do is to implicate that it is Aristotle's belief that fire, air, water, and earth are not genuinely elemental. But proponents of the impropriety explanation never offer such reasons. The evidence in favour of the impropriety explanation of *ta kaloumena stoicheia* appears to consist entirely of the alleged evidence that Aristotle identifies entities more fundamental, or simpler, than fire, air, water, and earth.

Philoponus, for instance, says that Aristotle refers to fire, air, water, and earth as 'so-called' elements precisely because they are not elements strictly speaking; and he explains that they are not elements strictly speaking because they are not simples, but composites (*In phys.*, 16. 94.13-15; cf. *In de gen et cor*, 14.2. 205.23-5; cf. 14.2. 206.24-26.).[b] The best evidence that fire, air, water, and earth are composites is supposed to be available at *De Gen. et Cor.* II.3. Many commentators, including Philoponus (*In de gen et corr* 14.2, 224.1-5), claim that Aristotle identifies the contraries hot and cold, dry and wet as the genuine *stoicheia* in this chapter; and indeed it does appear that Aristotle proceeds to state that fire, air, water, and earth are composite, rather than simple, bodies (330b21f.).[35] If this were correct, it would provide very strong evidence indeed that Aristotle does not believe that fire, air, water, and earth are the genuine elements.

But such evidence, while necessary, is not sufficient for establishing the truth of the impropriety explanation of Aristotle's use of *ta kaloumena stoicheia.* For such evidence would seem to support the impropriety explanation only if one *also* decides that the best, or most

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[34] Diels (1899), 25, Joachim (1922), 137, 212. Already in Simplicius we find the view that Plato's and Aristotle's accounts of the material elements are very similar, *In Phys.* I, 191a5; Diels 225.17-19.

[35] For references, see Chapter **2**, note 13. I consider the support for this claim in Chapter **2**, s. **2.**

plausible, available explanation of Aristotle's use of the phrase is that it implicates impropriety of the use of the term *stoicheia.* And in order to decide whether *this* is the case or not, it seems to me that we need to consider Aristotle's actual employment of the phrase *ta kaloumena stoicheia* itself, in the contexts in which it appears; it is worthwhile also to consider the basic assumption of the impropriety explanation, namely that the participle *kaloumenos* can be used to implicate misuse of the terms that it qualifies. These considerations I offer in the next section.

Before putting the impropriety explanation and its assumptions to the test, however, it might be useful to say something about my own assumptions.

3.4 In the texts to be examined I think we can assume some things about Aristotle's general intentions. We can assume, for instance, that Aristotle intends to communicate his ideas in such a way that what he says, at the point at which he says it, will be what is required by the apparent purpose or direction of the discourse in which he is engaged.[36] Granted that this is so, we can, and ought to, assume that a word or phrase in a particular sentence performs a function in that sentence, a function that can be understood by looking to the sentence itself, the argument in which the sentence appears, and the wider context in which the argument appears. In general, we ought to assume (a) that Aristotle intends to be as informative as required by the purpose of his discourse, (b) that Aristotle intends to say what he thinks is true, (c) that Aristotle intends to say what is relevant to the discourse, and (d) that Aristotle does not intend to confuse or mislead his audience through ambiguity or wilful obscurity in his expression. In other words, we should assume that Aristotle is following something like what Grice calls the 'co-operative principle' and its associated maxims of (a) Quantity, (b) Quality, (c) Relevance, and (d) Manner.[37] Now admittedly Grice is referring to conversations and 'talk exchanges'. But to head off doubts or objections to my appeal to Grice's co-operative principle, and these maxims, it is enough to remember that with Aristotle's texts what we are

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[36] 'The very first thing… to do is to assume that there is an intelligent structure to [Aristotle's] text', Pakaluk (2005), 40.
[37] Grice (1989), 26f.

dealing with, for the most part, are rough drafts of work in progress, or perhaps notes of lectures delivered or to be delivered to an audience (cf. *EN* I.3, 1095a5).[38] As no doubt will be readily agreed, a lecture, and *a fortiori* a draft of research in progress, is quite different to a conversation. Nevertheless they do have certain features in common: they are (normally) rational, i.e., 'not… a succession of disconnected remarks';[39] they are, to some extent, co-operative efforts; and they each have goals or purposes recognised or accepted by the parties involved, i.e., by the participants in the conversation, or by both writer and reader, or lecturer and audience.[40]

There is an added variable, of course, namely that since with Aristotle's work we often are dealing with working drafts, or lecture notes, they most likely have been revised and expanded over time, perhaps also with changes of view nestled alongside superseded but unexpurgated views. It might seem, then, that at times Aristotle is being *overinformative.* This can certainly provoke confusion and misunderstanding.[41] On the other hand, if they are lecture notes, one might expect that a phrase or line that causes difficulty on the page might receive further elucidation and clarification in the course of the lecture. Aristotle may thus seem to be giving information that may not appear relevant in the immediate context, because how it fits into that context is not clear; to put it another way, he may be rather *underinformative*—as one commentator puts it, he can be 'bafflingly cryptic and elliptical'.[42] So one might doubt whether we can apply strictly a maxim such as that of Quantity or even that of Relevance to such texts; and the maxim of Manner is placed in doubt too. We will have to be aware of this problem in what follows, and be prepared to make allowances for it.

Given these assumptions, the guiding question in what follows is this: when Aristotle uses the phrase *ta kaloumena stoicheia* does he thereby 'implicate' that fire, air, water, and earth

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[38] For the latter view, see Barnes (1976a), 14-16; and Pakaluk (2005), 38f.; but cf. Ross (1923), 16-17, Saunders (1981), 30-32, and Barnes (1995a), 12-15.

[39] Grice (1989), 26.

[40] In a lecture, however, the purpose may be initially implicit, known only to the lecturer, and becoming explicit during the delivery of the lecture; see Pakaluk (2005), 40.

are not the genuine elements of bodies? Paraphrasing Grice, we might say that Aristotle has implicated *q* ('fire, air, water, and earth are not the genuine elements of bodies') when he says *p* (e.g., 'it remains to consider the so-called elements of bodies'), if the supposition that Aristotle thinks that *q* is *required* in order to make his saying *p* consistent with the presumption that he is observing something like Grice's co-operative principle. What is implicated, in other words, is what is required that one assume a speaker to think in order to preserve the assumption that he intends honestly to convey relevant information in a rational order. Hence our question might be rephrased: is it required that we assume from what Aristotle says in the immediate contexts in which we find the phrase *ta kaloumena stoicheia*, and the overarching aims in these contexts, that Aristotle does not believe that fire, air, water, and earth are the genuine elements of bodies? To put it another way, would it be appropriate, given his aims in the contexts in which he uses the phrase, for Aristotle to use the phrase to make the point that he doesn't believe that fire, air, water, and earth are the genuine elements? I shall now argue that it is not.

Against the Impropriety Explanation

4.1 Let's begin with the instances of *ta kaloumena stoicheia* that we find in the *Physics*. Near the beginning of *Physics* I.4, Aristotle distinguishes the doctrines of Anaxagoras and Empedocles. They are similar, he says, insofar as they both separate things out from a mixture (*migma*), but whereas the former separates out an infinite number of things, Empedocles separates out 'only the so-called elements' (*ta kaloumena stoicheia monon*, 187a20-26). Why does Aristotle use the phrase *ta kaloumena stoicheia* here? Ross claims that it is 'because Aristotle believes Empedocles' 'elements' to be really complex'.[43] In other words, Ross thinks that Aristotle's use of the qualifier *kaloumena* ought to be understood ironically, or sceptically, because Empedocles'

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[41] As Grice points out, 'overinformativeness may be confusing in that it is liable to raise side issues; and there may also be an indirect effect, in that the hearers may be misled as a result of thinking that there is some particular *point* in the provision of the excess of information', (1989), 26.
[42] Saunders (1981), 30.
[43] (1936), 484.

rhizômata, or 'roots', although called 'elements', are not really elemental at all.[44] Thus what Aristotle is implicating is that the use of *stoicheia* with reference to Empedocles' 'elements' is an improper use. But who uses *stoicheia* that way? Ross neglects to specify by whom are Empedocles' 'elements' called 'elements'. But since Empedocles himself didn't use the term, it is presumably either Empedocles' followers, or else a broader selection of Aristotle's contemporaries.[45] If the suggestion, however, is that by 'the so-called elements' here we should understand Aristotle to be talking exclusively about the elements as conceived by Empedocles, and which are called *stoicheia* by his followers, then we ought to question it. For if *ta kaloumena stoicheia* is to be completed as 'by Empedocles' followers', then what Aristotle would appear to be saying is: 'Empedocles separates out only the things that Empedocles' followers call "elements"'. This would be a rather uninformative claim to make, and indeed it fails to specify precisely *what* Empedocles separates out from the mixture, and why his doctrine differs from that of Anaxagoras on this point. Thus it seem to make more sense to think that the so-called elements are the things that are quite generally called 'elements', regardless of whether or not Empedocles, or anyone else, chooses them as his elements. I'll expand upon this point below (s. **5.3**; cf. s. **2.2** above).

But, even if we leave aside the difficulty over the *identity* of those who call fire, air, water, and earth *stoicheia*, Ross' explanation is questionable because it is hard to see *why* Aristotle would want to make the point Ross thinks he wants to make in this context. It just doesn't seem to be relevant to the purpose of the discussion. For what Aristotle is most concerned with at *Physics* I.4, and to a surprisingly large extent throughout *Physics* I, is the number, rather than the nature, of the elements or principles (see, e.g., I.2, 184b15-25).[46] Thus *Physics* I.4 concludes by stating that it is better *(beltion)* to posit a limited number of elements, as Empedocles does, instead of an infinite number, as Anaxagoras proposes (188a17; restated at

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[44] Cf. Philoponus *In Phys.*, 16. 94.13-15; see also Charlton (1970), 46.

[45] Rashed (2005) takes Aristotle to use the phrase to refer to followers of Empedocles, xxxv, cf. 129. Aristotle refers to 'followers of Empedocles' (*hoi peri Empedoklea*) at *DC* III.7, 305b1, *GC* I.1, 314a21.

[46] See Bostock (1982), 181: 'Aristotle seems much more interested in the question of *how* many principles there are than in the question of *what* they are'.

I.6, 189a15). The status of Empedocles' elements, then, whether they are *really* simple, or complex, does not appear to be in question at all.

It is not, of course, *impossible* that Aristotle might want to make a contrast between Empedocles and Anaxagoras in terms of the number of principles each posits, and yet also include a swipe at the belief that what Empedocles posits are genuine elements. Indeed there is evidence that Aristotle did think that Empedocles' 'elements' are not simple, but composite (see *GC* I.8, 325b19-25; and II.3, 330b21-30, with discussion in Chapter **2**, s. **2.4** below). But even if it is the case that Aristotle believes that the things that Empedocles separates out from the mixture, which are called 'elements' by some people, are not really elements, to say so in the present context is not only somewhat irrelevant to the overall aims in *Physics* I; it would also seem overinformative, and potentially misleading, considering the contrast that Aristotle wants to make in the immediate context. And that seems enough to think that some alternative explanation, that does not go beyond what is required for our understanding of the context, would be preferable.

The next instance in the *Physics* appears in Aristotle's discussion of the infinite. On this occasion the phrase is not *ta kaloumena stoicheia*, but *ta legomena stoicheia*. Aristotle makes the point that all those who have spoken about nature suggest that the subject of the infinite is one of the so-called elements, either water or air or the intermediate between them (*Phys.* III.4, 203a16-18). Now Ross evidently thinks that so-called elements here can be glossed in the same way as at 187a26, i.e., that Aristotle is implicating that these 'elements' are not genuinely elemental.[47] But I see little in this passage to indicate, or require, that Aristotle is employing the phrase *ta kaloumena stoicheia* because he is in doubt as to whether the things so described are genuine elements or not. Again such reflections seem out of place. What is of particular interest in this passage, however, is that Aristotle is not thinking only about the elements as conceived by Empedocles. For the thinkers who make '*one* of the so-called elements' the

[47] (1936), 545.

subject of the infinite are evidently the Milesian monists. Plato, the Pythagoreans, or the Eleatics are not among these thinkers;[48] but neither is Empedocles, Anaxagoras, or Democritus. This is clear from the next sentences, where Aristotle says that of those who posit a finite number of *stoicheia*, no one makes them infinite in extent (203a18-19). Presumably he means 'those who posit a finite *plurality* of elements'. This has to be a reference to Empedocles.[49] Anaxagoras and Democritus are then mentioned as those who posit an infinite number (203a19f.). Thus it is clear that Aristotle is happy to say that Presocratics other than Empedocles, even monists, posit the 'so-called elements' (or *one* of them). The phrase, then, is not being used to refer uniquely to the 'Empedoclean' quartet of elements.

The final instance in the *Physics* of *ta kaloumena stoicheia* also appears in Aristotle's discussion of the infinite. Aristotle is considering whether or not there is any such thing as an infinitely extended body—or, to be more precise, whether or not there is such a body among the perceptible things, which are the topic of the investigation in the *Physics* (III.5, 204b1-4). Having dismissed the possibility that an infinite body can be composite (204b11-22), Aristotle proceeds to argue that it cannot be simple either (204b22f.). He tackles the view that the infinite is something besides the elements (*tines to para ta stoicheia*), from which the latter come to be (b23-4). It is impossible that there could be such a body, Aristotle argues, not merely because of the impossibility of an infinite in itself, but rather on observational grounds (204b29):

> ...there is no such perceptible body besides (*para*) the so-called elements (*ta kaloumena stoicheia*); for all things are dissolved into that out of which they come to be, so that it would have to be here in the world (*entautha*) alongside air and fire and earth and water, but no such thing can be observed (204b32-35).[c]

Aristotle's point here seems to be that an infinite body cannot be simple, because if it were, and it were understood as that from which the elements come to be, it would be observable

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[48] The former two have been discussed earlier in *Phys.* III.4 (203a4f.), while the last deny the existence of nature itself; see Ross (1936), 545.
[49] Ross (1936), 545, Hussey (1983), 74.

among the other simple bodies that we do observe, i.e., fire, air, water, and earth. No such thing is observed, hence there is no such thing. I take it that this argument holds generally against the hypothesis of any kind of simple body, whether infinite or not, besides the so-called elements, and from which the latter come to be.

Now let's just remind ourselves that the key assumption of the impropriety interpretation is that the so-called elements are not simple but composite. In this instance, however, it is clear that this assumption cannot hold. For it is clear that Aristotle identifies the so-called elements as simple bodies. Indeed, for his argument against an 'extra' simple body to work, the so-called elements must be the simple bodies. In other words, they must be the material things into which all other material things are dissolved, and from which all other material things come to be; and which moreover are not further analysable into any simpler or more basic sort of material thing. But this, of course, is to say that the so-called elements are the genuine elements.

To underline this point, consider, for a moment, the effect it would have on the immediate context if the impropriety explanation of the phrase *ta kaloumena stoicheia* were allowed to stand. It would be very difficult to see how the argument could be expected to work; and even if it did, it would certainly not be the conclusive rejection of another simple body besides the 'so-called elements' that Aristotle evidently thinks it is. For Aristotle would be saying that fire, air, water, and earth are *the simplest bodies we perceive*, whilst implicating that they are not *really simple*, but composite bodies. But this might imply that Aristotle thinks that there are simple bodies that we cannot perceive. Now this can't be his view: a body, for Aristotle, is by definition something perceptible, and elsewhere he rejects the possibility of bodies without perceptible characteristics (see s. **2.2** above). Moreover, if, in the context of *Physics* III.5, Aristotle were countenancing simple bodies that we cannot perceive, it would follow that his claim that we do not perceive another perceptible body alongside the so-called elements is irrelevant to the question of whether or not there is an extra simple body. For on this hypothesis a truly simple body, i.e., a genuine element, would not be perceptible. Hence, if

Aristotle employs the phrase *ta kaloumena stoicheia* here with the intention to implicate his view that the items so described are not really elemental, then it remains possible that there is an infinite, albeit imperceptible, simple body, from which fire, air, water, and earth come to be. Of course, this hypothesis is precisely what Aristotle wants to reject (cf. *GC* II.5, 332a20-27), and indeed he presumably believes that his argument does or should lead to its rejection. The impropriety explanation, then, is placed very much in doubt.

One, might object, however, that the claim that fire, air, water, and earth are simple bodies is not in fact in question. One might claim, for instance, that the so-called elements are not merely the simplest *perceptible* bodies, but also, in keeping with the principle that a body is something perceptible, the simplest bodies per se; while maintaining nevertheless that they are still composites in the sense that they may be analysed into further constituents. The crucial point, however, according to this objection, is that these latter are not *bodies*. Thus the so-called elements are indeed the simplest *bodies*, but they are not really simple, and hence not truly elemental. Now this may allow the argument against an infinite simple body to run that little bit smoother. For with this clarification, there is indeed no further *body* alongside, or simpler than, fire, air, water, and earth.[50]

But, if there is now no question about the status of fire, air, water, and earth as simple bodies, there arises a question as to why, in the midst of an argument about simple bodies, Aristotle would feel the need to indicate his belief that the simplest bodies we observe are not really elements. One might say that he does so because many people think that the simple bodies are the elements, and that this is a view that Aristotle thinks needs to be corrected. Nevertheless, even if that were true, it is still the case that a passage concerned with the rejection of an infinite simple body doesn't seem to be an appropriate place to make this fairly sophisticated technical point, and certainly not in so subtle a fashion.

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[50] See Joachim (1922), 137, 212, 213; cf. 217.

One might still counter that it is the nature of Aristotle's writings that we ought to expect remarks and suggestions that refer to conclusions drawn elsewhere, or revisions reflecting later views that may sit awkwardly in the midst of otherwise unrevised texts. So perhaps the use of *ta kaloumena stoicheia* at *Physics* III.5 is an instance of this: perhaps, for instance, Aristotle once thought that the simple bodies are the elements, and later changed his mind, and saw fit to reflect this change of mind by revising here and there, indeed somewhat haphazardly, *ta stoicheia* to *ta kaloumena stoicheia.* Or perhaps this phrase is placed where it is to remind Aristotle, in the course of delivering his lectures based on these notes, to include or to improvise a digression about the suspect elemental status of these things that people call *stoicheia.*

But all this is mere speculation. Where there is doubt as to what Aristotle, or anyone else, intends to convey by a certain remark or locution, we must look to the context, and it is far more prudent to consider what would be relevant to the other things that Aristotle is saying in that context, or what would fit with the purpose or purposes he obviously has, in these contexts, both the immediate and the wider or general context.[51] And given the context of the above instances of the phrase *ta kaloumena stoicheia*, the fact that it is not merely *not* required, but indeed quite unhelpful, to suppose that Aristotle is using the phrase for the reasons put forward according to the impropriety explanation, is sufficient to make that explanation unlikely, at best.

So what explanation is to be preferred? As I have said I will consider some alternatives below (s. **5**), and the one I settle on, as we shall see, is that Aristotle uses the phrase as a device that makes clear that the elements in question are fire, air, water, and earth. But, with the reader's indulgence, I shall continue with this examination of the contexts where we find the phrase *ta kaloumena stoicheia*, and the success, or lack of it, of the application of the impropriety explanation to each instance.

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[51] See Grice (1989), 222.

4.2 After the *Physics*, the phrase *ta kaloumena stoicheia* appears most often in the *De Gen. et Cor.* Before turning to the instances of the phrase in this work, however, let's deal with what is perhaps the most promising passage for the impropriety explanation.

At *Parts of Animals* II.1, Aristotle describes the generation and development of organic life in terms of three stages:

> Since there are three compositions, one might put first composition from what are called by some 'elements' (*ek tôn kaloumenôn hupo tinôn stoicheiôn*), e.g., earth, water, air and fire. And yet, perhaps it is better to speak of composition from the powers (*ek tôn dunameôn*), and not from all of them, but as stated previously in other works. For wet, dry, hot, and cold are the matter of composite bodies (*hulê tôn sunthetôn sômatôn*), while the other differentiae follow these… Second is the composition of the nature of the homoeomerous parts within animals, e.g., of bones, flesh, and the other things of this sort, out of the primary things. Third and last in the series is the composition of the nature of the nonhomoeomerous parts, e.g., face, hand, and such parts (646a12-24).[d]

Some commentators think that Aristotle in this passage more or less confirms that the 'powers', i.e., the contraries hot and cold, dry and wet, are the genuine elements. Sokolowski, for instance, claims that this passage makes it clear that the 'most primitive and irreducible components are not the so-called elements, earth, air, fire and water, but the powers… the so-called elements of Empedocles are not the true ultimates; they must be made up of still more basic factors, the elementary powers'.[52] Sokolowski continues by asserting that Aristotle's use here of the phrase *ta kaloumena hupo tinôn stoicheia* 'shows that he does not agree with the theory that considers these four things [earth, air, fire and water] the simple elements of physical reality".[53] Similarly, for Lennox, 'the discussion would be consistent if… the four primary potentials [hot, cold, dry, wet] form the four elements, and this is the first level of composition'.[54] The second level would thus be the formation of the homoeomerous parts from the four so-called elements, i.e., from the 'primary things' (*ek tôn prôtôn*, a20), and the

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[52] Sokolowski (1970), 269; see also Lewis (1996), 20-21, Gannagé (2005), 73-4. Cf. Lennox (2001), 136-7, 180.
[53] (1970), 270.
[54] (2001), 180.

third, the formation of non-homoeomerous out of the homoeomerous parts.[55] There is little controversial about this understanding of the second and third stages: indeed at *De Generatione Animalium* I.1 Aristotle says clearly that the so-called elements of bodies (*ta kaloumena stoicheia tôn sômatôn*) are the matter for the homoeomerous parts (715a10-11), and these latter for the non-homoeomerous parts.[56] The problem is with the first level of composition: as Lennox reads it, the so-called elements must be composite bodies.[57]

Now to make full sense of Aristotle's claims at *Parts of Animals* II.1 would require a treatment of the relationship between fire, air, water, and earth and the contraries hot and cold, dry and wet. But the nature of this relationship is a complex issue that I prefer to postpone to the next chapter. Nevertheless, without anticipating too much the conclusions of the next chapter regarding this relationship, there are some comments that we can make about the above passage which may be sufficient to cast doubt upon Lennox's and Sokolowski's readings, and in general upon the suitability of the application of the impropriety explanation of *ta kaloumena stoicheia* to this passage. Consider Lennox's claim that the so-called elements are the products of the first level of composition. There at least two difficulties with this claim. Firstly, Aristotle, of course, does not *say* that hot, cold, dry, and wet are the matter of fire, air, water, and earth—at least not explicitly. He says, rather, that the former are the matter of the *composite bodies* (*hulê tôn sunthetôn sômatôn estin*, 646a17). Admittedly, there is a difficulty as to the identity of these composite bodies.[58] But Lennox's suggestion, that by 'composite bodies' here Aristotle is referring to the so-called elements, seems very dubious (see *Phys.* III.5, 204b11-35, discussed above, s. **4.1**). Even on the traditional 'prime matter' interpretation it is rarely, if ever, doubted that fire, air, water, and earth are simple, or at least the *simplest*, bodies. For although they are thought to be further analysable, and hence composite, in a sense, of form (hot, cold,

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[55] Ibid.

[56] The authenticity of the passage in which this text appears has been doubted (Balme (1972), 127); but the thought is unquestionably Aristotelian (cf. *Meteor* IV.12, 389b26-8).

[57] He calls them 'the primary *composites*', (2001), 180.

[58] Lennox (2001), 180: 'we are not told explicitly what the composite bodies are'.

dry, wet) and matter (prime matter), this analysis is not thought to reveal simpler *bodies.*[59] So while one might question whether the so-called elements are genuinely elemental, their status as simple bodies is generally accepted.[60]

Secondly, whereas Lennox sees the first level of composition proceeding *to* the so-called elements, Aristotle says clearly that it proceeds *from* the so-called elements. Now certainly Aristotle then adds, on second thoughts, as it were, that it is better to speak about composition from the contrary powers. But, in saying this, is he thereby retracing his steps, and suggesting that, instead of starting from the four elements, we should start from a more primitive, or simpler, level, i.e., with the *matter* of the four elements? This would seem to be Lennox's and Sokolowki's understanding, and it seems to be required for the impropriety explanation. Yet if this is so, then perhaps Aristotle ought to have started by saying that there are *two* levels of composition, rather than three. For, presumably, on this account, if he had started with the so-called elements, and did not introduce the contrary powers, then the levels of composition would be (1) from the elements to the homoeomerous parts, and (2) from these latter to the non-homoeomerous parts. But of course he doesn't do this: even when he is proposing to start with composition from the so-called elements, he thinks there are *three* levels of composition.

Nevertheless, Aristotle does say that it is 'better' (*beltion*, a14) to speak of hot and cold, dry and wet than the so-called elements. Why 'better'? And what does this mean for the status of the elements? Let's emphasise, firstly, that Aristotle obviously isn't saying that the so-called elements have little or no role at all in the generation of an animal. Even proponents of the impropriety explanation don't suggest that. For even if the so-called elements were not truly elements, but were really composites of hot, cold, dry, and wet (and perhaps also prime matter), as such they would still play a fairly important role in the development of an animal, i.e., at the second level of composition. Now what Aristotle says, however, is that it is better to

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[59] See, for instance, Joachim (1922), xxxii, n 1, 137, 198-9; cf. J. and others on *GC* II.3, 330b22, discussed below, Chapter **2**, s. **2.4**.

[60] Hence the oft-stated defence of prime matter, i.e., that it is not a body; see, e.g., Ross (1923), 105, Robinson (1974), 169, Williams (1982), 211.

start with the contrary powers hot and cold, dry and wet, instead of the so-called elements. This may suggest that to start the analysis with the so-called elements is to start at a stage that is somehow too remote to be truly relevant to the discussion (cf. *Metaph.* IX.7, 1048b37-1049a3, 1049a5-18). It is better, or more relevant, to start with the powers because these are the active and passive forces to which reference must constantly be made (see, e.g., *PA* II.2-3). But, of course, the powers are, as I shall explain in the next chapter (ss. **2, 3**), the differentiae of the elements: they are, one might say, the powers *of* the elements (see, e.g., *Meteor* IV.10, 388a21-23, IV.11, 389a29-32; *GC* I.3, 319b1). Insofar as some body has the power to heat, for instance, it has that power due to its elemental makeup; and the extent to which it heats things indicates the extent to which fire predominates in its elemental makeup (see, e.g., *Meteor* IV.4, 382a5-6). Thus it seems that we can say *either* that the first composition is from the so-called elements, *or* that it is from the contrary powers; these are two ways of saying much the same thing (cf., e.g., *GC* II.7, 334b16-7; *Metaph.* VII.17, 1041 b17).[61] In the context of the *Parts of Animals*, however, where the focus is upon the development of animals and their parts, it is 'better', i.e., *more relevant*, to talk in terms of the readily identifiable powers that are responsible for this development.[62] Indeed, Lennox himself makes this point: 'since there is no stage of biological development when the uniform parts are actually composed from the elements (development begins with blood and its analogue), it is the four causal powers rather than the elements that are relevant'.[63] To say this, however, is not to repudiate the status of the so-called elements as elements.

There remains a question to answer: what are the products of the first level of composition? For if they are not the so-called elements, and they are not the homoeomerous

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[61] Cf. Furth (1988), 77. Citing *PA* II.1, 646a15, F. writes: 'sometimes in the biological works [the four elements] are called *dunameis*'. But cf. note 63 below.

[62] Cf. *On The Nature of Man* for the dismissal of fire, air, water, and earth 'and anything else that is not an obvious constituent of man ' (I.4), and the emphasis on obvious bodily constituents, i.e., blood, phlegm, yellow and black bile (III.24-29, IV, V.1-9), which are related to hot and cold, dry and wet (III.6-10, V.12-14, VII).

[63] (2001), 180. It is not clear how Lennox makes this point square with his view of the second level of composition. Furth (1988), 77, rather surprisingly claims that an appeal to hot, cold, dry, and wet 'is not directly relevant to or required for understanding of biological objects or processes, for which the four elements are as deep as we need go'. F. doesn't explain why Aristotle thinks it better, on this occasion, to speak in terms of the former rather than the latter.

parts of animals either, what are they? An interesting answer is offered by Furth. The composite bodies here, he suggests, are those homoeomerous composite items that can exist 'on their own, *kath'hauta*, rather than by way of being part of something else'.[64] These are such things as the *metalleoumena*, i.e., the stuffs that are mined, e.g., metals like gold, copper, tin, iron; and also stone, wood and others of this kind (cf. *Meteor* IV.10, 388a13ff). As Furth explains: 'these are things at the upper limit of what… can come to be or can *be* at all by the agencies of *matter* and *force*; to get beyond this point requires *form* and *end*.'[65] When we get to the second level of composition, i.e., the development of the homoeomerous parts 'within animals' (*en tois zôiois*, 646a21), such notions as form and end enter the scene.

There is no need to develop further this suggestion at this point. What is important is that it is again apparent that the impropriety explanation is neither required, nor indeed particularly helpful, for understanding the instance of *ta kaloumena stoicheia* at *Parts of Animals* II.1. Now let's look at the instances of *ta kaloumena stoicheia* in the *De Gen. et Cor.*

4.3 At *De Gen. et Cor.* I.6 Aristotle sets out the programme of study that will occupy him for most of the remainder of the treatise. We must discuss, he says 'the matter and the so-called elements', in particular

> whether they are or not (*eit'estin eite mê*), and whether each is eternal or comes to be in some way, and if they come to be, whether they all come to be from one another in the same way or whether one of them is primary (322b1-4).[e]

But before discussing the so-called elements, however, Aristotle feels it necessary to consider three things: contact, mixing, and action and passion (322b5, b25-6). This is because all those who discuss the elements—'both those who make the elements come to be and those who make the others come to be from the elements' (322b6-7), make use of these notions, yet

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[64] (1988), 78.
[65] (1988), 79; see also 80.

without saying clearly what they mean by them. Thus the remaining chapters of Book I are concerned with clarifying these notions, and in Book II Aristotle returns to the issue of the so-called elements (see *GC* II.1, 328b31). At *De Gen. et Cor.* II.1 Aristotle uses the phrase *ta kaloumena stoicheia* three times (328b31, 329a16, 329a27). Clearly the same explanation for his use of this phrase ought to apply in each case, and it presumably ought to be the same as the explanation of his use of this phrase at *De Gen. et Cor* I.6. But ought it to be the impropriety explanation?[66] Let's take a closer look at the instance at *De Gen. et Cor.* I.6.

Aristotle begins by announcing that it is necessary to talk 'about the matter and the so-called elements' (*peri tês hulês kai tôn kaloumenôn stoicheiôn*, 322b1). Joachim is surely right to take *kai* as explicative; hence what Aristotle is saying is that it is necessary to discuss 'the matter, i.e., the so-called elements'.[67] He proceeds to formulate a series of questions about this subject. Firstly, he asks 'whether they, i.e., the so-called elements, are or not'; secondly, 'whether each is eternal (*aidion*) or comes to be in some way'; thirdly, if the answer to the previous question is that they *do* come to be, 'whether they come to be from one another… or whether some one of them is primary' (b1-4). Arguably Aristotle's answer to the first question is given at *De Gen. et Cor* II.1, 329a5-8; and to his second, at II.1, 329a34-b2. The question of the *manner* in which they come to be is answered at *De Gen. et Cor.* II.4 (see 331b36), while at *De Gen. et Cor.* II.5 he rejects the hypothesis of a single primary element (332a18-20).

Now, on the impropriety explanation, Aristotle uses the phrase 'the so-called elements' here to implicate that he thinks that fire, air, water, and earth are not true elements.[68] The questions that follow are often thought further to reveal Aristotle's doubts as to the status of the so-called elements. Thus Joachim takes the first question to be equivalent to the question: 'Are they really *stoicheia* (as they are commonly called) or not?'.[69] Moreover, Joachim takes this

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[66] For the impropriety explanation applied to these instances, see Joachim (1922), 137, Williams (1982), 152, Rashed (2005), 129, 151-2.
[67] See Joachim (1922), 137. For discussion, see Natali (2004), 195f.
[68] For Joachim (1922), 137, and Williams (1982), 152, the true *stoicheia* are prime matter and the contraries; for Rashed (2005), 129, the true elements are the 'powers' hot and cold, dry and wet.
[69] (1922), 137.

question to be explicated by the second question. He explains: 'if they are *stoicheia*, they must be *aidia*, as, e.g., Empedokles maintained'.[70] As we know, Aristotle does not think that the so-called elements are *aidia* or eternal; it follows from Joachim's premiss that the so-called elements are not truly elemental.[71]

Let's allow that Joachim and others are right to think that the first question ought to be understood as 'whether the so-called elements are really elements or not'. It is a plausible reading, and indeed the way the discussion of the so-called elements resumes at *De Gen. et Cor.* II.1 appears to support it.[72] But if *this* is what Aristotle is asking, then presumably he is *not* using the phrase *ta kaloumena stoicheia* at 322b1 to implicate his belief that fire, air, water, and earth are not really elements. For whether they are really elements or not is precisely what is in question. In other words, when Aristotle says 'we must enquire about matter, i.e., the so-called elements, whether they are or not', if he is implicating by his use of the phrase *ta kaloumena stoicheia* that the so-called elements are not really elements, then it makes little sense immediately to raise the question whether they are elements or not. Aristotle would have already made his answer clear.

Perhaps one might counter that Aristotle is indeed already implicating by his use of the phrase *ta kaloumena stoicheia* that fire, air, water, and earth are not really elements, and that he does so *precisely* in order to indicate to his audience what his answer to the succeeding question will be. This suggestion is not easy conclusively to refute. However it involves a great deal of reading between the lines. What we have to go on is that, when Aristotle does consider the questions he raises at the beginning of *De Gen. et Cor.* I.6, he doesn't *appear* to treat it as a forgone conclusion that the so-called elements are not really elements. On the other hand,

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[70] (1922), 138. Cf. 200: 'the contrarieties, as contrasted with the 'primary bodies', do not change… and are therefore rightly reckoned as *archai*'.

[71] This seems in conflict with the traditional view that the phrase *ta kaloumena stoicheia* is a reference to Empedocles' elements—on J.'s account Empedocles' elements would appear to be genuinely elemental.

[72] Cf. Natali (2004), 196, n. 6: 'Nobody, except Mugler, gives to the expression *eit'estin eite mê* an existential meaning, because they consider the existence of the four elements as evident. The commentators understand either 'if they are elements or not' (Philoponus) or 'if they are principles or not' (Zabarella). Joachim and Migliori follow Philoponus.' But Rashed (2005) follows Mugler (1966). Cf. the similar questions concerning the infinite, at *Phys.* III.4, 202b35, concerning place, at *Phys.* IV.1, 208a28-9, and concerning the void, at *Phys.* IV.6, 213a13-14 (cf. IV.9, 217b27).

perhaps one might suggest that *kaloumena* is a later insertion, i.e., after it has been settled that fire, air, water, and earth are not really elemental. But this is speculation. Besides, where is it *settled* that fire, air, water, and earth are not truly elemental? Perhaps one might suggest *De Gen. et Cor.* II.3, especially 330a30-330b1, and 330b 21-30. I discuss these passages later (see Ch **2**, s. **2**). Or perhaps one might point more generally to Aristotle's view that the so-called elements change into each other, and as such are not eternal, as evidence that they are not really elements. Let's consider this last claim.

The view that fire, air, water, and earth cannot be true elements precisely because they can change into each other is certainly not peculiar to Joachim.[73] Presumably the reason behind this view is this: if these bodies change into each other, then there must be something underlying them that facilitates these changes (cf. *DC* IV.5, 312a30-33; *Metaph.* I.8, 989a19-30; *GC* I.1, 314b26-315a3, I.6, 322b13-19, II.1, 329a24f.). It is thought then to follow that there is some thing that is more basic, or elemental, than these bodies. But there is good evidence that Aristotle does *not* require that the elements of bodies be eternal. Take, for instance, *De Caelo* III.6. Here Aristotle asks whether the elements are eternal or subject to generation and corruption (304b23-4), and his answer is unequivocal: he rejects the possibility that they are eternal almost immediately (304b25), and concludes that the elements of bodies must be subject to generation and corruption (305a13-14; cf. 305a14-32, III.7, 305b1-3, and III.1, 298b10). If Aristotle thought that being thus subject to change entails that the elements of bodies are not truly elemental, *De Caelo* III.6 would be a good place to say so.

Again one might object, however, that in the *De Caelo* Aristotle takes fire, air, water, and earth to be the elements of bodies, and so when he asks whether or not the 'elements' are eternal, he is thinking about these items, rather than the notion of an element, properly speaking. And since an element, properly speaking, is eternal, fire, air, water, and earth are not

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[73] Graham (2006), 39, for instance, writes: 'since the four elements change into each other, they are not simple or irreducible, and are not really elements… Hence Aristotle often refers to them as the 'so-called elements"; see also Ross (1924), I, 182, Longrigg (1993), 151. But cf. Bostock (2000), 4.

true elements but merely so-called elements, as Aristotle calls them in the *De Gen. et Cor.*, when he reconsiders this question.

One might respond to this objection like so. Firstly, neither of Aristotle's accounts of the elements of bodies at *Metaphysics* Delta 3 and *De Caelo* III.3 emphasises unchangeability as a key characteristic of the notion of an element. Secondly, at *De Gen. et Cor.* II.1, Aristotle says: 'let it be granted that the primary things (*ta prôta*), the changes out of which, whether by aggregation or segregation or some other change, result in generation and corruption, are rightly called (*kalôs echei legein*) principles (*archai*) and elements (*stoicheia*)', (329a5-8). He evidently means that the 'primary things' to which he is referring are *properly* called, or entitled to, the names 'principles' or 'elements'.[74] It seems the terms are often used interchangeably.[75] Now, certainly, to say that generation and corruption result from the changes out of these primary things is not to say that these primary things themselves are subject to generation and corruption. For if, for instance, the change resulting in generation and corruption is aggregation and segregation, then the primary things that deserve the name 'principles' and 'elements' may well be eternal, like Empedocles' roots. But the change resulting in generation and corruption need not be aggregation and segregation; it may be some other kind of change by which the primary things themselves come to be and pass away—such change, indeed, that Aristotle describes at *De Gen. et Cor.* II.4. Clearly it is not necessary, then, that these primary things be eternal to deserve the name 'principle' or 'element' of body (cf. *GC* I.6, 322b6-8). Thirdly, Aristotle makes the general point in the *De Caelo* III.7 that the principles of things should be the same in kind as the things of which they are the principles: thus the principles of perceptible things ought to be perceptible, of eternal things eternal, of corruptible things corruptible (306a9-11). It ought to follow that the elements of bodies are not eternal, but, like

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[74] For the expression *kalôs echei legein*, cf. *Pol.* IV.7, 1293b1: 'So the constitution that we discussed in our first discourses is rightly called (*kalôs echei legein*) 'aristocracy".

[75] By Aristotle himself as well as others; see note 10 above, and cf. *Phys.* I.5, 188b28: 'the elements, or what are called 'principles' by them [i.e., the *phusiologoi*],' (*ta stoicheia kai tas hup' autôn kaloumenas archas*), and *Metaph.* XI.1, 1059b21: 'the principles, what are called *stoicheia* by some people' (*tas archas, ta kaloumena hupo tinôn stoicheia*). Note that it doesn't seem ever to have been suggested that Aristotle uses *kaloumenos* at *Phys.* I.5 to implicate that the

bodies, perceptible and corruptible (cf. *Phys.* IV.1, 209a17). Moreover, Aristotle makes it clear that it would be problematic if one insisted upon eternal, unchangeable elements of bodies—one would have difficulty, in particular, explaining alteration (II.1, 329a34-b2, II.4, 331a7-10; cf. I.1, 314b15-26; see also Ch. **2**, s. **4**). And finally, at *De Gen. et Cor.* II.6, it is significant to note Aristotle remarking that one might be surprised (*thaumaseie*) that some, like Empedocles, say that the elements of bodies are more than one, and yet deny that they change into each other (333a16-18). But who would be surprised if it were simply the case that whatever is an element must be eternal?

Generally speaking, then, the impropriety explanation does not seem a plausible explanation of the instance of *ta kaloumena stoicheia* at *De Gen. et Cor.* I.6, nor therefore of the instances at *De Gen. et Cor.* II.1. It does not appear to be required that we presume that Aristotle does not think that fire, air, water, and earth are genuine elements in these texts, and indeed it would be somewhat confusing or even misleading if we were to take this as his intended implicature. For it would raise more questions than it resolves. Why, for instance, at *De Gen. et Cor.* I.6, does Aristotle appear to explicate matter (*hulê*) as *ta kaloumena stoicheia*, if by the latter he intends, 'the things that are called elements, but are not really elements'? Indeed, why must we enquire into the things that are not really elements? Surely it would be better to announce, at *De Gen. et Cor.* I.6 and II.1, an enquiry into the things that *really are* the elements? To these questions we do not receive persuasive answers from the proponents of the impropriety explanation of *ta kaloumena stoicheia.*[76]

4.4 Let's survey briefly the most notable of the remaining instances of *ta kaloumena stoicheia.*

In the *De Generatione Animalium* the phrase occurs twice: we have already noted one occasion above (I.1, 715a10-11, see s. **4.2** above). Since we have given reasons to doubt the

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term *archai* is being used improperly; while at *Metaph.* XI.1 it seems clear that the term *stoicheia* is being used properly, referring as it does to the constituent principles of composite things, as opposed to universals.

[76] For Joachim (1922), 137, what Aristotle intends by *hulê* at *GC* I.6 is different to what he intends by *hulê* earlier in the treatise, e.g., at I.3, and also presumably to what he intends by *hulê* later on, at II.1, esp. 329a24f.

suitability of the impropriety explanation to the instance of *ta kaloumena stoicheia* at *Parts of Animals* II.1, it is unnecessary to say anything further about the instance of the phrase in a similar context at *De Generatione Animalium* I.1. The second instance occurs in a passage noted for its remarks about the difficult concept of the *pneuma*. Now this instance is of more interest, because it occurs in a passage where Aristotle is apparently proposing a further sublunary body in addition to the so-called elements fire, air, water, and earth. What he says is that there is a body that is associated with the soul which is 'different from and more divine than the so-called elements' (II.3, 736b31). Aristotle here does seem to indicate some dissatisfaction with the limitations of the four element theory. His remarks, as Bostock writes, 'certainly *seem* to imply that Aristotle is revising his view that all the matter of the sublunary world arises from a suitable combination of the four familiar elements'.[77] Be that as it may, for Aristotle to countenance the addition of an element to the so-called elements, not, as it were, as the underlying matter or principle of the latter, but alongside them, to do a specific function that the so-called elements cannot do,[78] is not at all the same as implicating, by his use of the phrase *ta kaloumena stoicheia*, that fire, air, water, and earth are not genuine elements. If, indeed, Aristotle has identified *another* element, alongside these four, it would be more natural to think that he believes the so-called elements *are* genuine elements, but not, after all, the *only* genuine elements, of bodies.

At *Meteorologica* I.3, Aristotle enquires about the place of air, relative to the 'other so-called elements of bodies' (*talla ta legomena stoicheia tôn sômatôn*, 339b5). Why use the phrase *ta legomena stoicheia*? Perhaps one might urge that Aristotle uses this phrase precisely because he has just remarked that fire, air, water, and earth can be dissolved (*analuontai*) into a common substrate (339a36-b2). In other words, there is something more basic than the 'so-called elements', and hence the latter are not truly elemental. But consider that Aristotle begins the

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[77] (2006), 59, n. 16. Balme (1972) rejects the suggestion that the four element theory is being revised, 160-4. See also Charles (1988), 31, who takes the connate pneuma to be an 'additional physical element'. This is denied by Freudenthal (1995), 35, n. 64.

[78] See Freudenthal (1995), 34-5.

Meteorologica with a brief outline of his physical investigations, from the *Physics* and *De Caelo* to *De Gen. et Cor.* (I.1, 338a20-25), and among the topics that have been discussed he mentions 'the elements of bodies' (*peri tôn stoicheiôn tôn sômatikôn*). Of these he says he has clarified how many there are, what they are like, and also that they change into each other (*posa te kai poia, kai tês eis allêla metabolês*, a22-24). From this description alone it is evident that the elements of bodies are obviously fire, air, water, and earth, rather than some other items, e.g., hot and cold, dry and wet. The point is that he thus refers to fire, air, water, and earth as the elements of bodies without qualification, and moreover that he gives no indication that at any point in his physical studies he felt compelled to withhold elemental status from these bodies. So, whatever his reasons for referring a couple of chapters later to fire, air, water, and earth as *ta legomena stoicheia*, a sudden reservation as to whether or not these are the elements of bodies ought not to be taken as the most obvious.

But what *are* his reasons for using the phrase on this and the other occasions? This question I consider in the next section (s. **5**). To conclude this section I want to approach the impropriety explanation from a more general angle.

4.5 Our examination of Aristotle's use of the phrase *ta kaloumena stoicheia* has, I think, cast doubt upon the prevailing explanation of his intentions when using this phrase. For when we consider the contexts in which the phrase appears, it does not seem to be required, by the aims that Aristotle has in these contexts, that we suppose him to be expressing doubt about the elemental status of fire, air, water, and earth. Indeed it seems often quite unhelpful to make this supposition. So when Aristotle qualifies *ta stoicheia* with the participle *kaloumena*, it doesn't appear to be the case that he does so in order to implicate that the term *stoicheia* is being used improperly. But what about Aristotle's other uses of *kaloumenos* (or *legomenos*), i.e., as a qualification upon terms other than *stoicheia*? Are there any instances where it is evidently required that we suppose that Aristotle is using the participle to implicate misuse of the term qualified? In other words, do we find in Aristotle's work a use of the participle *kaloumenos*

corresponding to the attributive use of the English participial adjective 'so-called'? Those who subscribe to the impropriety explanation of *ta kaloumena stoicheia* are slow to offer precedents for the understanding of the participle *kaloumenos* that their preferred explanation requires.[79] But presumably some of the following instances might be thought to be good candidates.

Consider, firstly, Aristotle's references to the 'so-called poems of Orpheus' (e.g., *en tois Orphikois kaloumenois*, *DA* I.5, 410b28; *en tois kaloumenois Orpheôs*, *GA* II.1, 734a19). Philoponus says that Aristotle uses *kaloumenos* here 'because it is unlikely that the verses are by Orpheus, as he himself says in the *de Philosophia*'.[80] So this may appear to be a clear cut case of a use of *kaloumenos* implicating impropriety.[81] And yet one might still harbour a doubt that this case is so straightforward. For the contexts in which these instances occur seem surprising places for Aristotle to choose to reveal his doubts about the authenticity of the Orphic poems. In the first instance, Aristotle is talking about the nature of the soul, and considers, and rejects, a theory found in the so-called Orphic poems; while in the second, Aristotle is discussing the development of the embryo, and whether its parts are produced simultaneously or, as suggested in the so-called Orphic poems, consecutively. Now by qualifying them as 'so-called', Aristotle is certainly indicating that there are people who call these poems Orphic; but why does he refer to their practice in this way? Is it because he wants to distance himself from this practice, because he personally doubts that these poems were by Orpheus? It seems odd that he would want to distract his audience by suggesting, or implicating, something rather irrelevant to his topic, and indeed overinformative. That, of course, is presuming that Aristotle's audience *would* be distracted by the suggestion that the poems of Orpheus are not really by Orpheus. As one scholar puts it, Orpheus 'was a religious symbol which even before

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[79] Hicks (1907), 480, in his commentary on the *De Anima*, says of Aristotle's use of the phrase *ho kaloumenos nous* (III.4, 429a22) that the 'use of the participle here… does not imply that the term is misused'. But, he adds, 'this is sometimes the case, e.g., *ta kaloumena stoicheia*'. Unfortunately he provides no other example of a use of *kaloumenos* that implies misuse.

[80] *In de anima*, 15.186.24-25. See Guthrie (1935), 12. Indeed Herodotus is already referring to the 'so-called Orphic rites', which, he notes, 'are really Egyptian or Pythagorean' (*Histories*, 2.81.5).

[81] Huffman (1993), 33: 'Aristotle is surely suggesting that although these verses are said to be by Orpheus he does not really think they are'.

the time of Alexander did not pass for the name of any poet that had ever lived'.[82] Another possibility is that by using the phrase 'the so-called Orphic poems', Aristotle is acknowledging that the authorship of these poems is a contentious issue, but that it is a question in which he does not want to get embroiled. For his interest in the poems, in the present contexts, is limited to the views—on the soul, on embryology—therein expressed. In other words, he wants to set aside questions about the *source* of these views, in order to focus upon the *content* of these views. Thus he uses the qualifier *kaloumenos* in these cases precisely in order *not* to distract his audience with questions of the authenticity of the poems. A more moderate explanation of Aristotle's use of the phrase 'so-called' with reference to the Orphic poems is thus available, i.e., that Aristotle wants to refer to certain views found in what people call the 'Orphic' poems, while withholding his commitment to, or reserving his judgement upon, the authenticity of these poems.

Next, let's consider Aristotle's reference at *Parts of Animals* II.10 to the void as the 'so-called void'. This instance seems promising as a precedent. For we already know from *Physics* IV.6-9 that Aristotle denies that there is a void. So, if we find him referring to 'the so-called void', a natural reaction might be to think that Aristotle qualifies *to kenon* like so to implicate his belief that there really is no such thing, that what is called 'void' is *merely* a so-called void. And this seems confirmed by what Aristotle says. For what he says is: 'the so-called void *is full of air*' (*to kenon kaloumenon aeros plêres esti*, 656b15). Consider, without the qualification, the same assertion: 'the void is full of air'. This is blatant self-contradiction, precisely as if one were to say 'what is empty is not empty'. It seems hard to avoid the conclusion, then, that Aristotle uses *kaloumenos* in this instance to implicate that what is called 'void' is not really void at all.

And yet it is worth considering this instance further. One point to note immediately is that the assertion is not in fact made as part of a critique of atomism. Rather, Aristotle is referring to what ordinary people mean by the void, or the common opinion of what void is. For the void is a place, or extension, in which there is nothing, i.e., no body (*Phys.* IV.6,

[82] Bernhardy, cited in Guthrie (1935), 4.

213a28-9, b33); and all body is tangible, and tangible body is either heavy or light (213b34f.). But since air, according to common opinion, is neither heavy nor light, and pretty much imperceptible (see III.5, 205a28, IV.4, 212a12-14; *GC* I.3, 318b29f.), it is commonly thought that the void is an extension in which there is nothing but air, i.e., 'full of air' (*to plêres aeros kenon einai*, 213a30; cf. *DA* II.8, 419b34).[83] Now Aristotle rejects the void in the *Physics*, but it is not *this* common notion of the void that he rejects. The real quarry is not this common notion, but the more sophisticated understanding of the void held by the Atomists. So there are two conceptions of the void: that which is held commonly, and the more refined 'separated void' of the Atomists (see *Phys.* IV.8, 214b12, 216a24, 216b20).[84]

At *Parts of Animals* II.10 Aristotle is referring to the former. But saying that it is 'full of air' seems now rather to be a *description* of the common notion of the void, one that 'ordinary people' would readily accept, than a *criticism* of it. Indeed, when he begins his discussion of the void at *Physics* IV.6, Aristotle makes clear that he doesn't think that the way to reject the void is simply by showing that air is a body, and hence that what is thought to be void is in fact full of *something*. This, in fact, is the sort of critique that some, such as Anaxagoras, offer, and which Aristotle thinks misses the point (213a22-27). But if Aristotle is dismissive of such a criticism of the void, then what is his point at *Parts of Animals* II.10, when he says that 'the so-called void is full of air'? Consider the context: Aristotle suggests that it is reasonable (*eulogos*) to think that hearing for some animals is located in the head, because what is called void (inside the head) is full of air (656b13-15). Elsewhere he goes so far as to say that it is correct (*orthôs*) to think that the void, i.e., as commonly understood, is essential to hearing (*DA* II.8, 419b33-5). But it is essential to hearing *because* it is full of air: on Aristotle's own account, the sense organ (*aisthêtêrion*) of hearing consists of air (*Sens.* 2, 438b20). Aristotle's point, then, seems to be that people are right to think that hearing is located in what they call the void, inside the head, because what they call the void is full of air, and air is essential to hearing. The purpose of

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[83] See Ross (1936), 582, and Hussey (1982), 123f., for a reconstruction of the argument at 213a22ff.

[84] As Hussey (1982) points out, even if the common notion of the void were rejected, 'we still only have *one particular kind* of presumed void refuted' (124, my italics).

kaloumenos here appears to be to clarify that it is *this* common notion of void that he is talking about, which, *by definition*, as it were, is 'full of air'.

It seems, then, that the use of *kaloumenos* here may simply be Aristotle's way of underlining that what is in question is the common view of the void, and not that which is held by the Atomists.[85] So, despite first appearances, Aristotle's use of the phrase 'so-called void' at *Parts of Animals* II.10 does not implicate that he doesn't believe that there is such a thing as the void. For what he rejects, in the *Physics*, is not the 'so-called void', i.e., the common notion of the void. At best, Aristotle may be implicating that the so-called void—the one that is said to be full of air— is not really void, if by 'what is *really* void', in the strict sense, we understand the Atomists' conception. Now this *would* be to implicate misuse of the term. But it could well be that the purpose of *kaloumenos* in this instance does not go beyond indicating that it is the common notion of void, rather than the philosophers' notion, that is in question. Understanding the phrase in its context does not appear to require that we assume that he is using *kaloumenos* for any further purpose.

Admittedly there are occasions, however, when Aristotle refers to something as a 'so-called *x*', and then proceeds explicitly to say that it is incorrect to apply the name to that thing. Hence we might have on these occasions clear instances of *kaloumenos* being used to implicate misuse of that which it qualifies. Thus in the *Meteorologica* Aristotle refers to the element fire as 'what we commonly call fire' (*ho dia sunêtheian kaloumen pur*), and he immediately points out that it is not really fire (I.3, 340b22; cf. II.2, 354b25). It seems natural to take 'we' here fairly generally or inclusively, as in: what *we all* commonly call 'fire', rather than, e.g., what *we*, who have looked into his matter carefully, commonly call 'fire'. Thus Aristotle might seem to be saying that the element is *merely* so-called fire, and that his use of *kaloumen* here offers a precedent for the impropriety explanation. But I think it would be hasty so to conclude. One caveat is that what is allegedly implicated is actually stated explicitly. For on this occasion we

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[85] That it is the *Atomists* is the usual assumption; but there may be other, e.g., Academic, theories of the void in question; see Hussey (1982), xxxv.

discover that what is commonly called 'fire' is not really fire precisely because Aristotle immediately and explicitly tells us. His point seems to be that the element that is usually called 'fire' is something different from 'real' fire, i.e., that which burns. The latter is an excess of heat and a boiling (340b23; I.4, 341b21; cf. *GC* II.3, 330b25-29), e.g., flame (cf. IV.9, 388a2, *GC* II.4, 331b25-6).[86] The element we habitually call 'fire' is not like this, although it is potentially like this (340b29). I will have more to say about this passage later (Chapter **2**, s. **2.4**). For now what is important to note is that for an understanding of Aristotle's point, i.e., that the element called 'fire' is not really fire, we are not required to suppose that *kaloumen* here is used to imply misuse of the term 'fire'. Indeed, it is questionable that there really is *misuse*; Aristotle later remarks that we are obliged to call the element 'fire' (I.4, 341b13-18). Consequently I don't think this instance offers an unproblematic precedent for the impropriety explanation.

Let's conclude this review with a look at the phrase 'the so-called Pythagoreans'. Aristotle sometimes refers to the doctrines of a group he calls 'the so-called Pythagoreans' (*Metaph.* I.5, 985b23, I.8, 989b30; *DC* II.2, 284b7, *Meteor* I.7, 345a13); on occasion, he describes them as 'the Italians, called by some people 'Pythagoreans',' (*hoi peri tên Italian, kaloumenoi de Puthagorieoi*, *DC* II.13, 293a20; cf. *Meteor* I.6, 342b30). It has been claimed that Aristotle refers to this group like so because they were not really Pythagoreans at all.[87] This would provide a good precedent for the impropriety explanation of *ta kaloumena stoicheia*, but it seems rather an extreme view. A more moderate view is that *kaloumenos* here is meant to convey Aristotle's scepticism not about whether or not these people are really Pythagoreans, but rather about *how much* of the teachings of these 'Pythagoreans' derives from Pythagoras.[88] There certainly does seem to be some reticence on the part of Aristotle, and also Plato, towards ascribing doctrines to Pythagoras himself. Plato refers to Pythagoras by name on one occasion only, and Aristotle no more than twice, and indeed one of these is thought to be by a later hand.[89] Ross and others

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[86] It might seem odd that ordinary fire, e.g., flame (*phlox*) could be conceived as a kind of 'boiling' (*zesis*), but see *Meteor* I.4, 341b21-22: *esti gar he phlox pneumatos xerou zesis.*
[87] Frank (1923), 77.
[88] Kirk, Raven, and Schofield (1983), 330.
[89] Ross (1924) I, 152.

suggest that their reticence indicates that Pythagoras was already something of a legendary figure.[90] If this is the case, then it seems natural that there would be hesitation on Aristotle's part about ascribing certain doctrines to the figure of Pythagoras. Ross' explanation of Aristotle's use of the phrase *hoi kaloumenoi Puthagoreioi* thus remains attractive: 'there is a set of people commonly called Pythagoreans, but Aristotle will not vouch for the origin of any of their doctrines in Pythagoras himself'.[91] This view amounts to an agnosticism, or a withholding of commitment, rather than outright scepticism.

So does Aristotle *ever* employ the participle *kaloumenos* in the way required by the impropriety explanation of *ta kaloumena stoicheia*? From our admittedly brief and highly selective review, our conclusions must tend towards doubt. The reference to the 'so-called Orphic poems' seems to be the most promising evidence, but the other instances don't appear to demand that *kaloumenos* implicates misuse. The problem, of course, with an attempt to answer this question is that we have to try to interpret intentions and attitudes, not only Aristotle's, but to large extent of his audience too, an audience that would obviously be more sensitive to each qualification and turn of phrase. And yet recognition of this very point should make us alive to the possibility that Aristotle may be using the participle *kaloumenos* for a variety of reasons *other* than to implicate misuse of the term it qualifies. Many commentators often appear too quick to presume that Aristotle must be using *kaloumenos* to express reservation or scepticism as to the suitability of the term being used to refer to something, or as to the status of that which is thus qualified.[92] But this presumption reveals a far too narrow conception of the kinds of things the participle *kaloumenos* is capable of doing when it qualifies a term. For, just as the English participial adjective 'so-called' need not always be used to indicate impropriety, so also this is not the only function that the participle *kaloumenos* performs—if indeed it does perform it.

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[90] Ross (1924) I, 143, Kirk and Raven (1957), 218 n. 2.
[91] (1924) I, 143. Cf. Huffman (1993), 33-4.
[92] Huffman (1993), 32: 'Clearly the addition of 'so-called' indicates some sort of reservation'.

Alternative Explanations

5.1 For the purposes of my thesis, what is important is to present reasons why the impropriety explanation of Aristotle's use of the phrase *ta kaloumena stoicheia* should be rejected. This is what I have attempted to do in the preceding section, firstly by examining the plausibility of the application of the impropriety explanation in the contexts where we find the phrase (ss. **4.1**-**4.4**), and secondly by raising a doubt as to whether Aristotle ever uses the participle *kaloumenos* in the way required by the impropriety explanation (s. **4.5**).

But it would be amiss not to attempt to offer an alternative explanation of Aristotle's use of this phrase. For there must be *some* explanation: it would be an error to conclude, for instance, that Aristotle is simply indicating a current linguistic practice. And yet this is an error from which even experienced commentators are not immune. Cherniss, for instance, commenting on a scholar's worry about Aristotle's description of his early work *On Philosophy* as 'the so-called *On Philosophy*' (*en tois peri philosophias legomenois*, *DA* I.2, 404b19), writes that the scholar

> is bothered by *legomenois* because he has not freed himself from the erroneous notion of the implication of *kaloumenon* and *legomenon*, as is shown by his reference to the notorious *hoi kaloumenoi Puthagoreioi*, which no more implies that the persons meant are not genuine Pythagoreans than *hoi kaloumenoi geôrgoi* (*Politics* 1290b40) and *hoi legomenoi Stôichoi philosophoi* (S.V.F. 2, 187, 16) imply that the former are not really farmers and the latter not genuine Stoics. The participles indicate that the substantives are being used in the currently recognised sense, and such is their function in references to books as well.[93]

But the participles surely indicate more than that.[94] The most basic inference we can make about Aristotle's use of the expression '*ta kaloumena x*' is that there are people who use *x* with reference to some items, and that Aristotle is now is using the term the way these people use it.

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[93] (1977), 424. Cherniss is reviewing H.D. Saffrey's *Le Peri Philosophias d'Aristote et la théorie platonicienne des idées nombres* (Leiden, 1955). For Saffrey, as C. puts it, 'Aristotle adds *legomenois* because *Peri Philosophias* was felt to be a strange title for a dialogue', 424.

[94] Indeed Cherniss' own examples bear this out. For the group of people Aristotle refers to as the 'so-called farmers' are not all *farmers*, but, rather more generally, those concerned with food production. Most of the members of this group will literally be farmers, but not all of them; on this, see Huffman (1993), 33. Cf. the 'so-

The question that Cherniss neglects to consider, however, is *why* Aristotle is drawing attention to the point that he is using *x* in the 'currently recognised sense'.[95] Why, for instance, does Aristotle feel it necessary to highlight the fact that fire, air, water, and earth are called *stoicheia*? Whatever its problems, and I hope I have shown that it *has* problems, an undoubted *merit* of the impropriety explanation is that it tackles this question head on. In this final section, then, I propose to say something about the reasons *why* Aristotle uses the phrase *ta kaloumena stoicheia*, while attempting to determine, as far as possible, *by whom* such things as fire, air, water, and earth are called *stoicheia*.

5.2 Now, presumably, when Aristotle describes something as *to kaloumenon x*, the thing described is called '*x*' either by the majority of people, and so the term is in common or general use as the name of the thing so designated; or else the term is not in common or general use, but there are some people who use the term in a particular way, and, for whatever reason, Aristotle thinks their practice is worth noting. Establishing whether the term is in common use or not would be very helpful towards discerning Aristotle's reasons for using the phrase. For instance, if the term is not in general use, then Aristotle may well be remarking upon a particular practice of calling a certain thing '*x*' because either the name, or the thing to which it refers, or both, are unfamiliar to the audience Aristotle is addressing. So first we should try to decide whether the term *stoicheion* is such a term.

By the time he wrote his commentary on the *Physics* (1936), Ross subscribed to the impropriety explanation (see above, s. **4.2**). But hitherto he had held a different view. In his commentary on the *Metaphysics* (1924), Ross says that it is 'clear' from Aristotle's use of the phrase *ta kaloumena stoicheia* that the usage of *stoicheion* with reference to the constituent principles of bodies 'was not yet fully established'.[96] In saying this, Ross is perhaps influenced

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called artisans', *Pol.* IV.4, 1290b40, and the 'so-called aristocracy' (IV.7, 1293a39f., IV.8, 1294a24-5). As for the 'so-called Pythagoreans', see discussion above (s. **4.5**).

[95] See Huffman (1993), 32: '[Cherniss] makes the important point that in calling these people 'Pythagoreans' Aristotle is following current practice, but [he] does not explain why Aristotle feels that he has to point this out'.

[96] (1924), I, 294.

by the view that Plato introduced the 'elemental' use of the term, in particular, that the term is metaphorically derived from its use with reference to the letters of the alphabet.[97] So, for Ross, Aristotle is using the participle *kaloumenos* precisely in order to notify his audience that he is about to use the term *stoicheia* in a way that he suspects many in his audience may still find unusual.

Now Aristotle occasionally introduces terms, which are used familiarly in a certain way, as 'so-called', or 'what we call (*kaloumen*)', and it is clear that he does so because he gives, or is about to give, specific, narrower meanings to these terms. These occasions may offer precedents for Ross' explanation of *ta kaloumena stoicheia*. In the *De Anima* I.3, for instance, on a number of occasions Aristotle refers to 'so-called *nous*' (*ho kaloumenos nous*; see I.2, 404b5, I.3, 407a4-5, III.4, 429a22, III.9, 432b26), and it would appear that he is referring to the way that *he* conceives of *nous*. For he identifies that part of the soul by which it thinks and knows, and forms judgements, as 'what is called *nous*' (III.4, 429a22; cf. I.2, 404b5). Later he refers to 'the logical (or judging) faculty, i.e., the so-called *nous*' (*to logistikon kai ho kaloumenos nous*, III.9, 432b26). Now it is not obvious that everyone would commonly think of *nous* just as that part of the soul that thinks and judges; it is often thought to be something more general, like mind, sense, or even feeling.[98] So Aristotle presumably refers to his notion of *nous* as 'the so-called *nous*', to flag to his audience that he is not talking of ordinary notions of *nous*, but specifically that part of the soul that thinks and judges. As Hicks puts it, 'the use of the participle … seems to import '*nous* in the sense in which we use the word".[99]

Something similar seems to be afoot at *Physics* IV.1, when Aristotle says that the most common and fundamental kind of change is change of place, 'which is what we call *phora*' (*hên kaloumen phora*, 208a31-2). For it is evident from *Physics* V.2 that *phora* has been consciously adopted as a general name for change of place, i.e., locomotion. There Aristotle points out that there is no general name peculiar to change of place, and therefore he announces his intention

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[97] See Ross (1924), I, 138; also Diels (1899, 17), Burkert (1959), 174-6.
[98] See LSJ s.v. *nous*.
[99] (1907), 480. Cf. *GA* II.3, 737a10.

to call change of place *phora* (*estô de phora kaloumenê to koinon*, 226a32-3). He does so while admitting that, strictly speaking, *phora* (or *pheresthai*) is ordinarily used for the movement of inanimate things, i.e., things that do not initiate their own movement, and are unable to stop when moving (226a32-226b1).[100] So here we have an example of a familiar term being used in an unusual way, and to draw attention to this Aristotle refers to it as 'what we call *phora*' (for another example, see *Phys.* VII.2, 244b5, with *Cat.* 9a28f.).

Nevertheless I would question Ross' suggestion that *stoicheion* is a term familiar in other uses, e.g. the 'alphabetic' use, which is now being deployed in a somewhat unusual way. Firstly, at *Metaphysics* Delta Aristotle himself introduces the 'alphabetic', 'elemental', and 'geometrical' uses of *stoicheia* as three 'ordinary' or 'proper' (*kuriôs*) uses of the term, and indeed he opposes these uses to a metaphorical derivation (V.3, 1014a31-34: see s. **2.1** above).[101] Secondly, the use of *stoicheia* in the sense of principles or constituents of bodies seems already to be well-established even by Plato's time;[102] and thirdly Ross' suggestion fails to account for the fact that later Greek philosophers continue, albeit infrequently, to use the expression *ta kaloumena stoicheia.*[103]

So it doesn't seem that *stoicheion* is not a well established term. Is it a term in *common* use then? Here we have to proceed with caution. For it is a little bit vague to identify a term as being the 'common name' for something, until we clarify *for whom* it is common, that is, whether it is so for 'everyone', or the audience one is addressing, or some other discrete group. And it is notable that Aristotle sometimes completes the phrase *ta kaloumena stoicheia* with the expression *hupo tinôn*, i.e., 'what are called 'elements' by some people' (*PA* II.1, 646a13, *Metaph.* XI.1, 1059b23). It might be thought, then, that *stoicheion* in the 'elemental' use, if not a particularly 'extra-ordinary' use of the term, is still a fairly uncommon one, familiar perhaps

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[100] See Ross (1936), 625; Bostock (1996), 270.

[101] Cf. Aquinas, *In Meta.*, V.4, 795: 'First, he explains how the term element is used in its proper sense; and second …how it is used in transferred [i.e., metaphorical] senses', trans. Rowan (1964), 316.

[102] For criticism of the view that Plato introduced the elemental use of *stoicheion*, see Crowley (2005), 367-394. Note that Aristotle himself is already referring—without qualification— to the 'solids', i.e., fire, air, water, and earth (cf. *Timaeus* 53d) as *stoicheia* as early as the *Protrepticus* (fr. 33, l. 9).

[103] See, for instance, Sextus Empiricus, *Outlines of Pyrhonism* III.62, Plotinus, *Enneades* III.1.3.2.

only to a specific audience. This thought seems to be behind Charlton's suggestion: '*ta kaloumena stoicheia* means: "the things philosophers call the elements"'.[104]

Again we can find precedents for this use of *kaloumenos*, particularly in the biological works. In the *Historia Animalium*, for instance, Aristotle refers to 'what women call the forewaters' (*ho kaloumenos hupo tôn gunaikôn prophoros*, VII.7, 586a28), that is, the bloody liquid between the womb and the outer membrane in pregnant women. It doesn't seem overly speculative to suggest that other terms to do with women's bodies, e.g., the menses, may also be best understood with the implied completion *hupo tôn gunaikôn*.[105] In a similar fashion, in cases involving marine biology, 'so-called' should probably be completed as 'by the fishermen' (*hupo tôn halieôn*), who are familiar on a daily basis with this area (we find this expansion at *HA* V.12, 544a12). For it seems likely that Aristotle received much of his information about the objects with which marine biology is concerned from experienced fishermen (see, e.g. *HA* IV.7, 532b20; but cf. *GA* III.5, 756a32).[106] The suggestion is that Aristotle introduces a term qualified by *kaloumenos* because this is what a particular group of people call this thing—people who, because of their distinctive status as, e.g., women, fishermen, people of a particular geographical area, are familiar on an everyday basis with this thing.[107] So the term qualified is in common use by these people, but it is also somewhat unfamiliar, for beyond these privileged groups there is likely to be unfamiliarity with the name itself or with its application in certain contexts. What Aristotle may want to do, then, when he uses *kaloumenos* in such cases, is to highlight certain terms that could well be unfamiliar. Perhaps some of these terms *are* well known, but it is a pedagogical virtue not to presume that everyone in one's audience will be familiar with the names of the things of which one intends to speak. Can we also understand *ta*

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[104] (1970), 46.

[105] For the so-called menses (*ta kaloumena katamênia*), see, e.g., *GA* I.17, 721b5, I.19, 727a2. Other such terms qualified by *kaloumenos* include: the uterus or womb (*GA* I.2, 716a33); the umbilical cord (*GA* II.4, 740a30, 32;), wind eggs (*GA* I.21, 730a2; III.2, 753a22), molar pregnancies (*GA* IV.7, 775b25, *HA* X.7, 638a24).

[106] See Preus (1975), 36-7.

[107] Not that Aristotle thinks we should always defer to their 'authority'; e.g., he occasionally disagrees with what the fishermen claim. See, e.g., *GA* I.15, 720b32-6.

kaloumena stoicheia, then, as 'what are called *stoicheia* by a particular community, namely, *the philosophers*'?

The suggestion is attractive but not without its difficulties. For it is not obvious *why* Aristotle would think it necessary to use such a description, and Charlton himself doesn't supply one. This is because the analogy with the use of *kaloumenos* in the biological works breaks down at a crucial point, namely, when one considers the audience Aristotle is addressing. A plausible general reason for Aristotle's frequent use of *kaloumenos* in the biological works is that he is aware that the audience he is addressing may not be familiar with many of the terms he is introducing. That some names of human and animal body parts *are* unfamiliar to his audience is indeed suggested by the famous passage in the *Parts of Animals* I.5, where Aristotle is persuading his audience that the study of such parts, and of biology in general, is worthy of attention. For it seems that the study of biology is quite foreign, and, for many of Aristotle's contemporaries, even distasteful (645a8-645a30). But one might wonder why it would be deemed necessary, or even useful, to introduce the term *stoicheia* as a term used by 'philosophers', if we assume that, when he uses the phrase *ta kaloumena stoicheia*, Aristotle is addressing his students, or the wider community of philosophers. If addressing women or fishermen, for instance, he would hardly need to qualify terms as 'called thus by women', or 'by fishermen'. For he would be addressing the very community for whom the term is familiar.

Perhaps, then, so one might suggest, Aristotle uses the phrase *ta kaloumena stoicheia* only in more exoteric writings, or lectures for philosophical neophytes. This seems unlikely given some of the contexts in which we find the phrase. But whatever the audience there is a difficulty here. For, as we saw earlier (s. **2**), *ta kaloumena stoicheia* is used to refer to fire, air, water, and earth, whereas Aristotle's philosophical contemporaries, e.g. the Platonists, the followers of Anaxagoras, are certainly not all in agreement that *these* items are the elements. At best it seems that *ta kaloumena stoicheia* could be further restricted to 'what are called 'elements' by *some* philosophers', namely those who posit one or more of fire, air, water, and earth, e.g., the Milesians and Empedocles, or more accurately, the *followers* of these *phusiologoi*.

5.3 It seems reasonable, however, to think that the ideas of these philosophers have long gained popular acceptance beyond the Academy and the Lyceum. That fire, air, water, and earth are the material constituents of things does indeed appear to be already fairly common by Plato's time.[108] Moreover, as noted earlier, the entry on *stoicheion* in *Metaphysics* Delta is evidence that *stoicheion* in the 'elemental' use is an ordinary or common use. But consider, also, for instance, Aristotle's statement at *Metaphysics* Alpha, that Empedocles 'was the first to speak of the four so-called elements of the material kind' (I.4, 985a32). The fact that Aristotle says Empedocles was *the first* to speak of these four elements is significant. This would hardly need pointing out if it were only the followers of Empedocles who call such things *stoicheia.* But it *would* be worth pointing this out if it is has since become relatively common, among Aristotle's contemporaries, to say that fire, air, water, and earth are the elements. In other words, if some people think that the simple bodies fire, air, water, and earth are the constituents of things, and they duly call these things *stoicheia*, it does not follow that they are self-confessed followers of Empedocles, or share his conception of the nature of these simple bodies.

Consider also *De Gen. et Cor.* I.6, where, as we have seen (s. **4.3**), Aristotle raises the question whether or not the so-called elements are eternal (322b1-3). Now Empedocles, of course, conceives of fire, air, water, and earth as eternal and unchangeable (*GC* I.1, 315a3-5, II.1, 329a35-b2). So at *De Gen. et Cor.* I.6, the question Aristotle is raising might be paraphrased: 'Are the so-called elements fire, air, water, and earth eternal, as, for instance, *Empedocles* conceives of them, or not?' Presumably this is not a question that would arise if the phrase *ta kaloumena stoicheia* were simply a way to refer to Empedocles' elements, or the elements as conceived by Empedocles' followers. Indeed, as we have seen, that it is *not* the case that the phrase picks out Empedocles' elements is clear at *Physics* I.4 and III.4 (see ss. **4.1**, **2.2**). Hence it seems that the view that fire, air, water, and earth are the *stoicheia*, and are called thus, is one held by people generally. But this again raises the question of Aristotle's reasons for

[108] See *Timaeus* 48b-c, with Crowley (2005), 378f.; cf. also *Philebus* 29a10f., *Cratylus* 408d, *Protagoras* 320d.

using the phrase 'the *so-called* elements' For if these things are commonly called elements, why does Aristotle not simply refer to them as 'elements'?

It can be difficult to divine the reasons why Aristotle is calling attention to a term, if that term appears to be in common or general use, and the motivation to highlight impropriety in the use of the term is ruled out. But consider the following instance. At *De Gen. et Cor.* I.1, Aristotle makes the point that alteration is an observable phenomenon. He writes: 'For in the same way that we see a substance, which stays the same, change in respect of size, [that is] so-called growth and diminishing (*tên kaloumenên auxêsin kai phthisin*) thus also we see alteration' (314b13-16). Why does Aristotle draw attention to the term *auxêsis* (and presumably also to *phthisis*), in this manner? Commentators who fasten onto the references to *ta kaloumena stoicheia* later on in the *De Gen. et Cor.*, and invest in that use of *kaloumenos* significant theoretical claims, are curiously silent about *hê kaloumenê auxêsis*, so we find little guidance from that quarter. If we begin by wondering how the expression is to be completed, presumably we must say that everyone calls the change in size of a substance *auxêsis*—or *phthisis*, if it is a decrease in size we are talking about. For these terms seem to be terms in common use, and they are being used here in their 'ordinary' sense (cf. *Phaedo* 71b). So here we have a commonly used term, that names an everyday phenomenon; yet Aristotle is drawing attention to it. Why?

It seems that the answer is quite simply that the notion of growth, that is, the nature of this phenomenon, is problematic. At the beginning of *De Gen. et Cor.* I.2, Aristotle mentions growth as one of the subjects to be discussed, alongside generation and corruption and alteration (315a26-29), and he proceeds to complain that none of his predecessors, apart from Democritus, has examined these subjects in any great depth (a34-35). No one has said anything about the nature of growth, for instance, beyond the obvious, i.e., that things grow by the accession of like to like. But the problem is to explain *how* this accession occurs (315b1-3). Aristotle addresses this problem at *De Gen. et Cor.* I.5, where, apart from distinguishing growth from other changes like alteration and generation, he sets out his task as the attempt to figure out how the things that grow, grow, and the things that get smaller, get smaller (320a8-10).

What I think we can take from this is that a plausible reason why Aristotle qualifies the common word 'growth' in the very first chapter of the *De Gen. et Cor.* is precisely because the nature of growth, i.e., what it is, is not clear, and demands investigation. There is, of course, no doubt that growth does occur: we see things getting bigger and smaller, and people say this gets bigger, and that gets smaller; and to call these phenomena 'growth' and 'diminution' respectively is certainly not a misuse of these terms. So there is certainly no implication of impropriety in the use of the phrase 'so-called growth'. The problem, rather, is that not much thought is given to *how* growth occurs, or what are its causes. In other words, growth is something not really understood: it needs looking into. What the participle *kaloumenos* does, then, is highlight the term, pick it out from our ordinary discourse, and identify the phenomenon it names as a possible subject for discussion.

Could this offer a model for the explanation for Aristotle's use of *ta kaloumena stoicheia*? If we look again at the questions he asks about the so-called elements *De Gen. et Cor.* I.6, we might initially be tempted to think so. It is time, Aristotle might appear to be saying, to look into what are ordinarily called 'elements', because although we talk about these often, and the term 'element' itself is well known, it isn't clear whether the elements are *really* elements or not, and if they are, whether or not they are eternal, and so on (322b1-4; cf. *Timaeus* 48b-c).

And yet this explanation doesn't fully convince. Certainly the *De Gen. et Cor.* is an appropriate context in which to investigate the nature of the elements; but in other contexts it doesn't appear that Aristotle is highlighting the term because he feels the nature of the elements is not well understood, and needs to be discussed. Indeed, elsewhere, if there is an 'ordinary' or 'common opinion' as to what the elements are, in the way there is, for instance, a 'common opinion' as to what the void, or place, or substance, is,[109] then Aristotle seems often content to rely upon this common opinion for the purposes of his discussion. Take the instance at *Physics* I.4. On this occasion Aristotle doesn't explicitly say that the so-called

[109] See *Phys.* IV.6, 213a27-31, IV.1, 208a29-31, b27-33, and *Metaph.* VII.2, 1028b8-13 respectively. The 'common opinions', as Hussey (1982) puts it, are 'those held by people generally', 123.

elements are fire, air, water, and earth. Some lines earlier, he had referred to those monists who posited 'one of the three' (*tôn triôn ti*), or else an intermediate between fire and air (187a12-15). Presumably by 'the three' he means water, air and fire, posited respectively, and most famously, by Thales, Anaximenes, and Heraclitus (*Metaph.* I.3, 983b20-984a8).[110] Evidently Aristotle expects his audience to grasp that 'the three' is a reference to these bodies, and these thinkers. And presumably he is confident his audience will understand that with the phrase *ta kaloumena stoicheia* he is referring to the *four* elements of bodies, fire, air, water, *and earth*—earth being the one that Empedocles added to 'the three' (see *Metaph.* I.3, 984a8-9, with I.8, 989a6-9). It seems, in other words, that Aristotle is presuming that his audience will know what the 'so-called elements' are, and so, by telling them that Empedocles posited these, they will know that, whatever else he might have said, Empedocles posited fire, air, water, and earth as the elements of bodies.[111] It is perhaps also significant that Aristotle doesn't need to say that the so-called elements are *four*. Hence, at *Physics* I.4, it seems that Aristotle can say that Empedocles separates out the 'so-called elements', and be confident that both the number and the identity of Empedocles' elements—his elements of bodies, to be more precise—will be understood without the need for further explication.

But, to repeat our earlier question: If fire, air, water, and earth are the elements according to common opinion, why doesn't Aristotle refer to them simply as the 'elements'? More often than not, of course, Aristotle *does* refer to fire, air, water, and earth simply as 'elements', or 'simple bodies', rather than 'so-called elements' (see s. **2.3**). But that this is so would seem to increase the demand for an explanation of his motivation for adding the participle on certain occasions. For, given that fire, air, water, and earth are the things that are the elements according to common opinion, what difference would it make to assert:

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[110] See, e.g., Bostock (1996), 235. The identity of he, or they, who posited the intermediate is in doubt, as on this occasion it seems not to be Anaximander; see Ross (1936), 482.

[111] Aristotle says that Empedocles separates *only* the so-called elements from out of the mixture, but this is because the latter (the *Sphairos*) comes to be and passes away under the influence of Empedocles' other two 'elements', love and strife. See, e.g., *GC* I.1, 315a3-25.

'Empedocles separates out only the elements', rather than 'Empedocles separates out only the *so-called* elements'?

The problem, I think, is that the former statement is too vague. For almost any principle, whether of the Presocratics, or of Aristotle's contemporaries, may be called an 'element' (see. s. **2.1** above). In the context of a discussion where *stoicheia* generally means whatever principles of nature have been posited in Presocratic and contemporary theories, whether Parmenides' hot and cold (or fire and earth), the Milesian's rarity and density, Democritus' full and void (188a20-23), or Plato's Great and Small (189a8-10), the participle *kaloumenos* has a useful function. For its function, as a qualification upon *ta stoicheia*, would appear to be to clarify that the elements in question are the four corporeal elements fire, air, water, and earth, *as opposed to* other kinds of material, or indeed, immaterial, principles.

This, then, is what I want to suggest as the most probable explanation of Aristotle's use of the phrase *ta kaloumena stoicheia*. We might note immediately that it closely parallels my proposed explanation of Aristotle's use of the phrase 'the so-called void' at *Parts of Animals* II.10 (see s. **4.5** above). Recall that I argued that Aristotle uses *kaloumenos* in that instance in order to clarify that it is the common notion of void, rather than the philosophers' notion, that is in question. Likewise, the explanation I am proposing for Aristotle's use of the phrase 'the so-called elements' is that Aristotle uses *kaloumena* to clarify that the elements in question, i.e., in the context of the discussion wherein he uses the phrase, are what people commonly or unreflectively tend to call 'elements', rather than, say, the elements of Plato, or the Pythagoreans, or Democritus.

So, to sum up, my proposed explanation is that the phrase *ta kaloumena stoicheia* can be completed as 'what are *commonly* called 'elements', i.e., the common opinion as to what the elements of things are; and Aristotle's aim or intention when using the phrase is to underline that what he is talking about, when he uses the phrase, are the things commonly called 'elements', namely, fire, air, water, and earth. His use of the phrase thus picks out a certain subgroup of material principles. The contexts of its use do not appear to require *also* the

supposition of an implicature such as that discovered by proponents of the impropriety explanation.

5.4 Admittedly, this explanation of *ta kaloumena stoicheia* might appear disappointingly conservative, indeed somewhat deflationary. And one might wonder whether there are further alternatives that deserve consideration. No doubt it is rather conservative (although, considering the prevailing view, *revisionary*); and no doubt there may be other alternatives. One I haven't considered at all is whether or not Aristotle uses the phrase because the things called *stoicheia* are *properly* called *stoicheia*, i.e., a use of *kaloumenos* analogous to the 'predicative' use of the English 'so-called'. Perhaps this shouldn't be ruled out of hand as impossible, and indeed in Chapter **2** I will suggest that Aristotle does accept, to an extent, the view that fire, air, water, and earth are the genuine elements of bodies. But there is no need to claim that the phrase itself provides evidence that this is so. It seems preferable to think that Aristotle, by using the phrase *ta kaloumena stoicheia*, successfully conveys to his audience that he has in mind the elements of bodies fire, air, water, and earth, and not any other kind of principle, without, however, also conveying either his criticism or endorsement of this view. And while this explanation is conservative, it seems to me that the phrase appears too infrequently to justify the investment of further significance (see s. **2.3**). In any case, to repeat a point emphasised earlier, my main aim in this chapter has been to remove the phrase *ta kaloumena stoicheia* from among the exhibits of evidence usually offered to support the view that Aristotle does not believe that fire, air, water, and earth are the genuine elements of bodies.

My conclusion, then, is that Aristotle uses the phrase *ta kaloumena stoicheia* as a way of fixing the reference to the four elements of bodies, fire, air, water, and earth. Obviously for this to work there must be people who call fire, air, water, and earth *stoicheia*, and I have suggested that it is plausible to think that this is a fairly popular view. It must be acknowledged, however, that it does not follow from this conclusion that Aristotle *himself* believes that fire, air, water, and earth *are* the genuine elements. For it is important to remember that, on this

account, one could introduce something as the 'so-called *x*', without implicating impropriety of use, only *then* to proceed to argue or to show that the name is for some reason inappropriate. In other words, by using the phrase *ta kaloumena stoicheia* Aristotle could well be highlighting a contemporary usage, only later to criticise and to distance his own view from that usage, and eventually, perhaps, to identify other things as the genuine elements. We still need to see whether Aristotle does so or not. This, however, is a task for the next chapter.

Texts for Chapter 1

[a] *Metaphysics* V.3, 1014a26-1014b15

Στοιχεῖον λέγεται ἐξ οὗ σύγκειται πρώτου ἐνυπάρχοντος ἀδιαιρέτου τῷ εἴδει εἰς ἕτερον εἶδος, οἷον φωνῆς στοιχεῖα ἐξ ὧν σύγκειται ἡ φωνὴ καὶ εἰς ἃ διαιρεῖται ἔσχατα, ἐκεῖνα δὲ μηκέτ' εἰς ἄλλας φωνὰς ἑτέρας τῷ εἴδει αὐτῶν, ἀλλὰ κἂν διαιρῆται, τὰ μόρια ὁμοειδῆ, οἷον ὕδατος τὸ μόριον ὕδωρ, ἀλλ' οὐ τῆς συλλαβῆς. ὁμοίως δὲ καὶ τὰ τῶν σωμάτων στοιχεῖα λέγουσιν οἱ λέγοντες εἰς ἃ διαιρεῖται τὰ σώματα ἔσχατα, ἐκεῖνα δὲ μηκέτ' εἰς ἄλλα εἴδει διαφέροντα· καὶ εἴτε ἓν εἴτε πλείω τὰ τοιαῦτα, ταῦτα στοιχεῖα λέγουσιν. παραπλησίως δὲ καὶ τὰ τῶν διαγραμμάτων στοιχεῖα λέγεται, καὶ ὅλως τὰ ὧν ἀποδε-ίξεων· αἱ γὰρ πρῶται ἀποδείξεις καὶ ἐν πλείοσιν ἀποδείξεσιν ἐνυπάρχουσαι, αὗται στοιχεῖα τῶν ἀποδείξεων λέγονται· εἰσὶ δὲ τοιοῦτοι συλλογισμοὶ οἱ πρῶτοι ἐκ τῶν τριῶν δι' ἑνὸς μέσου. καὶ μεταφέροντες δὲ στοιχεῖον καλοῦσιν ἐντεῦθεν ὃ ἂν ἓν ὂν καὶμικρὸν ἐπὶ πολλὰ ᾖ χρήσιμον, διὸ καὶ τὸ μικρὸν καὶ ἁπλοῦν καὶ ἀδιαίρετον στοιχεῖον λέγεται. ὅθεν ἐλήλυθε τὰ μάλιστα καθόλου στοιχεῖα εἶναι, ὅτι ἕκαστον αὐτῶν ἓν ὂν καὶ ἁπλοῦν ἐν πολλοῖς ὑπάρχει ἢ πᾶσιν ἢ ὅτι πλείστοις, καὶ τὸ ἓν καὶ τὴν στιγμὴν ἀρχάς τισι δοκεῖν εἶναι. ἐπεὶ οὖν τὰ καλούμενα γένηκαθόλου καὶ ἀδιαίρετα (οὐ γὰρ ἔστι λόγος αὐτῶν), στοιχεῖα τὰ γένη λέγουσί τινες, καὶ μᾶλλον ἢ τὴν διαφορὰν ὅτι καθόλου μᾶλλον τὸ γένος· ᾧ μὲν γὰρ ἡ διαφορὰ ὑπάρχει, καὶ τὸ γένος ἀκολουθεῖ, ᾧ δὲ τὸ γένος, οὐ παντὶ ἡ διαφορά.
ἁπάντων δὲ κοινὸν τὸ εἶναι στοιχεῖον ἑκάστου τὸ πρῶτον ἐνυπάρχον ἑκάστῳ.

[b] Philoponus *In Aristotelis physicorum libros octo commentaria*, 16. 94.13-15

...ὁ δὲ Ἐμπεδοκλῆς τὰ τέσσαρα ταῦτα στοιχεῖα πῦρ ἀέρα ὕδωρ καὶ γῆν. καλούμενα δὲ αὐτὰ εἶπεν, διότι οὐκ ἔστι κυρίως στοιχεῖα (οὐδὲ γάρ εἰσιν ἁπλᾶ, ἀλλὰ σύνθετα), κυρίως δὲ στοιχεῖα ἡ ὕλη καὶ τὸ εἶδος.

Philoponus *In Aristotelis libros de generatione et corruptione commentaria* 14.2. 205.23-5

ἀρχαὶ γὰρ κυρίως καὶ στοιχεῖα πρῶτα τῶν ἐν γενέσει καὶ φθορᾷ ἡ ὕλη ἐστὶ καὶ τὸ εἶδος, ἐξ ὧν καὶ αὐτὰ ταῦτα τὰ καλούμενα στοιχεῖα σύγκειται, καὶ ἐν αὐτοῖς ἐστι γένεσις καὶ φθορά.

[c] *Physics* III.5, 204b32-35

οὐκ ἔστιν τοιοῦτον σῶμα αἰσθητὸν παρὰ τὰ καλούμενα στοιχεῖα· ἅπαντα γὰρ ἐξ οὗ ἐστι, καὶ διαλύεται εἰς τοῦτο, ὥστε ἦν ἂν ἐνταῦθα παρὰ ἀέρα καὶ πῦρ καὶ γῆν καὶ ὕδωρ· φαίνεται δ' οὐδέν.

[d] *Parts of Animals* II.1, 646a12-24

Τριῶν δ' οὐσῶν τῶν συνθέσεων πρώτην μὲν ἄν τις θείη τὴν ἐκ τῶν καλουμένων ὑπό τινων στοιχείων, οἷον γῆς ἀέρος ὕδατος πυρός. Ἔτι δὲ βέλτιον ἴσως ἐκ τῶν δυνάμεων λέγειν, καὶ τούτων οὐκ ἐξ ἁπασῶν, ἀλλ' ὥσπερ ἐν ἑτέροις εἴρηται καὶ πρότερον. Ὑγρὸν γὰρ καὶ ξηρὸν καὶ θερμὸν καὶ ψυχρὸν ὕλη τῶν συνθέτων σωμάτων ἐστίν· αἱ δ' ἄλλαι διαφοραὶ ταύταις ἀκολουθοῦσιν, οἷον βάρος καὶ κουφότης καὶ πυκνότης καὶ μανότης καὶ τραχύτης καὶ λειότης καὶ τἆλλα τὰ τοιαῦτα πάθη τῶν σωμάτων. Δευτέρα δὲ σύστασις ἐκ τῶν πρώτων ἡ τῶν ὁμοιομερῶν φύσις ἐν τοῖς ζῴοις ἐστίν, οἷον ὀστοῦ καὶ σαρκὸς καὶ τῶν ἄλλων τῶν τοιούτων. Τρίτη δὲ καὶ τελευταία κατ' ἀριθμὸν ἡ τῶν ἀνομοιομερῶν, οἷον προσώπου καὶ χειρὸς καὶ τῶν τοιούτων μορίων.

[e] *De Gen. et Cor.* I.6 322b1-4

Ἐπεὶ δὲ πρῶτον δεῖ περὶ τῆς ὕλης καὶ τῶν καλουμένων στοιχείων εἰπεῖν, εἴτ' ἔστιν εἴτε μή, καὶ πότερον ἀίδιον ἕκαστον ἢ γίνεταί πως, καὶ εἰ γίνεται, πότερον ἐξ ἀλλήλων γίνεται πάντα τὸν αὐτὸν τρόπον ἢ τι πρῶτον ἓν αὐτῶν ἐστιν.

2

The Status of the Contraries

Introduction

1. It is clear that there is a very intimate relationship between the elements fire, air, water, and earth and the primary contrarieties hot and cold, dry and wet. But what is the nature of this relationship? The very least we can say is that the elements are related to the contraries in such a way that changes between the former are explicable in terms of changes between the latter (see *DC* III.6, *GC* II.4). But beyond this bare description it is notoriously difficult to say anything with certainty. Solmsen complains that '[t]he truth is that Aristotle has not clearly defined what status his 'contraries' are to have', and one readily sympathises.[1] Nevertheless it is possible to discern two rival interpretations in the secondary literature. Most commonly, commentators tend to favour some form of the 'traditional' interpretation, according to which the contraries are qualities or properties predicable of an underlying subject called 'prime matter'. This subject is unusual because, as conceived by its proponents, it does not actually exist; rather, it is 'nothing but a potentiality which can exist only as actualized… in one of the elements'.[2] Other commentators reject prime matter, however, on grounds either of incoherency or redundancy or both.[3] Where precisely this rejection leaves the contraries is not always entirely clear, but evidently they are promoted above the status of mere qualities or properties and take on a more substantive flavour.[4] Rather than dwell on their differences, however, it is more interesting to draw out what both these interpretations have in common. For a cursory examination of their arguments reveals that the 'traditional' and what we might

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[1] (1958), 252.

[2] Robinson (1974), 168; see also, e.g., Joachim (1922), 94; Solmsen (1958), 244; Williams (1982), 211.

[3] See, e.g., King (1956); Charlton (1970), 129-145, and (1982); Furth (1988), 221-227; Gill (1989), 243-252. Williams (1982), 219, and Graham (1987) defend the traditional interpretation, while accepting that the notion of prime matter is incoherent.

[4] See, e.g., King (1956), 378; with Loux (1991) 250, and Robinson (1974), 183.

call the 'revisionist' readings both entail the general claim that the contraries are in some sense constituents of fire, air, water, and earth.[5] The traditionalist takes each of these elements to be composed of prime matter qualified by the appropriate contraries;[6] the revisionist claims that the pair of contraries that are allocated to an element exhaustively compose or constitute that element.[7] But if the contraries are constituents of fire, air, water, and earth, then—according to Aristotle's definition of 'element'—the former, and not the latter, are (or are among) the true elements, or *stoicheia*, of bodies. This is a conclusion that many commentators are happy to draw (see Ch. **1**, s. **3.1**).

Circumstantial evidence that Aristotle holds this view of the contraries is supposed to be available in his use of the phrase *ta kaloumena stoicheia*, but we have rejected the required impropriety explanation of this phrase in the previous chapter. In the first section below I assess the remainder of the alleged evidence, and I want to show that it is also found wanting. I argue that Aristotle neither explicitly nor implicitly identifies the contraries hot and cold, dry and wet as *stoicheia* in the *De Gen. et Cor.*, and that his procedure in this and other works points rather to the conclusion that he endorses, with some qualification, the popular opinion that fire, air, water, and earth are the elements of bodies. In the succeeding sections of this chapter I want to clarify the status of the contraries and the nature of their relationship to the elements. I emphasise Aristotle's understanding of the contraries as the differentiae of the elements (s. **3**), and I focus in particular upon the meaning and implications of Aristotle's claim that alteration is impossible without elemental change (s. **4**). The significance of this claim, if recognised at all, has been but little explored. Such neglect is somewhat remarkable, since, as I shall show, it offers an important insight into the relationship between the contraries and the elements.

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[5] See Chapter **1**, note 5.

[6] For Solmsen (1960) 'the four qualities [hot, cold, dry and wet] … are constitutive factors of these elements', 351, see also 368. See also Ross (1923), 73, and Joachim (1922), 104.

[7] See King (1956), 376ff., Furth (1988), 76-79, 221-227; Gill (1989), 67-82; Lewis (1996), 15-59. Gill denies that the elements are composed out of properties or simpler ingredients (1989, 75-78), but to say, as she does, that the contraries persist through the generation and corruption of the element seems tantamount to identifying the contraries as constituents of the elements.

Does Aristotle Identify the Contraries as *Stoicheia*?

2.1 In the first chapter, I argued that Aristotle's use of the phrase *ta kaloumena stoicheia* does not by itself indicate that he denies to fire, air, water, and earth the status of elements. Hence what I call the 'impropriety explanation' must be rejected. But, from the point of view of an attempt to identify the true elements of Aristotle's system, this argument leaves much unresolved. For one could readily accept that Aristotle's use of the phrase *ta kaloumena stoicheia* does not provide evidence of a sceptical or ironical attitude towards the claims of fire, air, water, and earth to be genuine elements, while happily retaining the opinion that Aristotle posits other items as the true *stoicheia* of bodies, i.e., the contraries (and often prime matter). That is to say, the premiss upon which the impropriety explanation is based still remains an option (see Ch. **1**, s. **3.1**). In this first section I attack this premiss, and thereby complete my criticism of the impropriety explanation. The main piece of evidence that Aristotle makes the contraries his *stoicheia* is at *De Gen. et Cor.* II.3. Before examining the textual evidence, however, let's begin by considering some basic theoretical objections to the identification of the contraries as the *stoicheia.*

One of the key claims of *De Gen. et Cor.* II, and arguably of the treatise as a whole, is that the elements change into each other (see *GC* I.1, 314b15-27, II.1 329a35-b2, and II.4; cf. *DC* III.6). Aristotle is particularly critical of Empedocles' conception of the elements, precisely because Empedocles claims the elements are immutable. Empedocles may have arrived at the theory that fire, air, water, and earth are the four 'roots' by 'hypostasizing' the contraries, i.e., by conceiving each member of the contrary pairs hot and cold, dry and wet, as a real thing.[8] Now, for the sake of argument, let's say that Aristotle does believe that the genuine *stoicheia* are hot, cold, dry, and wet. For Aristotle, as for Plato, there is no change between contraries: hot does not become cold, but *something* that is hot becomes *something* that is cold (see, e.g., *GC* I.6, 322b15-17, II.1, 329b2-3; and *Phaedo* 102e-103c). It follows that if hot, cold, dry, and wet were the true elements, then Aristotle's theory of elements would be nothing more than a rehashing

[8] For this interpretation of Empedocles, see Burnet (1892), 228, and Kirk and Raven (1957), 329; but cf. Longrigg (1976), 424f.

of Empedocles' theory. His claim that the elements can change into and out of each other would be mere window dressing, for the 'genuine elements' would be as unchangeable as Empedocles' roots. It may still be held that fire, air, water, and earth change into each other. But such change would have to be reinterpreted as the rearrangement, or the aggregation and segregation, of hot, cold, dry, and wet, rather than genuine transformation.[9] Aristotle, of course, denies that generation and corruption are reducible to the aggregation and segregation of elements (cf. I.2, 317a17-24). Moreover, he argues that generation is distinct from alteration (I.4), and criticises the material pluralists among his predecessors, in particular Empedocles, who fail adequately to account for both kinds of changes (I.1, 314b4-17; see s. **4.1**). But were Aristotle to make the contraries his *stoicheia*, then alteration would be as impossible on his theory of elements as he takes it to be on Empedocles' theory (314b17-26). Hence to assert that the contraries are Aristotle's *stoicheia* is to impute to Aristotle a theory of matter that seems vulnerable to the problems he finds in Empedocles.

Why, then, do so many commentators make this assertion? The reason why the contraries are supposed to be better candidates for the title of *stoicheia* is that they are believed to be the constituents of fire, air, water, and earth. To put this point another way, fire, air, water, and earth are believed to be composite, rather than simple, bodies. But this, were it true, would be little short of disastrous for the coherency of Aristotle's general theory of elements. It severely damages his theory of elemental motion. In the *De Caelo* Aristotle argues that there must be simple bodies, because there are simple motions (III.3, 302b5-9). The simple bodies are defined as simple according to their movement, e.g. fire moves up, earth moves down (I.8, 276b30-a7). These are their natural motions, and any other motion is against their nature: for fire to move downwards, for instance, is for fire to move in a way that is contrary to its nature

[9] Loux (1991) also makes this point: if the contraries are the constituents of the elements, then the elements are generated from each other 'in an almost Empedoclean spirit… by a process akin to what Aristotle… calls 'combination and separation", (251).

(I.2, 269a17, b10). Simple bodies, then, will have simple movements.[10] Composite bodies, by contrast, have the potentiality to move in more than one way. So if fire, air, water, and earth were really composite bodies, then presumably each would have more than one natural motion. Consequently it would not be in the nature of fire to go up: it would not go up necessarily, nor earth down necessarily. If Aristotle intended to change his doctrine of the elements so drastically, then he would owe us a new account of elemental motion. But even in the *Meteorologica*, where the introduction of the doctrine of the two exhalations is often thought to be a significant revision of the doctrine of the *De Caelo*,[11] Aristotle makes it quite clear that he retains the basic tenets of the latter regarding motion and the four elements (see *Meteor.* I.2, esp. 339a14-20, 27-30; cf. I.1, 338a20-26).

These, then, are some of the theoretical problems that arise if Aristotle identifies the contraries as the *stoicheia*. But, of course, the existence of such problems does not mean that Aristotle *doesn't* identify the contraries as the *stoicheia*. To judge whether he does so or not, we need to look at the textual evidence.

2.2 If Aristotle does not think that fire, air, water, and earth are the genuine elements, then it seems reasonable to expect him to say so clearly—to expect, for instance, a rejection along the lines of his rejection of Anaxagoras' principles from the status of elements at *De Caelo* III.4 (302b14-20; see Ch. **1**, s. **2.2**). Moreover, it seems reasonable to expect to find this rejection in the *De Gen. et Cor.* For it is often thought that Aristotle's attitude towards fire, air, water, and earth changes significantly when he introduces the primary contraries hot, cold, dry, and wet at *De Gen. et Cor.* II.2. In the *De Caelo*, which is usually regarded as the earlier work, he neither expresses nor implies a reluctance to name fire, air, water, and earth as the elements or *stoicheia* of sublunary bodies. But in the *De Gen. et Cor.* he seems to suggest that these 'simple bodies'

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[10] Graham (1987) suggests that that the description 'simple bodies' has no reference to the composition of bodies so described; it indicates merely that such bodies have simple movements (476, n. 5). But Aristotle infers from the fact that there are simple movements that there must be simple bodies, i.e., bodies that are not composed of other items (III.3, 302b7-9). This surely does tell us something about composition.

[11] See Longrigg (1975), 214f.; cf. Lewis (1996), 15-59.

can be analysed into the primary contraries. This analysis, so one might argue, implies a development in Aristotle's theory of elements such that, in his 'mature' or considered opinion, fire, air, water, and earth are no longer considered to be really simple, and the true *stoicheia* are hot, cold, dry, and wet.[12] Many commentators, for instance, Philoponus, Joachim, and Ross, to name but a few, claim that Aristotle actually refers to the contraries as *stoicheia* at the beginning of *De Gen. et Cor.* II.3, and thereby confirms that this is his considered opinion.[13] Here is the relevant passage:

> (1) Since (*epei de*) the *stoicheia* are four, (2) and of the four there are six pairings; (3) but contraries cannot be paired with each other (for it is impossible for the same thing to be hot and cold, and again wet and dry), (4) it is clear that the pairings of the *stoicheia* will be four, hot with dry and wet with hot, and again cold with dry and cold with wet. (5) And these are attached according to reason to the apparently simple bodies fire, air, water, and earth; for fire is hot and dry, air is hot and wet, for air is like vapour (*atmis*), water is cold and wet, and earth is cold and dry, (6) thus the differentiae are reasonably distributed among the primary bodies, and the number of these is according to reason (my numbers, 330a30-b7).[a]

At first glance it does seem that Aristotle is calling the contraries hot and cold, dry and wet *stoicheia*. He begins by saying that the *stoicheia* are four (a30)—this, certainly, is true if he means fire, air, water, and earth; but then he says 'of these four there are six pairings'. If by 'these four' Aristotle means 'these four *stoicheia*', then by *stoicheia* Aristotle must mean the four contraries. For what are paired are not fire, air, water, and earth, but the contraries hot and cold, dry and wet. At 330a33 (line 4) it seems to be confirmed that the *stoicheia* are the things that are paired, and indeed that the pairings of the *stoicheia* are pairings of the contraries. So it appears that the *stoicheia* at 330a30 and at a33 are not fire, air, water, and earth, but the contraries hot and cold, dry and wet.[14]

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[12] Hankinson (1998) writes: 'Aristotle's theory of chemical combination [in the *De Gen. et Cor.*]... represents a considerable advance upon the traditional four-element physical chemistry he elsewhere adopts. Four qualities, hot, cold, wet and dry, are now primary...the four elements being composed from them...' (180). Cf. Longrigg (1975), 214. See above, Ch. **1**, s. **3.1**.

[13] Philoponus *In de gen et corr* 14.2, 224.1-5. Joachim (1922), 213; Ross (1936), 484; see also Kahn (1960), 120f.; Lacey (1965), 464; Sokolowski (1970) 269-71; Williams (1982), 160; Furth (1988), 223, Rashed (2005), 56, n. 2; cf. D. Frede (2004), 303, Cooper (2004), 315, n. 1, and Sorabji (2004), 268.

[14] See Joachim's commentary on this passage (1922), 213-217, and also Forster's translation (1955).

To admit this interpretation we need to accept that Aristotle would suddenly switch from calling hot, cold, dry, and wet 'contraries' and 'differentiae', as he has been doing up to this point, to calling them *stoicheia*.[15] It is certainly possible that Aristotle might do this. But it is far more sensible, both here and in every other context, to proceed as if Aristotle has not made any unannounced switch in terminology, and to revise this opinion only if the passage under examination fails to make sense on the usual understanding of the terms involved. And, as I shall now argue, 330a30-b7 does make good sense, both internally and in the context of the chapter, if *stoicheia* is taken throughout to refer, as it usually does, to fire, air, water, and earth.

Let's start by considering the concluding lines of *De Gen. et Cor.* II.2, the immediately preceding chapter. In this chapter, Aristotle is concerned with the reduction of the perceptible, or more strictly speaking the tangible, principles of body to four, namely, the two pairs of contraries hot and cold, and dry and wet. He argues that no further reduction is possible: hot, for instance, cannot be reduced to cold, wet or dry, and the same is true of each of the others. Hence, Aristotle concludes, 'there are necessarily these four' (*hôst'anangkê tettaras einai tautas*, 330a29), where 'these four' are the primary differentiae (*prôtai diaphorai*) hot, cold, dry, and wet. Ignoring the chapter division—which is, after all, the work of a later hand—Aristotle continues: 'since (*epei*) the *stoicheia* are four, and of the four (*tôn de tettarôn*) the pairings are six…' (330a30-1). I think it is obvious that by 'of the four' Aristotle means 'of the four differentiae'. This is clear from the following lines, where the six pairings are listed as hot and cold, wet and dry, hot and dry, wet and hot, cold and dry, hot and wet. So immediately before and after the reference to *stoicheia*, Aristotle refers to the differentiae hot, cold, dry, and wet as 'the four'. Now those who think that the occurrence of *stoicheia* at 330a30 is a reference to the differentiae presumably take 'since' (*epei*) as referring back to the conclusion at 330a29. If correct, it would follow that

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[15] Sokolowski (1970) claims that Aristotle is already referring to hot, cold, dry and wet as *stoicheia* in *GC* II.2; he cites as evidence 329b13, and 329b16-26 (cf. D. Frede (2004), 300). He also finds *stoicheia* used to refer to the contraries at *GC* II.4, 331b27-8, and at II.7 334b17-18, and b25; also, 'probably', at II.5, 333a12 (270, n. 14). He is certainly mistaken about 329b13 and b16-26, and it is extremely doubtful that any of the other passages indicate anything of the sort. The best available evidence in support of the view that Aristotle calls the contraries *stoicheia* is that under present consideration.

'of the four' at a30 ought to be glossed 'of the four *stoicheia*', where the *stoicheia* are hot, cold, dry and wet. But I want to suggest that, having reduced the differentiae to four, Aristotle now wants to show how these four differentiae are associated with the four *stoicheia*, i.e., the primary or simple bodies fire, air, water, and earth. To do so, and in particular to show that the differentiae are associated with the *stoicheia* according to reason (*kata logon*), would indeed appear to be the point of the whole passage (see 330b6-7).

I propose, then, that we read the passage in the following way. At 330a30, Aristotle states that the number of the *stoicheia* is four. That there are four *stoicheia*, and that these are the simple bodies fire, air, water, and earth, has already been established in the *De Caelo* (III.4-5, with III.3, and IV.5). Moreover, at the very start of *De Gen. et Cor.* II Aristotle announces that the aim of the book is to consider the 'so-called *stoicheia* of bodies' (II.1, 328b31)—a phrase which, as we have seen (Ch. **1**), is shorthand for fire, air, water, and earth (cf. also 328b33-329a5, with 329a35; and II.3, 330b30-33). It is fairly clear, then, that Aristotle is proceeding on the hypothesis that the *stoicheia* are fire, air, water, and earth. So now, at 330a30, having just concluded that there are four differentiae (II.2, 330a29), Aristotle is reminding us that there are four *stoicheia.* Thus the number of the differentiae matches the number of the *stoicheia.* But, for his purposes, this happy correspondence is not enough: he intends to allocate the differentiae to the *stoicheia* in pairs. This is because he thinks that the *stoicheia* are by nature capable of changing into each other (II.4, 331a12-14, a20-1), which means they must be mutually active and passive; but they are so only because the contrary differentiae are distributed among them in the appropriate way, i.e., in pairings that render each *stoicheion* contrary to the others (see II.2, 329b20-6; II.4, 331a14-19). Hence there must be a match between the number of the *stoicheia* and the number of the possible pairs of differentiae. Now an immediate problem is that from four differentiae one gets six pairs. But this problem is easily resolved, as mutual contraries cannot form pairings: an element can't be hot *and* cold; it can't be dry *and* wet. So we are left with four possible pairings of contraries, and this matches the number of *stoicheia.* On this reading, the conjunction *epei* at 330a30 does not build upon the conclusion of the immediately

preceding sentence, but refers rather to the familiar point that the *stoicheia* are four—fire, air, water, and earth. What this entails is that the expression *epei de* introduces a contrast[16] between the number of *stoicheia* (four) and the number of pairings of differentiae (which, at first count, was six). A paraphrase of 330a30-a33 would run as follows: '(1') There are (as we know) four *stoicheia*, (2') but the four differentiae form *six* pairings; (3') mutual contraries, however, cannot form valid pairs.'

This resolves the first instance of the term *stoicheia* at a30. The second instance at a33 is more problematic. For whereas we might expect Aristotle to conclude that the pairings of the differentiae are four, this is not at all what he says. The passage continues: ' … (4) it is clear that the pairings of the *stoicheia* will be four: hot and dry, and hot and wet, and also cold and wet, and cold and dry' (330a33-b1). Here, admittedly, it does appear that Aristotle is using the term *stoicheia* to refer to hot, cold, dry and wet. Nevertheless it is well to pause before rushing to the conclusion that the differentiae are now called *stoicheia*. Consider again the reason why Aristotle wants to allocate the differentiae to the *stoicheia* in pairs. That the *stoicheia* change into each other is an accepted fact (II.2, 329b20-6, II.4, 331a7, a12-14); to explain it, the *stoicheia* must by nature be capable both of affecting, and of being affected by, each other. In other words, each *stoicheion* must have a pair of differentiae, one of which is active, i.e., either hot or cold, and the other passive, i.e., either dry or wet (cf. *Meteor.* IV.1, 378b12-26). The crucial point here is that these are the differentiae that are said of (*legetai*, 329b26) the *stoicheia*: possessing these differentiae renders the *stoicheia* mutually active and passive (see II.4, 331a14-16). Now, as we have seen, the four differentiae form six pairs. But at 330a33-b1 Aristotle says that it is clear (*phaneron*) that 'the pairings of the *stoicheia*' (*hai tôn stoicheiôn suzeuxeis*) will be four. He explains that two of the six pairs must be ruled out, because, as he puts it, 'it is impossible for one and the same thing (*to auto kai palin*) to be hot and cold, or wet and dry', (330a31-33). That is to say, it is impossible

[16] The conjunction *epei* could be rendered as 'although', instead of 'since'; cf. *Phys.* IV.2, 217a10 for a possible precedent. As it happens, some MSS have the variant reading *epeidê de*, i.e., 'whereas', or 'although', instead of *epei de* (Laurentianus 87.7, Vaticanus 1027, and Vaticanus 253). See LSJ s.v. *epei*.

for the both hot and cold to be said of, or predicated as the differentiae of, any one of the *stoicheia*. To put it another way, a pairing of two active, or two passive, differentiae cannot belong to a *stoicheion*. But the pairings that match an active with a passive differentiae *are* said of the *stoicheia*; these are the pairings of differentiae that do belong to the *stoicheia*. What I think we can draw from this is that by 'the pairings' (*hai suzeuxeis*) Aristotle means 'the pairings of the differentiae'. These pairings are 'of the *stoicheia*' not in the sense that the members of each pair are *stoicheia*, but in the sense that these pairings are said of, or *belong* to, the *stoicheia*. Hence what Aristotle is saying is that the pairings of the differentiae that belong to the *stoicheia* will be four, and in confirmation of this point, he then lists the four pairs of differentiae. The pairings of the *stoicheia*, then, are the pairings *of the differentiae* of the *stoicheia* (*hai diaphôrai tôn stoicheiôn*; cf. I.1, 314b18).

One might legitimately ask why Aristotle doesn't say this clearly and unambiguously, instead of using the potentially (and indeed actually) misleading expression 'pairings of the *stoicheia*'. To this question there can be no definitive answer. It is certainly notable that Aristotle uses the term *diaphorai* once only in the passage under examination (330b6), preferring to refer to hot, cold, dry and wet as 'the four', or 'the contraries' (330a31). But, given what he has said about the necessity of the *stoicheia* being both active and passive, perhaps Aristotle would presume it ought to be obvious that it is not the *stoicheia* themselves, but the differentiae of the *stoicheia*, that are paired. The fact is that, in the wider context of *De Gen. et Cor.* II, Aristotle shows no interest in pursuing the innovation in the reference of *stoicheion* that so many commentators insist on foisting upon him. Before and after 330a30-b7, hot, cold, dry and wet assume their duties as the differentiae of the *stoicheia* (see also II.2, 329a15-26; II.4, 331a14-16), and from this role we ought to have a more compelling reason to grant them release than the mere instance of the phrase *hai tôn stoicheiôn suzeuxeis* at 330a33. Indeed, at *De Gen. et Cor.* II.5, we find something approaching a confirmation of the interpretation I have offered. Aristotle says there that the *stoicheia* must be four in number, 'because this is the number of the pairings; for although there are six, two are impossible', (332b3, with 332a10-12). This inference

illustrates clearly that there must be a distinction between the elements and the members of each pair. Looking beyond the *De Gen. et Cor.*, it is again clear that hot and cold, dry and wet are conceived of as differentiae, rather than as *stoicheia.* At *De Anima* II.11, for instance, Aristotle explains that the 'differentiae of body qua body (*hai diaphoras tou sômatos hêi sôma*) are those which define the *stoicheia*, i.e., hot cold, dry wet, about which we have spoken before in our discussion of the elements', (423b27-9). Since he refers back to the discussion of the elements (*peri stoicheiôn*), by which he almost certainly means *De Gen. et Cor.* II (especially II.2 and II.3), Aristotle evidently believes he has established in the latter text that hot, cold, dry, and wet are differentiae that define, or belong to the definition of—that is, are *said of*—the elements.[17]

So, to continue our paraphrase: '(4') it is clear that the pairings (of the differentiae) of the *stoicheia* will be four'. The number of *stoicheia* and the number of pairings of the differentiae now match up; it remains to assign each pair to its appropriate *stoicheion.* In the next line (5), the guiding hypothesis that the *stoicheia* are the simple bodies fire, air, water, and earth is stated explicitly, and the pairings are duly allocated to each according to reason (*kata logon*, 330b2). Hot and dry are allocated to fire, hot and wet to air, cold and wet to water, cold and dry to earth. At 330b6-7 Aristotle again emphasises the reasonability of his conclusions. We may paraphrase as follows: '(6') the differentiae are distributed in a reasonable way (*eulogôs*) among the primary bodies (fire, air, water, and earth), and the number of them is in accordance with reason (*kata logon*)'. Thus the quandary with which *De Gen. et Cor.* II.3 begins, that is, that the *stoicheia* are four, while the differentiae make six pairs, is resolved: there are four possible pairs, and each pair corresponds to a *stoicheion* (cf. II.5, 332b2-5).

2.3 But we are not out of the woods just yet. For my interpretation of 330a30-b7 faces a major challenge. When Aristotle assigns the four pairings to fire, air, water, and earth, he describes the latter as *ta hapla phainomena sômata* (330b2). Now this is usually translated as 'the apparently

[17] Cf. *Meteor.* IV.1, 378b10f.

simple bodies', and the qualification 'apparently' here is taken by some commentators, Joachim, for instance, in contrast to 'really'.[18] In other words, fire, air, water, and earth *appear* to be the simple bodies, but they are not *really* simple at all. In support of this contention, they claim that the reference to the 'apparently simple bodies' is picked up and explained some twenty lines later, in a passage that rather strikingly begins with the assertion that fire, air, water, and earth are 'not simple, but mixed' (330b21f.).[19] I consider that assertion in its context below (s. **2.4**); first, let's examine the phrase *ta hapla phainomena sômata.*

Aristotle says that the pairings of the differentiae 'follow according to reason the apparently simple bodies (*êkolouthêke kata logon tois haplois phainomenois sômasi*) fire and air and water and earth' (330b1-3). What does he mean by 'apparently' here? Usually when Aristotle talks about *phainomena*, he is referring to the 'observed facts', or the empirical data by which a physical theory must be judged (cf. *Pr. An.* I.30, 46a17-22; *GC* I.1, 315a4, I.8, 325a26; *DC* III.7, 306a5-7, 16-17, IV.2, 309a25). But the term can have a broader reference. In his essay, '*Tithenai ta phainomena*', Owen[20] points out that among the *phainomena* Aristotle tends often to include the *endoxa*, the received or reputable opinions about a subject (see, e.g., *EN* VII.2, 1146b27-8). The *endoxa* are the opinions, beliefs, or judgements that are commonly accepted by everyone, or by the majority, or by the wise, or at least the most notable of the wise (*Top.* I.1, 100b21f.). The *phainomena*, then, meaning both the evidence of the senses and the things that are believed and said, either commonly or by the wise, are to be consulted as the 'witnesses and paradigms' of philosophical investigation (*EE* I.6, 1216b26). Aristotle is certainly aware, however, of the difference in quality between *endoxa* and observed or perceptual evidence, and there are times when he makes it explicit that his interest is in the latter (*ta phainomena kata tên aisthêsin*, *DC* III.4, 303a23). It is quite clear that this kind of evidence is authoritative in physical or scientific

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[18] Joachim (1922), 213 and 217, see also Sokolowski (1970), 270-1, esp. n. 15; cf. Gannagé (2005), 43f. esp. n. 173.
[19] Joachim (1922), 212-3, 217; see also Williams (1982), 160, Sokolowski (1970), 271, n. 15, D. Frede (2004), 304, n. 37.
[20] (1961).

matters (III.7, 306a13-17; *Phys.* VIII.3, 254a35-b1).[21] As he puts it in the *De Generatione Animalium*, observations must be trusted over theories: theories are reliable only insofar as they agree with the *phainomena* (III.10, 760b28-33; cf. *Meteor.* II.4, 360a33-4).

Hence an appeal to the *phainomena* in physical or scientific matters is an appeal to what is observed to be the case (*DC* II.13, 294b4; IV.5, 312b30). The *De Gen. et Cor.* is a treatise concerned with physical or scientific matters, therefore we might expect the meaning of the phrase *ta hapla phainomena sômata* to reflect this. The 'apparently simple bodies', then, are the observed, or observable, simple bodies. But we should nevertheless bear in mind that when Aristotle says that a hypothesis must cohere with the *phainomena*, while he certainly means that it must agree with (and explain) the facts as established by observation, he will also want to see whether it agrees with the *endoxa* (cf. *Phys.* IV.4, 211a7-11; *DC* I.3, 270b4). So we might say that the point of *De Gen. et Cor.* II.3 is to fit the findings of *De Gen. et Cor.* II.2 regarding the differentiae, i.e., that the differentiae are four, to the *phainomena* regarding the *stoicheia*; and, according to the *phainomena*, i.e., both the evidence of the senses and received opinion, the *stoicheia* or simple bodies are fire, air, water, and earth (see Ch. **1**, s. **5**).

But received opinion can be wrong; couldn't also the evidence of the senses be mistaken? 'Earth, Air, Fire, and Water appear to perception to be 'simple' bodies', Joachim writes, 'but they are not really so, as reflection will show'.[22] For Joachim, Aristotle's use of the phrase *ta hapla phainomena sômata* implies a distinction between what *seems* to be on the evidence of perception, and what, on the evidence of *reasoning*, is really the case. In other words, the evidence of the senses is misleading; there are bodies simpler than fire, air, water, and earth that we can discover using our reason.[23] Now Aristotle certainly doesn't think that what appears to be the case is always an infallible guide to what is really the case.[24] He does on occasion use the

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[21] See Bolton (1987), 125-129. Cf. Nussbaum (1982), with Wians (1992).
[22] (1922), 213.
[23] Joachim (1922) explains that fire, air, water, and earth 'logically presuppose' *prôtê hulê* or prime matter and the contraries as their constituents, 137. Thus the 'really-simple bodies' are prime matter informed by the appropriate pairings of the contraries hot, cold, dry and wet, 217.
[24] See, e.g., *Metaph.* IV.5-6; cf. *DA* I.2, 404a29, III.3, 428b2-4.

term *phainomenos* to mark a distinction between appearance and reality, for instance, when he says that sophistry is not really intellectual excellence, but only *appears* to be (*hê sophistikê phainomenê monon sophia esti… ousa d'ou*, *Metaph.* IV.2, 1004b18-19, 26; see also *Metaphysics* XII.7, 1072a28, *De Gen. et Cor.* I.8, 325a21). But it is doubtful that he intends such a distinction when he refers to fire, air, water, and earth as *ta hapla phainomena sômata.* Consider, e.g., the passage in *Physics* III.5 where Aristotle argues against an infinite over and above the elements (204b22-35; see Ch. **1**, s. **4.1**). Some, he says, posit something beside the elements, an *apeiron* or infinite body out of which the elements come to be. But such a body is impossible. Since all things are dissolved into that out of which they come to be, anything apart from air, fire, earth and water would have to be here in the world—but there *appears* to be no such thing (*phainetai d'ouden*, 204b35; cf. *Metaph.* XI.10, 1066b34-1067a1). What is meant by *phainetai* here is: 'what appears to the senses', or 'what is *observed* to be the case'. Fire, air, water, and earth are the simple bodies that appear to the senses, hence these are the simple bodies. No other simple body appears to the senses, hence there is no other simple body, besides these four. Aristotle doesn't mean to suggest that it only *seems* that there is no such thing, with the implication that there may, in fact, be some such thing. The point is rather that another simple body besides fire, air, water, and earth would be observable, or perceptible: it would be *apparent.*

The *Physics* passage ought to guide our interpretation of *ta hapla phainomena sômata.* By describing them in this way, Aristotle means that these are the simple bodies that are apparent to the senses. Their generation, for instance, is apparent to the senses (*kata tên aisthêsin phainetai ginoma*, *GC* II.4, 331a8; cf. *DC* III.7, 306a3-6). But there is no distinction here between what appears to be on the evidence of the senses, and what is really the case. Reason will not discover other bodies, simpler than those that appear to the senses. For, as the *Physics* passage makes clear, there are no simple bodies apart from those that appear to the senses. In other words, there is no body, such as an intermediate, or something like Anaximander's *apeiron*, that is completely lacking in sensible or perceptible characteristics (see *GC* II.1, 329a8-13; also II.5,

332a20-27; cf. *Cat.* 8a1, *DA* III.12, 434b12, *DC* I.7, 275b5-11). Hence the 'apparently simple bodies', the simple bodies that appear to the senses, are the *only* simple bodies (cf. II.5, 332a2).

Let's return to the original context where the phrase *ta hapla phainomena sômata* appears. Aristotle says that the pairings of the differentiae 'follow according to reason (*kata logon*) the apparently simple bodies fire and air and water and earth. For fire is hot and dry, air hot and wet… water cold and wet, and earth cold and dry; thus the differentiae are reasonably (*eulogos*) distributed among the primary bodies, and the number of these is according to reason (*kata logon*)' (330b1-5). Note how Aristotle emphasises that his conclusions are reasonable. His point, I take it, is this. He has deduced a set of four pairs of differentiae, hot and dry, wet and hot, cold and dry, and cold and wet. On the other hand, there are four apparent, i.e., observable or perceptible, simple bodies, fire, air, water, and earth. They are perceptible, which is to say that they have perceptible, specifically tangible (II.2, 329b5-13), characteristics (for discussion of the way in which the simple bodies are perceptible, see below, ss. **3.3** and **4.4**). The allocation of the differentiae to the simple bodies is thus deemed reasonable (*kata logon*) because it follows the perceptible characteristics associated with the simple bodies. It is reasonable, for instance, to allocate the pair 'hot and dry' to fire precisely because, on the evidence of the senses, fire is hot and dry (*to men gar pur thermon kai xêron*). Likewise the other differentiae are assigned to the remaining simple bodies according to how they appear: water is cold and wet, earth cold and dry. As for air, Aristotle acknowledges the need to explain his claim that it is hot and wet. Presumably some might think that air is not obviously hot and wet—it may appear cold rather than hot.[25] But Aristotle points out that what he means by 'air' is somewhat like vapour (*atmis*, 330b4), and this is hot and wet (*Meteor.* I.3, 340b25, 27; I.10, 347a24; but see note 44 below). Hence the allocation of the pair 'hot and wet' to air accords with reason.

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[25] For Plato's contemporary Philistion of Locri, air is cold (*Anonymus Londinensis*, xx, 25, in Wellman (1901), Fr. 4). Theophrastus (*De Igne*, 25 and 26) and the Stoics likewise took air to be cold (Diogenes Laertius VII, 137; cf. Cicero, *On the Nature of the Gods*, 2.26-7). Aristotle himself seems sometimes to say that air is cold; see, e.g., *Phys.* III.5, 204b27, with Ross (1936), 549, and *De Respiratione* 21, 480a28-b6.

Aristotle believes that his account of the number and distribution of the differentiae is reasonable, because it coheres with what is already known and established about the simple bodies, i.e., the theory coheres with the *phainomena* about the simple or primary bodies. It is reasonable to have four differentiae, which are then put into four pairings, because the number of the simple bodies is four; it is reasonable to allocate, for instance, hot and dry to fire, because fire is hot and dry. Now, as we have noted, Aristotle will often want to compare his findings to the *endoxa*, i.e., the reputable opinions, which typically include reference to previous theories, and indeed here he immediately embarks on a discussion of his predecessors (330b7f.). I say something about the significance of this discussion below (s. **2.4**). But, to finish off my interpretation of 330a30-b7, I just want to draw attention to the way Aristotle introduces that discussion: 'For all who make the simple bodies [their] *stoicheia*…' (*hapantes gar hoi ta hapla sômata stoicheia piountes*, 330b7). There can be no doubt that by *stoicheia* here Aristotle means fire, air, water, and earth. But there can be no doubt either that he wants to consider the views of all who say that (one or more of) fire, air, water, and earth are the *stoicheia* precisely because he too makes these simple bodies his *stoicheia*. Moreover, he presumably thinks that it is clear, from the immediately preceding passage, that he too makes the simple bodies his *stoicheia*. This point, together with the arguments I have offered above, must render untenable the claim that by *stoicheia* at 330a30 and a33 Aristotle means anything other than fire, air, water, and earth.

2.4 Now, as we noted earlier, some commentators think that Aristotle describes fire, air, water, and earth as 'apparently simple bodies' because in a later passage he says that fire, air, water, and earth are not really simple.[26] Here is that passage:

> Fire and air and each of the others that have been mentioned (*eirêmenôn*) are not simple, but mixed (*ouk haploun alla mikta*). The simples (*ta hapla*) are similar to these, yet not the same as them, for instance, the one like fire is fiery (*puroeides*), and the one like air airy (*aeroeides*); and likewise for the others. Fire is an excess of heat (*huperbolê thermotêtos*), just as ice is of cold; for freezing and boiling are types of excess, the one of cold, the other

[26] See note 19.

> of heat; so if ice is a freezing of wet and cold, thus also fire will be the boiling of dry and hot (and for this reason nothing comes to be from ice or from fire) (II.3, 330b21-30).[b]

It seems to me that the crucial interpretative decision here concerns the extension of the phrase '[of the things] that have been mentioned' (*tôn eirêmenôn*). Joachim and others must presume that it extends back to the start of the chapter, to the 'apparently simple bodies' fire, air, water, and earth. For they believe that the passage offers strong evidence that the 'apparently simple bodies' are really 'mixed', or composite, bodies, and consequently that there are other items that ought to be considered simpler, and as such truly elemental.[27] But there are reasons to doubt that Aristotle is thinking of the 'apparently simple bodies' when he refers to 'fire, air, and the others that have been mentioned'. An alternative reading of the passage, which I shall now defend, is that Aristotle is referring only to fire, air, water, and earth as 'mentioned', i.e., as conceived and posited, by his predecessors. Once we place the passage in the context of the chapter as a whole, it becomes clear that this is the most natural reading. In any case, the passage is worth investigating on its own merits, as it helps to clarify further the nature of Aristotle's *stoicheia.*

For purposes of reference it is helpful to divide *De Gen. et Cor.* II.3 into four parts of roughly equal length. The first part is that which we have discussed in detail above (ss. **2.2** and **2.3**). The second part consists of Aristotle's discussion of the views of those of his predecessors who make the simple bodies their *stoicheia* (330b7-21).[28] The third part is the one we are now endeavouring to interpret (330b21-30). Finally, in the fourth part Aristotle discusses further aspects of the simple bodies and their differentiae (330b30-331a6). Commentators generally agree that the second part is intended to support the argument of the first part, in particular the

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[27] There is here a clear echo of the impropriety explanation of the phrase *ta kaloumena stoicheia.* Indeed, for Joachim (1922), 213, and 217, Sokolowski (1970), 270-1, and Gannagé (2005), 43, esp. 173, *ta kaloumena stoicheia* and *ta hapla phainomena sômata* bear the same significance.

[28] Note that Aristotle is not referring to all of his predecessors, as Joachim (1922), 213, and Williams (1982), 161, seem to think. He is referring just to those who make one, some, or all of the simple bodies fire, air, water, and earth their *stoicheia.* This admittedly broad class nevertheless excludes such as Anaxagoras and the Atomists—a point that becomes relevant below (cf. Ch. **1**, s. **2.2**).

conclusion that it is rational to allocate the differentiae to the primary bodies in pairs.[29] In other words, it doesn't further the first part's argument, but, rather like a footnote, adds incidental evidence. For in the second part Aristotle is keen to show that his predecessors, whether they posited one, two, or more of fire, air, water, and earth as their *stoicheia*, were also obliged to make use of contrary principles (cf. *Phys.* I.5, 188b26-30). The details need not detain us: what is important is that it is at the end of this review that Aristotle says that 'fire and air and each of the others that have been mentioned are not simple, but mixed'.

Now, granted that Aristotle's review of his predecessors in part two is something of a footnote to part one, our question is this: is part three a return to the main text, as it were, or a continuation of the footnote? If it is the latter, then the statement at 330b21 takes on a whole new perspective. For it would mean that the reference to 'fire, air and the others that have been mentioned' is internal to this footnote, and the information that these bodies are 'mixed' would leave the 'apparently simple' bodies unaffected. Aristotle's point would be that, while some of his predecessors also name fire, air, water, and earth as the *stoicheia*, their fire, air, water, and earth are not really simple bodies. But what reasons are there to accept such an interpretation? There seem to be three good reasons. Firstly, taking the two middle parts as one long footnote already makes good sense simply from the point of view of the structure of the chapter. Secondly, there is evidence that Aristotle does indeed think that his predecessors posited as *stoicheia* bodies that are composite, or 'mixed', rather than simple. Thirdly, the 'apparently simple bodies' are correctly identified not with the 'mixed' bodies, but with the 'fiery' and 'airy' (and presumably 'watery' and 'earthy') 'simples' (*ta hapla*).

Regarding the structure of the chapter, the whole middle section, from 330b7-30, seems to be as self-contained as if it were in parentheses. Note, for instance, that the discussion in the fourth part doesn't depend or build upon what has been said in the second and third parts; it seems to presuppose only that of part one. Nothing would be amiss if we skipped parts two

[29] Joachim (1922), 213-214; Verdenius and Waszink (1966), 54; Williams (1982), 160f.

and three and read the fourth immediately after the first. Aristotle just carries on his discussion of the simple bodies, identifying their places in the sublunary world (as originally set out in the *De Caelo*), and briefly indicating how their contrary differentiae determine their nature and relationships with each other. The most remarkable thing about part four, however, is that Aristotle takes it for granted that the simple bodies are fire, air, water, and earth (330b30-33). It is as if he never said that these bodies are 'not simple, but mixed'.[30] But, of course, if he was referring to his predecessors' fire, air, water, and earth at 330b21, then he never did say that his own 'apparently simple' bodies are mixed.

Before arguing that Aristotle believes his predecessors' *stoicheia* are 'mixed', we need first to clarify what he intends by 'mixed' bodies. If something is 'mixed', then it is composed of other things; i.e., it has constituents, and if these are not also mixed, then they are simple (*DC* I.2, 268b26-a2; I.8, 276b30-a7). So when Aristotle says that 'fire, air and the others mentioned are not simple but mixed', he means that they can be analysed into further constituents, or *stoicheia*. But it is also clear that by these 'mixed' bodies Aristotle means the ordinary, everyday phenomena that we call 'fire', 'air', 'water', and 'earth'. It is clear, for instance, that 'mixed' fire is the fire that we are most familiar with, i.e., that which burns or is burning. In the passage quoted above, Aristotle describes 'mixed' fire as an 'excess of heat' (*huperbolê thermotêtos*, 330b25), and then, on noting that boiling (*zesis*) is a kind of excess, as 'a boiling of dry and hot' (b29). That this is a description of ordinary fire, or fire properly so-called, becomes apparent at *Meteor.* I.3.[31] For here Aristotle explains that the *stoicheion* that 'we commonly call fire', is not real fire, 'for fire is an excess of heat and a boiling' (340b22-3; cf. Ch. **1**, s. **4.5**). In other words, 'mixed' fire is ignited gas, the state of combustion, or flame, i.e., the proper referent of the term

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[30] Aristotle does say that water and air are 'mixed' (*memigmena*) at 330a34. But this is relative to fire and earth, which are the 'extremes and the purest' of the simple bodies because they are found at the boundaries of the sublunary world—earth at the centre, fire furthest away from the centre. Water and air are intermediate between these extremes, and are to an extent mixed up with each other. This point recalls the *De Caelo* doctrine of elements (see, e.g., I.8, 277b13-24, with IV.4), and looks forward to the *Meteorologica*'s account of air as a vaporous exhalation from water (I.3, 340b2-3, 23-9, II.4, 360a21-27; see Joachim (1922), 139). Note also that the word Aristotle uses at 330a34 is *memigmena*, which might be more appropriately said of liquids (LSJ s.v. *mignuma*), and not *mikta* as at 330b21.

[31] That this is so could perhaps be gleaned from the analogy between fire and ice at *GC* II.3, 330b25-30. But it is confirmed at *Meteor.* I.3.

'fire' in its ordinary usage. Indeed at *De Gen. et Cor.* II.4 flame (*phlox*) is said to be the best example of fire, and it is clear from the context that Aristotle means 'the best example of the *stoicheion* called 'fire'' (331b25); and both there and in the *Meteorologica* flame is described as a burning or a boiling of the hot and dry (331b25-6; *Meteor.* I.4, 341b21-22, IV.9, 388a2). Thus by 'mixed' fire Aristotle means the fire of our everyday experience—or, as Philoponus rather nicely put it, 'domestic' fire (*to diakonikon*).[32]

So the *stoicheion* that is commonly called 'fire' is something different from 'mixed' fire, i.e., that which burns. The same can be said about 'what we call air' (I.3, 340b23, 339b3) and its 'mixed' or 'domestic' counterpart,[33] and again for the others. We will say more about the *stoicheia* in a moment. For now it is important to see that Aristotle's point at *Meteor.* I.3 is that one must be careful not to confuse the *stoicheia* with the familiar phenomena with which they share their names. Presumably this is an error that people are liable to commit. I would suggest, indeed, that it is an error Aristotle believes his predecessors *did* commit. Consider, for instance, Empedocles' tendency to describe the 'roots' or the elements in terms of their everyday manifestations. Kahn explains that, for Empedocles, the element fire is the sun, but it is also the fire in the hearth, or in the blacksmith's forge; the element water is the sea, but also that which is in wells and rivers.[34] In other words, Empedocles makes fire, air, water, and earth his *stoicheia*, but he characterises them it is as if they were 'mixed', rather than simple, bodies.

This may not seem an altogether fair assessment of Empedocles' doctrine.[35] But it does seem to be how Aristotle understood the matter, and, moreover, he is not alone. Plato in the *Timaeus* argues that fire, air, water, and earth are not the true *stoicheia*, but can be analysed into further constituents which account for their generation and corruption (48b-c, 53af.). Although

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[32] Philoponus *In de gen et corr* 228,28; Gannagé (2005), 46, claims that Alexander of Aphrodisias also used this term.
[33] If the *stoicheion* that is called 'air' is not really air, what is that which is properly called 'air', i.e., 'mixed' air? Aristotle doesn't say explicitly, but it is presumably something like cloud, mist, fog, or a damp unhealthy air, such as described in the Hippocratic treatise *Airs Waters Places*; see, e.g., 6.7, 15.24-5. Cf. *Meteor.* I.10, 346b3235; and also note 25 above.
[34] (1960), 124-5.
[35] At DK 31B21.1-6 Empedocles does characterise the roots in terms of everyday examples, such as the sun and rain, but, as Curd (1998) points out, 'it needs to be borne in mind that these "witnesses" are phenomenal earth, air, fire and water, which are partially mixed versions of the pure roots', 158. Nevertheless, for Simplicius (*in Phys.* 33.8-11, 159.13-18), Empedocles' characterisation of the roots does not get any more specific than at B21.1-6.

Aristotle rejects Plato's analysis of these bodies,[36] he does agree that fire, air, water, and earth—as conceived by his predecessors and in particular Empedocles—must be further analysable. Thus at *De Gen. et Cor.* I.8, in a passage where Empedocles' theory is being compared with that of the Atomists, Aristotle says that Empedocles cannot explain the generation and corruption of the elements, unless he is prepared to admit that fire and the others have their own *stoicheia*, 'as Plato writes in the *Timaeus*' (325b19-25). Now one might object that Empedocles doesn't need to admit any such thing, since he believes the 'roots' are eternal and immutable. For Aristotle, however, elemental change is a fact of perception (II.4, 331a8-10; cf. s. **4.3** below). Hence he seems to think that Empedocles ought to have explained this phenomenon, and, indeed, that in failing to do so he contradicted himself (cf. I.1, 315a3f.).[37] So to save the phenomena, and to save Empedocles from self-contradiction, the 'roots' must be conceived as 'mixed', i.e., composite, bodies, analysable into simpler constituents.

Clearly, then, Aristotle is not convinced that Empedocles' 'roots' should be regarded as truly simple bodies. That this is his view is further borne out by the terms of the comparison that he makes between Empedocles and the Atomists. The crucial point of difference between the two parties seems to be their respective conceptions of the *stoicheia.* Whereas Empedocles' explanation of generation and corruption is deemed incomplete because of an alleged confusion in his conception of the *stoicheia*, the Atomists posit 'primary bodies' (*ta prôta tôn sômatôn*) that are described as 'indivisible' (*adiaireta*), and the first constituents out of which things are composed and into which they are dissolved (325b17-19). In other words, their primary bodies, unlike Empedocles', are genuinely elemental. Now although Empedocles is singled out for criticism here, there are evidently others who face similar difficulties. At 325b13, Aristotle praises the Atomic theory for being clear and consistent to its principles, 'but', he continues, 'things are less so with others, for instance, Empedocles' (*tois d'allois hepton, hoion Empedoklei*, 325b15-16; cf. 325b1). Who are these 'others'? Since they are contrasted to the

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[36] See *DC* III.1, 7, and IV.2; see also *GC* I.1, 315b30, and II.1, 329a21-24.
[37] See Burnet (1892), 230, n. 3, and Joachim (1922), 163-164.

Atomists, it is reasonable to presume that Aristotle is thinking of those who posit one or more of fire, air, water, and earth as their elements. He is referring, in effect, to 'all those who make the simple bodies their *stoicheia*', i.e., the same group of thinkers that he discusses at *De Gen. et Cor.* II.3 (see 330b8).[38] Now if Empedocles is taken as representative of this group, then the criticism of his elements (i.e., that they are further analysable) will presumably apply generally to the group.[39] This means that, at *De Gen. et Cor.* II.3, when Aristotle says that 'fire and air and the others that have been mentioned are not simple but mixed' (330b21), he has in mind the bodies 'mentioned', or posited as the *stoicheia* of things, by some of his predecessors, chief among them Empedocles.[40]

But does it follow conclusively that the bodies described as 'not simple, but mixed' at 330b21 do not include also the fire, air, water, and earth described as 'apparently simple bodies' at 330b2? To clinch this point, we need to show that Aristotle is operating at *De Gen. et Cor.* II.3 with two sets of bodies that are called 'fire, air, water, and earth', one set being simple, the other mixed. To put it another way, it remains to show that the 'apparently simple bodies' are identical to the 'simples'. Happily this is a reasonably straightforward task. For if we simply pay attention to Aristotle's descriptions of them, it very quickly becomes clear that the 'apparently simple' bodies and the 'mixed' bodies are not the same things; and, as noted earlier, if something is not mixed, then it is simple. Let's compare, then, the descriptions of fire as an 'apparently simple' and as a 'mixed' body. At 330b3 Aristotle says that fire (*pur*), by which he means the 'apparently simple body', is hot and dry. These are the differentiae of fire. At 330b23, however, fire (*pur*) is said to be mixed, and Aristotle distinguishes it from the simple body he calls 'fiery' (*puroeides*). This 'mixed' fire, as we have seen, is an 'excess of heat' and 'a boiling of dry and hot' (330b25, b29). But this means that 'mixed' fire is a boiling of the

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[38] See note 28.

[39] Similarly Plato's critique of fire, air, water, and earth at *Timaeus* 48b-c is aimed not exclusively at Empedocles, but at a number of Presocratic doctrines; compare, for instance, 49b-d with Anaximenes, DK 13A5 and A7.

[40] Aristotle includes Plato in this group, referring to a work called 'Plato's *Divisions*' (330b16). This is surprising given what Plato says about fire, air, water, and earth in the *Timaeus*. It may well be one of the unwritten doctrines, sporting a theory quite at odds to that of the *Timaeus*; but see Joachim (1922), 215f.

differentiae of 'apparently simple' fire—or at least an excess of the latter's most distinctive differentia (see 331a5). Consequently the fire that is 'not simple but mixed' is not the same thing as 'apparently simple' fire. They are certainly similar, insofar as the former is an excessive or extreme form of the latter; but plainly they are not *identical.* Presumably the same goes for 'apparently simple' and 'mixed' air, and the others. Hence the 'fire, air, and the others' that are 'mixed' are clearly not the same as the fire, air, water, and earth identified as 'apparently simple bodies'.

Naturally this invites the inference that the 'apparently simple bodies' are really what Aristotle calls 'the simples' (*ta hapla*). Indeed, insofar as 'apparently simple' fire and 'mixed' fire are somewhat similar, but not identical, the latter being an excess of the former, their relationship matches that between the 'simple' *puroeides* and 'mixed' fire. Aristotle explains that the 'simples' are similar in nature or character (*toioutos*) to, but not the same as, the 'mixed' bodies (330b23-25). Moreover, he describes the 'mixed' bodies as excesses or extremes, and, given the context, he undoubtedly means that they are excessive forms of the 'simples'. Everything thus seems to point towards the conclusion that the 'apparently simple bodies' are the 'simples'. The only slight question mark is raised by Aristotle's decision to call the latter *puroeides* and *aeroeides*, i.e., 'fiery' and 'airy', rather than 'fire' and 'air'; and presumably 'watery' and 'earthy' rather than 'water' and 'earth' (*homoios de kapi tôn allôn*, 330b25). Since the 'apparently simple bodies' were identified without qualification as 'fire', 'air', 'water', and 'earth', this change in terminology might just tempt one to wonder whether *ta hapla phainomena sômata* and *ta hapla* really are the same things, or whether the latter are items different to, perhaps even simpler than, the former.[41]

But it is well to remember that when Aristotle distinguishes *puroeides* and *aeroeides* from *pur* and *aêr*, what he means by the latter are the 'mixed' bodies fire and air, rather than the 'apparently simple bodies' of the same names; that is, he is contrasting the 'simples' with their

[41] Joachim (1922) understands the 'fiery' body to be 'a really-simple body… a pure example of *prôtê hulê* informed by… hot-dry', 217.

'mixed' counterparts. Moreover, it is important to realise that *puroeides* and *aeroeides* are not being introduced as technical terms. Aristotle doesn't use either term again,[42] and, having made his distinction between simples and mixed bodies, he reverts immediately to calling the simple bodies 'fire', 'air', 'water', and 'earth' (330b30-33). Now this seems to suggest that the simple body that is like fire is usually called 'fire', and that like air 'air'—and therein lies the problem that inspires 330b21-30. It is, indeed, essentially the same problem that Aristotle confronts at *Meteor.* I.3.[43] The problem is that, since each simple body shares its name with a 'mixed' body, there is a very real possibility that the 'simple' bodies will be confused with their 'mixed' homonyms. What is required, then, is the odd reminder that the 'mixed' body is not the same as the 'simple body'. By way of giving such a reminder in the *De Gen. et Cor.*, Aristotle describes the simple bodies as *puroeides* and *aeroeides*, 'fiery' and 'airy', and then distinguishes them from 'mixed' or ordinary fire and air; while in the *Meteorologica*, he qualifies his ascription of the name 'fire' to the outermost *stoicheion* of the sublunary world by referring to it as 'what we commonly (or habitually) call fire (*ho dia sunêtheian kaloumen pur*, 340b22; cf. I.4, 341b19)', and immediately denies that it is fire, in the sense of something that burns.

Now if this reading is correct, then the 'simples' can be identified with the *stoicheia* of the *Meteorologica.* Both the *stoicheion* that we commonly call 'fire' and the *puroeides* are said to be 'like fire' (*Meteor.* I.3, 340b32, *GC* II.3, 330b23). Moreover, Aristotle suggests we think of the *stoicheion* that we commonly call 'fire' as a highly inflammable fuel (*hupekkauma*), which, although it is not actually something that burns, can, and does, ignite easily—in other words, it is potentially flame, i.e., 'mixed' fire (*Meteor*, I.4, 341b18-22; cf. I.3, 340b29). Hence ordinary or 'mixed' fire is an excess of the *stoicheion* (I.3, 340b22-3), as it is of the 'simple' *puroeides.* But it is also clear that the *stoicheion* that we commonly call 'fire' is no less than the 'apparently simple' body fire. Both are hot and dry—these are their outstanding characteristics or differentiae

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[42] Both are quite rare; Plato uses the former at *Laws* 895c, and the latter at *Timaeus* 78c, but neither instance is of much relevance. We find occasional uses in Homer, e.g. *êeroeidês pontos*, 'misty deep' (sea), *Il.* 23.744.
[43] Cf. Solmsen (1960), 397.

(*Meteor.* I.3, 340b26, I.4, 341b14, I.7, 344a9; cf. I.3, 340b14-17); and 'mixed' fire is an excess of 'apparently simple' fire, as it is of the *stoicheion* called 'fire'. That the 'apparently simple bodies' and the *stoicheia* of the *Meteorologica* are identical is made most explicit, however, in the case of 'air'. Showing a reticence towards using the term 'air' (*aêr*) for the *stoicheion* similar to that displayed when dealing with 'fire', Aristotle explains that 'what we call air' (I.3, 340b24, 339b3) is hot and wet, because it consists of *atmis*, i.e., the vapour that rises from the water on the surface of the earth when heated by the sun (340b25, 27, with I.4, 341b6-10, I.10, 347a24, II.4,359b28-30, 34f.).[44] But recall that at *De Gen. et Cor.* II.3, Aristotle describes the 'apparently simple' body air as hot and wet, and justifies this by saying: 'for air is a sort of *atmis*' (*hoion atmis gar ho aêr*, 330b4). The identification of the 'apparently simple' body with the *stoicheion* as it is understood in the *Meteorologica* could hardly be more pronounced. It is but a short step to describe the *stoicheion* that is called 'air' as *aeroeides*, i.e., the 'airy' simple body.

Clearly, then, the *puroeides* and the 'apparently simple' fire are two ways of referring to the *stoicheion* that we call 'fire', and the same can be said of *aeroeides* and the 'apparently simple' air in relation to the *stoicheion* that is called 'air'. What we can conclude from this, I think, is that *puroeides* and *aeroeides* are somewhat ad hoc descriptions of the simple bodies that are commonly called 'fire' and 'air', and that Aristotle introduces these descriptions in order to try to emphasise that the simple bodies that are called 'fire' and 'air' (and 'water' and 'earth' i.e., the 'apparently simple bodies') are not the same as their 'mixed' or ordinary counterparts. The simple body that causes the things it constitutes to move upwards, and that which burns in the hearth, cooking our food and keeping us warm, are both called 'fire', but, although similar, they are not the same things. Whereas the former is one of the *stoicheia* from which things come to be, nothing comes to be from the latter (II.3, 330b29-30). The simple but important point that Aristotle is making at *De Gen. et Cor.* 330b21-30, and again at *Meteor.* I.3, is that one must be

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[44] It is often unclear whether *atmis* is by nature hot and wet, or cold and wet. Most of the MSS say 'hot' at 340b27; but some commentators believe this should be emended to 'cold' to make it consistent with II.4, 360a22-3 and II.8, 367a34; see, e.g., Ross (1923), 109, n. 4. I side with Freudenthal (1995), 129, n. 51, however, who rejects the emendation; cf. Hankinson (1995), 153, n. 12. What is not in doubt is that the sphere of air, where the *atmis* ultimately gathers, is hot; see, e.g., 360a26-7, cf. also III.3, 372b30-33, IV.9, 387a24-26. Cf. n. 25 above.

careful not to confuse the simple bodies or *stoicheia* with the familiar phenomena with which they share their names.

2.5 So, to sum up, the fire, air, water, and earth described at 330b2 as the 'apparently simple bodies' are the truly simple bodies. The bodies that are described as 'not simple, but mixed' (330b21), on the other hand, can be identified as the items that have been 'mentioned', or posited as the *stoicheia*, by Aristotle's predecessors. These 'mixed' bodies are the familiar, or 'domestic', phenomena of our everyday experience, while the 'simples' (*ta hapla*), such as the 'fiery' and 'airy' bodies, are the 'apparently simple bodies' that are commonly called 'fire' and 'air' respectively.

My reading of *De Gen. et Cor.* II.3 naturally raises some issues. One, for instance, concerns the perceptibility of the *stoicheia*. In my interpretation of the phrase *ta hapla phainomena sômata*, I emphasise that fire, air, water, and earth are the bodies that appear to the senses (s. **2.3**). But there is a question as to whether or not the *stoicheia* are actually perceptible. Some commentators argue that Aristotle's *stoicheia* are so pure as to be *imperceptible*, and the only fire, air, water, and earth that we can experience are mixtures or composites. The genuine *stoicheia* are thus rather like ideal forms of the phenomenal fire, air, water, and earth that we perceive.[45] This strikes me as rather too Platonic a reading of Aristotle,[46] coupled with a failure fully to appreciate what Aristotle means by an element. For it should be obvious that one doesn't perceive the element in itself; what one perceives, rather, is the composite body of which the element is an 'element', i.e. a constituent. Since this issue raises the question of the nature and status of the contraries in relation to the elements, I return to it below (ss. **3.3**, **4.4;** see also Ch. **3**, s. **3.3**).

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[45] See King (1956), 378-9, Sokolowski (1970), 272-3, Lewis (1996), 40, Gannagé (2005), 43f.

[46] Cf. Plato's distinction between phenomenal or perceptible fire and the pure, imperceptible, intelligible form of fire, at *Timaeus*, 51a-d; cf. also *Philebus* 29b-c.

A second issue raised by the foregoing discussion concerns the significance of the phrase *ta kaloumena stoicheia.* In the previous chapter I rejected the 'impropriety explanation', according to which this phrase provides evidence that Aristotle promotes or intends to promote items other than fire, air, water, and earth to the rank of genuine elements. But, following the above discussion, it seems now that there *is* a sense in which it is correct to say that fire, air, water, and earth are not the genuine *stoicheia.* For if people, when they speak of the elements, mean the everyday phenomena that are properly called 'fire', 'air', 'water', and 'earth', then they are mistaken, because these bodies are not simple but composite. I have argued that Aristotle thinks that some of his predecessors made this mistake. Now does this mean that there is, after all, a kernel of truth in the impropriety explanation? For it might be suggested that, since the phrase *ta kaloumena stoicheia* means what people commonly call 'elements', and what people commonly call 'elements' are, in Aristotle's opinion, 'mixed' fire, air, water, and earth, then Aristotle does seem to be using *ta kaloumena stoicheia* to refer to items that are not really elemental.

I think the suggestion should be resisted. For one thing, it is not the case that Aristotle deliberately reserves the phrase the 'so-called elements' for 'mixed' fire, air, water, and earth. On a number of occasions it is fairly clear that he has in mind the genuine *stoicheia*, i.e., the simplest constituents of bodies, when he uses the phrase *ta kaloumena* (or *legomena*) *stoicheia* (see *GC* II.1, 329a27, *Meteor.* I.3, 339b3, *PA* II.1, 646a13). Furthermore, there is a question as to whether the distinction at *De Gen. et Cor.* II.3 and *Meteor.* I.3, between 'mixed' and 'simple' fire, air, water, and earth, indicates a change in Aristotle's understanding of the elements, or an attempt to be more precise about their nature.[47] If the latter, then the *endoxon*, or received opinion, that the elements are, without qualification, fire, air, water, and earth, is really an unscientific approximation to the truth. Even so, it is evidently an approximation that Aristotle is often willing to accept (*GC* II.1, 328b31f., cf. 329a5-8; *Phys.* I.5, 187a26, III.5, 204b33). If the

[47] See Lee (1952), 21, note c.

former, then it is a question of determining which instances of the phrase 'so-called elements' are chronologically prior and posterior to this change. But, apart from when he explicitly distinguishes them, it is very difficult to tell when Aristotle is referring to simple or 'mixed' fire, air, water, and earth. For while the genuine *stoicheia* may be described as 'fiery' and 'airy', and so on, or in terms of their differentiae (e.g., the 'hot and dry element', the 'cold and wet element'), nevertheless these simple bodies still go by the names 'fire', 'air', 'water', and 'earth'. Indeed, this seems to be how we must refer to them, because, as Aristotle himself points out, with reference to the *stoicheion* called 'fire', there are no names available that are more suitable. At *Meteor.* I.4, he explains: 'first below the circular motion is the hot and dry (*to thermon kai xeron*), which we call 'fire', for there is no name (*anônumon*) common to the whole of the smoky exhalation; thus, since this is the most inflammable of bodies, it is necessary to use these names' (341b13-18; cf. II.4, 359b30-2).

It is doubtful, then, that there is some subtle unifying stratagem behind Aristotle's use of the phrase *ta kaloumena stoicheia*. It is best to say that it is used to refer uniquely to fire, air, water, and earth, the elements of bodies according to common opinion (see Ch. **1**, s. **5.3**). But, since it remains true to say that, for Aristotle, the *stoicheia* are *called* fire, air, water, and earth, and since he sometimes refers to these bodies as *ta kaloumena stoicheia*, then it does seem acceptable to claim that, at least on some occasions, the significance of this phrase is the more positive: 'what *we* call 'elements''. In other words, Aristotle endorses the common opinion that the *stoicheia* are fire, air, water, and earth, albeit with the (usually unstated) qualification that these bodies are not the same as the everyday phenomena with which they share—or, better, *from which they borrow*—their names.

Our examination of *De Gen. et Cor.* II.3 shows that the textual support for the view that Aristotle identifies the contraries hot and cold, dry and wet as *stoicheia* is far less persuasive than the prevalence of this opinion in the secondary literature would suggest. On the contrary, what comes across from the foregoing examination is Aristotle's clear commitment to the view that fire, air, water, and earth, properly understood, are the *stoicheia* of bodies. In other words, fire,

air, water, and earth are not further analysable. So, whatever the relationship of the contraries to fire, air, water, and earth, the introduction of the former does not entail the relegation of the latter from the status of elements. But how then are we to understand this relationship? If the contraries are not the constituents of fire, air, water, and earth, then what are they? As we have seen, Aristotle refers to hot and cold, dry and wet as *diaphorai*, 'differentiae', and, in particular, as the differentiae of the elements (see, e.g., II.2-3, 330a24-b6, with s. **2.2** above). It is time that we discovered precisely what this means.

The Differentiae of the Elements

3.1 Aristotle considers differentiae to be 'qualities' (see *Top.* VI.6, 144a20-22). So hot, cold, dry, and wet might be called 'qualities of the elements'; indeed, some commentators refer to them as the 'elementary qualities'.[48] But there are, generally speaking, two fundamentally different kinds of qualities, and it is important that we observe the difference between the two. There are, on the one hand, essential qualities, that tell us what this substance is; and, on the other, accidental qualities, that tell us how this substance happens to be. Differentiae are essential qualities, while affections, or *pathê*, are accidental (*GC* I.4, 320a1). For instance, this particular man is pale, but it is not essential to being a man that he is pale. What is essential to being a man, i.e., what differentiates man from other substances, would be something like rationality. It just happens that *this* man is pale: being 'pale', therefore, belongs accidentally (*kata sumbebêkos*) to the man.

In most cases, it is unlikely that one will get very confused about whether a quality is a differentia, and as such essential, or an affection, and accidental. For whereas a differentia of a substance tends to indicate the kind of activities (*energiai*) that are peculiar to that kind of substance, e.g., whether it walks or flies, or is capable of rational thought; an affection is by

[48] Joachim (1922) regularly refers to hot and cold, dry and wet as 'elementary qualities' in his commentary; see his explanation for this choice, 200-1; see also Forster's Loeb translation (1955), and Williams (1982), esp. 158ff, and 160. Cf. Solmsen (1958), 243, 250, 252.

definition a perceptible quality, i.e., something that affects the senses. But, as we shall see, the status of the differentiae of the elements is rather unusual.

3.2 Aristotle's most important discussions of quality (*poion*, *poiotes*) are at *Categories* 8 and *Metaphysics* V.14. A notable difference in his treatment of quality in these texts is that, in the latter, a differentia is considered as a quality, indeed, as the most important kind of quality (1020b13-15; 1020a33f), whereas in the former, differentiae are excluded from the category of quality. In the *Categories* account, Aristotle identifies four kinds of quality: conditions (*diatheseis*) or habits, natural abilities, affections (*pathê*), and forms or shapes (*Cat.* 8). Particular instances of such kinds are said to be 'in' a subject (*en hupokeimenôi men esti*), and not 'said of' (*legetai*, *katêgorêthêsetai*) any subject. By 'in a subject', Aristotle means the following: A is 'in' B if A is not a part of B, and A is not separable from B (1a24f.). Aristotle's examples of what is 'in a subject' reveal rather more than this curt account: qualities such as white, or knowledge of grammar, are said to be 'in' subjects. He adds that only the name of any such item that is 'in' a subject in this way is predicated of the subject; the definition of the item is not also predicated. For instance, pale may be predicated of Socrates, but the definition of pale cannot truly be predicated of Socrates: he may be pale, but what it is to be Socrates, and what it is to be pale, are very different things. By contrast, when items are 'said of' subjects, the name and the definition are predicable (2a19-34). Secondary substances, i.e., genera and species, are 'said of' subjects, but so also are the differentiae (3a21f). When defining, Aristotle explains, one must give the genus and add the differentiae (*Top.* VI.1, 139a28; cf. I.4, 101b17). So, for instance, of Socrates we may predicate the secondary substances animal and man, and the definitions of animal and of man; but the differentia of man, e.g., rational (Aristotle's own example is 'two-footed'), is also predicable, both in name and definition (2a19-26). Man is of the genus 'animal', and if the feature that distinguishes, or *differentiates*, man from the other members of the genus is that he is rational, then 'rational animal' uniquely defines man. Being rational, in other words, is literally one of the 'differences' that mark man out from other animals. 'Rational', then, will be in the

definition of man; but it is not 'in' man. Thus the differentia is said of a subject, but is not in any subject. Consequently differentiae are treated not under the category of quality, but under the category of substance.

Now if it were the case that qualities must inhere in their subjects, then it would follow that the differentiae of substance are not qualities.[49] But Aristotle thinks that secondary substances, and hence also differentiae, signify a certain kind of quality (*poion ti*, 3a16; cf. *Top.* VI.6, 144a20-22). He is quick, however, to distinguish this kind of quality from the kinds of qualities that are found under the category of quality, e.g., 'white'. Whereas 'white' signifies a quality and nothing but, the differentia signifies a quality of substance: it signifies what kind of substance something is (3b18f). The point is that, were we to ask 'what are the differentiae of this thing?', we would not get—nor want—an answer from the category of quality.[50] Rather, what we would want is a substance under a certain description—'rational', or 'two-footed'. Hence differentiae are not listed under the category of quality. The sorts of things that *are* listed under the category of quality tell us whether some subject is, for instance, musical, or healthy, or hot, or crooked. As examples of affections or *pathê*, for instance, Aristotle names sweetness, bitterness, hotness and coldness, whiteness and blackness. These, Aristotle explains, are called 'affective qualities' (*pathêtikai poiotetes*) because they affect the senses (9a28-b8).

Aristotle returns to the topic of quality in his 'philosophical lexicon', *Metaphysics* Delta. In the very first line of the entry for 'Quality', he writes: 'in one sense, a quality (*poion*) is the differentia of a substance; for instance, man is a certain quality of animal, because he is two-footed... The differentia according to substance is a quality,' (1020a33-b1). This is one sense of the term 'quality' (1020b1-2); indeed, it is the primary (*protê*) and most accurate (*kuriôs*) sense of the term (b15). Another sense is recognisable as one of the kinds of quality discussed under the category of quality in the *Categories*: '...the affections (*pathê*) of changing substances, e.g., heat and cold, paleness and darkness, heaviness and lightness, and other such things; and it is

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[49] See Kirwan (1971), 162; Irwin (1988), 64-6, 508, nn. 46, 47; cf. Shields (1999), 250, n.70.
[50] Ackrill (1963), 88-9.

according to their changes that bodies are said to undergo alteration', (1020b8-12). Aristotle identifies other senses of 'quality', but, in the summary of the chapter (1020b13-25), the two main senses or kinds of 'quality' are said to be: (1) Differentiae of substance, and (2) Affections of changeable substances.

This division of qualities into differentiae of substance, on the one hand, and affections or *pathê*, on the other, is remarkable in the light of the *Categories* discussion. Particularly striking is the identification of all qualities that are not differentiae as *pathê*. In the *Categories*, *pathê* are identified as one of the four kinds of quality (9a28-9). In *Metaphysics* Delta, however, the fourfold division of the category of quality seems to be ignored, and in its stead the different kinds of qualities are subsumed into a general class of *pathê*, a class given unity only by its contrast with the differentiae of substance. This contrast is itself conceived as a contrast between those qualities in respect of which a subject can, and cannot, change. That this is so is already indicated in the entry for 'Quality' at *Metaphysics* V.14. It is repeated in the brief entry in *Metaphysics* Delta for 'Affection' (V.21), and again, more explicitly, at *Physics* V.2. In the former text Aristotle defines 'affection' (*pathos*) as 'a quality in respect of which a thing may undergo alteration (*alloiôsis*), for instance pale and dark, sweet and bitter, heaviness and lightness, and all others of that kind' (1022b15-18). This seems to cater for every variety of quality identified at *Categories* 8. For the only qualities that can be contrasted to *pathê*, so defined, are those qualities in respect of which a subject may not undergo alteration, i.e., the differentiae.[51] At *Physics* V.2 Aristotle emphasises this point. Here he defines alteration as 'change according to quality (*to poion*)', before adding: 'I do not mean by quality that which is in substance (for the differentia is also a quality), but the affective quality (*to pathêtikon*),[52] or that in respect of which a thing is called active or passive' (226a26-9). This makes it quite clear that the differentiae of substance

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[51] See Kirwan (1971), 171.

[52] Aristotle says 'affective quality' here (see *Cat.* 9a28f.), but again it is a general term for all qualities apart from essential qualities or differentiae—in other words, perceptible qualities, or qualities that arise in a body because of the way it is affected; cf. *Phys.*VII.2, 244b5f, and see also Bostock (1996), 270, 283.

are distinguished from all other qualities, insofar as the differentiae are qualities in respect of which their subjects cannot alter (cf. *Metaph.* XII.2, 1069b12, *Top.* VI.6, 145a3f.).

Note the way Aristotle refers to the differentia at *Physics* V.2. He refers to it as 'that which is in substance' (*to en tê ousia*), which may on the face of it appear to conflict with the *Categories* denial that differentiae are in a subject. But presumably the sense in which the differentiae are said to be 'in' substance is not the sense of 'in a subject' introduced in the *Categories*. This 'technical' sense is defined as 'that which is in a subject, but not as a part of the subject'. If differentiae are 'in' substances, but not 'in' substances in the technical sense, then perhaps they are in subjects as parts of the subjects. By a part of a subject we might think of the bodily parts—limbs, organs, tissues; the differentiae of substance are certainly not parts of the substance in this way. But a part of a subject may also be thought to be part of the *definition* of some subject, and in this way the differentiae may be considered to be parts of the substance. Ackrill, for instance, suggests that the differentia 'seems to be *part of* the 'what is it' of a secondary substance'.[53] As we have noted, for Aristotle a definition consists of a genus and a differentia, and to define something is to place it within a genus and determine what characteristic differences (*diaphorai*) mark it out from others of the same genus. A thing's differentia, in other words, is a mark or a sign of what that thing is. It is an essential quality—it necessarily belongs to its subject. Simply stated, the differentia of a thing cannot at one time belong, and at another not belong to the subject, whereas affections or accidental qualities generally may or may not belong to a subject (see *Top.* IV.6, 144a25).

So when Aristotle talks about alteration, or *alloiōsis*, and describes it as a change in quality, by 'quality' he means *pathos* rather than *diaphora*, i.e., affection, rather than differentia. A change in an affection is an alteration of the subject of the affection, which remains the same thing it was before the change. But if the differentia of a substance changes, then we would have a destruction, rather than an alteration, of that substance.[54] For the subject to which the

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[53] (1963), 86; Ackrill's italics.
[54] See Ross (1936), 625 (on *Phys.* 226a27).

differentia belongs—of which the differentia is an essential quality—would not survive a change in its differentia. With this clarification of Aristotle's understanding of the notion of a differentia in hand, let's now consider the differentiae of the elements.

3.3 As we saw above (s. **2.2**), Aristotle identifies the contraries hot and cold, dry, and wet as the differentiae of the elements, i.e., the simple bodies fire, air, water, and earth (*GC* II.2-3, 330a24-b6; see also II.4, 331a15). More specifically, hot and dry are the differentiae of fire, hot and wet of air, cold and wet of water, and cold and dry of earth (330b1-5). What this means is that, insofar as they are qualities of the elements, the contraries must be understood not as accidental qualities, but rather as essential qualities. Hot and dry, for instance, are essential qualities of fire, cold and wet essential qualities of water. Hence a change in one or both of the differentiae of an element will result in the destruction of that element (see, e.g., II.4, 331a26f., 331b4f.). Thus if fire, for example, were to lose its heat, then fire itself will be destroyed.

But what does it mean for fire to lose its heat, or in general for one of the differentiae of an element to 'pass away' (or 'perish'; *phtharê*, 331b9, b13, b15, b20, b30, b36)? One would usually think of hot and cold as affections of some underlying substance; a change, then, from hot to cold would be an alteration of that substance. For, as we have seen, alteration is a change in respect of an affection (*kata to pathos*, *Metaph.* XII.2, 1069b12). Or, to specify the nature of this change more carefully, it is a change in the affections of an underlying subject that persists, as a perceptible substratum, through the change (*GC* I.1, 314b1-4; I.4, 319b10-12). In an elemental change, however, the element that is changing is not being altered in respect of its affections. Consider, for instance, the change from fire to air. Aristotle explains all elemental change in terms of change between contraries. For change takes place between contraries (II.4, 331a14; see also I.7, 324a1-8, *Phys.* I.4, 188b21-26), and the differentiae are allocated among the elements in such a way as to render each one contrary to the others (331a14-19). Thus elemental change is possible because of the contrary differentiae. So fire, which is hot and dry, changes to air, which is hot and wet, and this change can be understood in terms of a change

between the contraries dry and wet (331a26-29). But the element fire—the subject from which the change proceeds—does not persist through the change. Fire cannot become wet, and remain fire. Rather, the element ceases to be once one of its differentiae changes, and another element, in this case air, comes to be. To repeat: hot, cold, dry, and wet are not affections of the elements.

Nevertheless hot, cold, dry, and wet *are* affections. Hot and cold, for instance, are listed among the examples of *pathê* at *Categories* 8, and again at *Metaphysics* V.14. Now an affection is something that affects the senses; heat, for instance, affects the sense of touch (*Cat.* 8, 9b6-9). Do the differentiae of the elements likewise affect the senses? In other words, is hot, for instance, qua differentia of fire, the same as the familiar *pathos* hot? Or is cold—as a differentia—cold in what we might call the ordinary sense of the term? If the answer to these questions is yes, then the passing away of a differentia of an element would *also* be a change with respect to an affection, and such a change, as we have seen, is an alteration. And given that it is not the element that is altering, this would seem to imply that when the elements change into each other, there must be some persisting subject that undergoes alteration in these affections.

It is not unusual, however, to find commentators insisting that the differentiae of the elements have nothing, apart from the names they share, in common with the affections hot and cold, dry and wet.[55] Now if this is so, then presumably Aristotle must posit two different qualities that are called 'hot', only one of which belongs to something in such a way that we can actually perceive that the thing is hot. But this might strike us as counter-intuitive. It seems more natural to presume that the differentia cold is *perceptibly* cold; the differentia hot, *perceptibly* hot; and likewise dry, dry, and wet, wet. In other words, it seems more natural to presume that fire is hot and dry, and water wet and cold, in the sense that if we were to touch these elements, this is what we would feel—water wet and cold, fire hot and dry.

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[55] Lacey (1965): 'the basic qualities are not… qualities in the sense of perceptual qualities', 26. See also Sokolowski (1970), 268, King (1956), 378.

To put the matter like this, however, raises an important question: can we actually touch an element? Are elements perceptible at all? For those who think the differentiae are not perceptible, the elements are not likely to be perceptible either.[56] But it might seem obvious that they are perceptible. For Aristotle's elements are the simple bodies, and a body is, by definition, something perceptible (*Cat.* 7, 8a1, *DA* III.12, 434b12, *DC* I.7, 275b5-11). Moreover, Aristotle suggests that everyone takes the simple bodies to be perceptible bodies (*Metaph.* VIII, 1042a6-11; cf. 1028b8-b13, *DC* III.1, 298a29-32). Of course, there may be reasons to question this common opinion: Aristotle may be reporting an *endoxon* with which he does not agree. For, as we have seen (s. **2.4** above), fire and air as we ordinarily experience them are not the *stoicheia* we call 'fire' and 'air'. So it is possible that people believe the simple bodies are perceptible because they tend to confuse the simple bodies with their 'mixed' counterparts. Furthermore, it does seem that everything we experience by our senses must be 'mixed', or composite. For we don't perceive matter, or form, but rather that which comes to be from both. Thus, whereas matter and form are difficult notions to grasp, the composite of matter and form is 'clear' or obvious (*dêlê*), presumably because this is what we experience (*Metaph.* VII.3, 1029a30-2).[57] Does it follow, then, that we cannot perceive unmixed, i.e., simple, bodies? If we cannot perceive a simple body, and yet hot, cold, dry, and wet are the differentiae of the simple bodies, then it does appear that hot, cold, dry, and wet, qua differentiae, are quite other than hot, cold, dry, and wet, qua *pathê*.

There are, however, good reasons to doubt that this is Aristotle's view. If we refer, for instance, to his discussion of the various senses of 'hot', in the *Parts of Animals* II.2, it is clear that 'hot' is always used of things that give off heat, i.e., that are perceptibly hot (648b11-649b8). So presumably 'hot', as a differentia of the element fire, is perceptibly hot, and if this is the case, then 'hot' qua differentia is not different to 'hot' as an affection. Indeed, in the *De Gen. et Cor.* itself, the differentiae of the elements are occasionally called *pathê* or affections. Thus,

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[56] See note 45 above. For Gill (1989), pairs of differentiae, and hence the simple bodies to which they belong, are perceptible, while unpaired differentiae are imperceptible; 245f., with 81, and note 7 above.
[57] See Ross (1924), II, 166, and Burnyeat and others (1979), 16.

e.g., in the context of a discussion of change between water and air, cold is named as a *pathos* (*GC* I.4, 319b21-24). Also, towards the end of *De Gen. et Cor.* II.3, the very chapter where he identifies hot and cold, dry and wet as the differentiae of the elements, Aristotle refers to the differentiae as the contrary *pathêmata* (331a1-3). Most conclusive, however, is the evidence of *De Gen. et Cor.* II.2, where the differentiae are introduced; for here it is quite clear that Aristotle understands the differentiae hot, cold, dry, and wet as perceptible qualities and, as such, affections.

At *De Gen. et Cor.* II.2 Aristotle says that he is seeking the 'principles of perceptible body' (*aisthêtou somaton archas*, 329b7). By 'perceptible body' he means 'body in general', or 'body insofar as it is a body'.[58] Almost immediately Aristotle revises 'perceptible body' to *tangible* body, and explains that by tangible (*hapton*) he means 'that of which touch is the sense' (329b7-8; cf. *Cat.* 8, 9b6-9). He does so because he believes that the distinctive characteristics of body qua body are the tangible contrarieties (329b10; *DA* II.11, 423b27; *Sens.* 6, 445b23; cf. *Phys.* VII.2, 244b5). By 'contrarieties' (*enantiôseis*) here Aristotle means those perceptible qualities which define the range between which the relevant organ of sense is the mean (*to meson*). It is clear, then, that Aristotle is seeking the principles of the tangible contrarieties of body. But it soon becomes apparent that these principles are themselves tangible contrarieties. For the other perceptible contrarieties do not, as he puts it, 'make forms or principles of body' (*sômatos eidê kai archas poiousin*, 329b8-10)—thus ruling out contrarieties of taste, such as sweetness and bitterness, and of vision, such as whiteness and blackness, and the other non-tangible contrarieties.[59] The contrarieties that *do* make forms and principles are those that belong to touch (329b18), namely, hot and cold, dry and wet, heavy and light, hard and soft, viscous and brittle, rough and smooth, and coarse and fine (329b18). The differentiae will thus be selected

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[58] See Joachim (1922), 201, Williams (1982), 157. Gill (1989), 69, thinks Aristotle is referring to the simple bodies. In Ch. **3** I reject the view that the 'perceptible bodies' in the context of *De Gen. et Cor.* II.2 are the simple bodies.

[59] Aristotle's insistence on the priority of tangible affections over other, e.g., visible, affections seems to be based on the idea that while every body is tangible (see, e.g., *DA* III.12, 434b12), bodies are not always perceptible in non-tangible ways; light, for instance, is necessary for visibility; without light, we will not see a body (*DA* II.7, 418b2f.). Furthermore, whereas the sense of touch can exist without the other senses, it is not possible for the

from this set (329b16-18). Aristotle rules out those that are (a) neither active nor passive, i.e., capable neither of affecting nor of being affected;[60] and (b) derivable from more basic contrarieties; and in this way he settles on hot and cold, dry and wet, as the principles of tangible body (cf. *Meteor.* I.3, 340b16-18). In the next chapter, *De Gen. et Cor.* II.3, these principles are identified as the differentiae of the elements (330b6). It is clear, then, that the differentiae of the elements are tangible qualities, i.e., tangible affections.

That this is so is further supported by the argument for the primacy of the tangible contrarieties over those of vision (329b14-16).[61] Here we get a clear statement that Aristotle is dealing with affections. The argument seems to be that although a visible feature of a body, e.g., its colour, is an affection (*pathos*, 329b15) of a tangible body, it cannot be considered among the principles of tangible body because it is not a *tangible* affection. By implication, hot and cold, dry and wet and the other tangible contrarieties from which the principles are selected *are* tangible affections. Consider also *De Anima* II.11. Here Aristotle says that the differentiae of body qua body are tangible, and continues: 'I mean by differentiae (*diaphorai*) those that define (*diorizousi*) the *stoicheia*, i.e., hot cold, dry wet, about which we have spoken before in our discussion of the elements [i.e., *De Gen. et Cor.* II]. The organ for the perception of these is touch,' (423b27-30). Aristotle is quite explicit here that the differentiae hot and cold, dry and wet affect the organ of touch—that is, that they are tangible affections.[62]

Hence the differentiae of the elements hot, cold, dry, and wet are *perceptibly* hot, cold, dry, and wet. Now this might seem to answer our query as to whether the simple bodies are perceptible or not. But let's leave that issue aside for the moment. For there is a more pressing concern, regarding the consequences of this understanding of the differentiae of the elements for our understanding of elemental change.

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other senses to survive the destruction of the sense of touch (*DA* II.2-3, III.13, 435b3-19). Touch is basic, then, and so also is the object of touch, namely, tangible body. Cf. Williams (1982) 157.

[60] Cf. *Phys.* V.2, 226a28-9. See also *GC* I.6, 323ab16-20), with Williams (1982), 117, 159.

[61] See *DA* III.13, for the primacy and directness of touch, as opposed to the mediacy of the other sense organs.

[62] See also Sorabji (1992), 214f. *DC* III.4, 302b30-303a2, III.8, 307b19-22.

Alteration and Elemental Change

4.1 It is clear, then, that the differentiae of the elements affect the senses, or more specifically, they affect the sense of touch. They are, in other words, *pathê* or affections (cf. *Metaph.* III.5, 1002a2). But, of course, they are not affections *of the elements*. The crucial thing about affections, i.e., what distinguishes them from differentiae, is that they are the kind of qualities that are involved in the definition of alteration (s. **3.2**). But elements do not undergo alteration (s. **3.3**). Nevertheless, if the differentiae of the elements are affections, then presumably elemental change must, in some way, involve change between affections, i.e., alteration. And indeed Aristotle does believe that elemental change and alteration are closely related. He makes this clear at the beginning of his discussion of elemental change at *De Gen. et Cor.* II.4:

> Since it has been established earlier that the generation of the simple bodies is out of one another, and at the same time also that it is clear to perception that they come to be (*for there would be no alteration; for alteration is according to the affections of the tangible things*), we must now discuss the way they change into each other… (331a7-11, my italics).[c]

This leaves no doubt about a connection between elemental change and alteration. It seems that alteration and elemental change are related in such a way that, if the latter does not occur, the former is impossible. We already find this claim at the end of *De Gen. et Cor.* II.1. There, having said that the elements change into each other, Aristotle adds: 'it is not as Empedocles and the others say; for then there would be no alteration' (329a35-b2; cf. *Metaph.* I.8, 989a26-8). Empedocles, of course, denies the possibility of elemental change. Aristotle explains why this denial entails a rejection of alteration at *De Gen. et Cor.* I.1. If we are to get to the bottom of the relationship between elemental change and alteration, and thereby to understand better the status of the contraries hot and cold, dry and wet, then to this text we should now turn.

Aristotle begins the *De Gen. et Cor.* with his familiar division of his predecessors, i.e., the natural philosophers or *phusikoi*, into monists and pluralists.[63] The monists are the Milesians,

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[63] This distinction of the *phusikoi* into monists and pluralists has a precedent in Hippocratic writings; see Burnet (1892), 9, n. 2; cf. p. 11, n. 4.

e.g., Thales and Anaximenes, who say that the universe (*to pan*) is some one thing, and they make everything come to be from this one thing (314a8-11). The pluralists, such as Empedocles, Anaxagoras and the Atomists, say that the universe is made of a plurality of different things (314a11-12). Now on the monist theory, since everything comes to be from one thing, generation is reduced to alteration (314a9-11). For the monists' single *hupokeimenon* or substratum, e.g., Thales' water, or Anaximenes' air, remains one and the same through change, which is to say, it is altered (314b2-5). The pluralists, on the other hand, can account for generation, and corruption, because they posit more than one substratum (314a11-12). We find out later that they explain generation and corruption in terms of combination and separation (*sugkrisis kai diakrisis*), which is not what Aristotle considers to be genuine generation (*GC* I.2, 317a17-24; cf. 314b5). But, whatever the merits of their account of generation, Aristotle insists that they cannot provide a distinct account of alteration.[64]

This is not to say that they do not recognize alteration. Aristotle thinks that they must recognize it, as it is an observable phenomenon that things alter (314b10-15). What he means, rather, is that alteration is impossible on the principles of pluralism (314b11-12, 15-17), and he thinks this can be easily shown (314b12). It is impossible, he explains, because 'the affections, according to which we say this [i.e., alteration] takes place, are differentiae of the elements', (*ta gar pathê, kath' ha phamen touto sumbainein, diaphorai tôn stoicheiôn eisin*, 314b17-8). Aristotle proceeds to offer examples of affections: hot and cold, white and black, dry and wet, and hard and soft, 'and each of the others' (314b18). This list includes more than those that Aristotle later identifies as the differentiae of the elements. Perhaps, then, he is referring generally to what are commonly taken to be affections.[65] But it may be that he wants to include the differentiae of the elements according to Empedocles (or, rather, according to his interpretation of Empedocles). Indeed it ought to be emphasised that Aristotle takes Empedocles' theory as

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[64] Aristotle seems to suggest that the pluralists, unlike the monists, *do* offer distinct accounts of generation and alteration (314a7, a11-13, 314b4). But apparently what he means is that the pluralists conceive of generation and corruption as changes that are clearly different to the phenomenon of alteration, understood as change in a persisting substratum. Cf. Williams (1982), 61.

[65] Brunschwig (2004), 56.

representative of pluralism.[66] He writes: 'as Empedocles says "the sun is white[67] to see and hot all over, while rain is dark and cold all through"; in the same way he defines (*diorizei*) the remainder [of the elements]', (314a20-23, quoting DK 31B21). Thus the differentiae of fire (the sun) are hot and white;[68] of water (rain), cold and black (or dark, *dnopheros*); later we find that earth is heavy and hard (315a10-11; described as 'rooted and solid' at DK B21.6), so presumably air is light and soft, i.e., the contrary of earth (but cf. B21.4).[69] The problem is then stated:

> If, therefore, it is not possible for water to come to be from fire, nor earth from water, then neither will anything come to be black from white, or hard from soft; the same argument will also apply for the others; yet this is what alteration is (314b23-26).[d]

Empedocles, as is well known, claims that that the elements (or 'roots') are eternal and ungenerated. His, and more generally the pluralists', problem with alteration rests on this claim, taken with the assumption that the affections according to which alteration takes place are the differentiae of the elements. For Aristotle's argument is that on the hypothesis that the elements are eternal and ungenerated, fire will not change into water, and, consequently, something that is hot will not become cold (to take the other differentiae of fire and water). In other words, if the elements are immutable, it is impossible to explain how alteration occurs, because the affections according to which alteration takes place are the differentiae of the elements.

Note that Aristotle does not mean merely that fire, which is hot, cannot undergo alteration and become cold. Even on his own theory, the element fire cannot alter in this way. What he means is that something that has heat as a *pathos* or an affection, i.e., a composite,

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[66] He twice quotes Empedocles (DK 31B8 and B21, at 314b7 and 314b20 respectively), and after the first quotation, he says that the pluralists in general say the same thing, i.e., they say that generation and corruption is really the combining or mixing and separating of things (314b8-10). See Joachim (1922), 67.

[67] Or 'bright', *leukon*. Presumably we should understand the Greeks as conceiving the extremes of the colour spectrum as dark and light, or bright, rather than black and white. For the mixture of *leukon* and *melan* is supposed to give rise to all of the other colours; see *Sens.* 439b18ff. See Bostock (1982), 190; Ierodiakonou (2005), 9, n. 13.

[68] It does appear that Empedocles believed fire was white (or bright; see previous note); cf. B 96, and Simplicius *In De anima* 68.10-12, Hayduck.

[69] See Curd (1998), 164, n. 99, for doubt that Empedocles intends these characteristics as differentiae of the elements.

rather than a simple, body, will not become cold. And this, presumably, is because in order for a composite body that is hot to become cold, much of the fire that is in the composite as an element (the predominance of which accounts for the composite's heat) will have to change into water. But, on pluralist principles, such change is impossible, and the reason is that the elements, of which these affections are differentiae, do not change into each other.

Now we need to tread carefully if we are fully to appreciate this argument. For Aristotle is surely not saying that Empedocles is ignorant of the everyday changes that bodies undergo. The problem seems rather to be that the very same processes that Empedocles believes are responsible for the generation and corruption of all things, i.e., the combination and separation of elementary particles,[70] would again have to be appealed to in order to explain how things change from being hot to being cold. Bodies come to be, according to Empedocles, due to the combination or mixing of the elements with each other, and they pass away when the elements separate: so birth (*phusis*), e.g., is just 'the name given by men… [to] the mixing and interchanging of what is mixed' (DK B8; partially quoted at 314b5; cf. B26). In such mixtures, the elements are preserved (see *GC* II.7, 334a26-30; also I.10, and DK A34). Thus change is really the movement and rearrangement of the elements. Now what this means is that the elements are the true subjects of change, and therefore they are ontologically prior to the bodies to which they give rise. For a body that comes to be is an aggregation of elements—with organisation and structure, certainly (see DK B96 and 98), but an aggregate nonetheless, rather than a substance (cf. *GC* II.6, 333b9-15). Hence any change in this body, e.g., qualitative change, or growth (see II.6, 333a35), is an addition of elements to, or subtraction of elements from, this aggregate.[71] But any such change in the composition of the aggregate entails a destruction of the original aggregate. In other words, the body that was hot is not the same as the body that is now cold.[72] It follows that an Empedoclean composite body is not a subject

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[70] Empedocles seems to have conceived of his composite bodies as consisting of tiny particles of the elements; see DK 31A43, with Aëtius I 13 1, and Galen *In Hipp. De nat. hom.* xv.49 Kühn. See also Longrigg (1967), and (1976).
[71] See Furley (1987), 186, and Inwood (2001), 33.
[72] See Brunschwig (2004), 57: '[for Empedocles] blood [can] not get brighter or darker without ceasing to be blood'.

that persists in its own identity through the change from hot to cold, or from black to white. Alteration, however, as Aristotle understands it, demands a single substratum that remains one and the same throughout the change (314b3; b26). Clearly, then, Empedocles cannot admit alteration.[73]

Aristotle, of course, believes that he can give an account of alteration, as a change distinct from generation and corruption (I.2, 317a20-27; I.4; II.1, 328a28-31); and evidently this has something to do with the fact that he believes that the elements change into one another (II.4, 331a7-8; cf. *DC* III.6, 304b23ff.). But this belief is not asserted dogmatically. Consider again the passage quoted above (314b23-26). If the elements do not change into each other, Aristotle explains, then alteration is impossible. Now, for Aristotle, alteration is *not* impossible: indeed, he believes that it is apparent to the senses that it does take place (314b13-15). And if alteration of the affections does occur, then it follows that the elements *do* change into each other. It seems, then, that Aristotle infers that the elements must change into each other from the perceived evidence that alteration takes place. But why does Aristotle assume a connection between alteration and elemental change? Presumably it is because, as he has already told us, the affections according to which alteration takes place are the differentiae of the elements (314b17-8).

4.2 So it seems that alteration involves or presupposes the coming to be of the simple bodies, i.e., the elements, out of one another, because the affections involved in alteration are the differentiae of the elements. Now before we go any further, we need to pause to ask if this could really be Aristotle's view. For, stated baldly, the identification of the affections according to which alteration takes place with the differentiae of the elements is false. Or, rather, it is false, and clearly so, if it means that any affection *whatsoever* is a differentia of the elements. This cannot be what Aristotle intends. In the next section I attempt to work out a plausible

[73] It may be that the notion of alteration was not even available to Empedocles; for Tarán (2001), Plato's distinction between *alloiôsis* and *phora* (locomotion) at *Theaetetus* 181c-d is made 'in terms that leave no reasonable doubt that this was a novel conception', 183. Cf. Cherniss (1935), 362.

interpretation of this identification consistent with Aristotelian principles. Firstly, however, I want to establish that Aristotle accepts, at least to some extent, this identification.

Commentators usually tend to presume that Aristotle is not speaking *in propria persona* at 314b17. It is thought that the view that the affections according to which alteration takes place are the differentiae of the elements is one that Aristotle is imputing to the pluralists, Empedocles in particular. Thus, for instance, Brunschwig writes: 'the *pathê* involved in *alloiôsis* are treated as "differentiae of the elements" by Empedocles, in Aristotle's opinion'.[74] Now the suggestion here cannot be that Empedocles expressly identifies the affections according to which alteration take place as the differentiae of the elements. For what is meant at 314b17 by *alloiôsis*, or alteration, is a change in the affections of a persisting substratum, i.e., Aristotle's own notion of alteration,[75] and Aristotle's argument is precisely that the pluralists cannot admit alteration in this technical sense. So, insofar as alteration is, for them, impossible, it is obvious that the pluralists do not identify the affections that are involved in alterations as the differentiae of the elements.[76] What Brunschwig must mean, then, is that those properties that *we* regard as the affections, e.g. hot and cold, black and white, and so on, are regarded *by the pluralists* as the differentiae of the elements. A paraphrase of lines 314b17 to 314b23 according to this interpretation would run as follows: 'the affections according to which we say (*phamen*)[77] that alteration takes place, I mean (*legô*), for instance, hot cold, white black..., are *for them* the 'differentiae of the elements',[78] just as Empedocles says[79] 'the sun is white and hot, but rain is dark and cold', and similarly he defines the others'.

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[74] (2004), 57. Cf. Philoponus *In de gen et corr* 17.1, Joachim (1922), 67, Williams (1982), 61f.

[75] As Joachim also notes (1922), 67.

[76] As noted above (note 73), the concept of *alloiôsis* may well be unavailable to the Presocratic pluralists.

[77] 'We' presumably being Aristotle and his audience. Brunschwig glosses this as: 'we ordinary people', suggesting that it refers to 'common opinion'; (2004), 56, n. 73.

[78] Cf. Williams' reading of 314b17: 'the affections in whose succession alteration consists are *for them* [i.e., the Pluralists] differentiae of the elements' (my italics); (1982), 61. See also Brunschwig (2004), 56, with n. 74 ibid., and Philoponus *In de gen et corr* 17.4-5.

[79] Brunschwig (2004) suggests that *kai* in *hôsper kai phasin Empêdoklês* be taken as 'actually' or 'precisely'; 56, n. 74. He takes the quote as Aristotle's attempt to 'prove' that Empedocles says that the affections are differentiae of the elements.

The implication here is that Aristotle himself does not share this 'pluralist' view of the affections.[80] But let's look again at the context. Aristotle states that it is a consequence of what the pluralists say that alteration is impossible (314b15-17). It is apparently by way of explanation that he then says that the affections according to which alteration takes place are the differentiae of the elements (314b17f.). So admittedly it does appear that the identification of affections as differentiae of the elements is one of the things that the pluralists say that renders alteration impossible. The other thing they say that renders alteration impossible is that the elements are unchangeable (I.1, 314b5, 315a3; II.1, 329b1). What the pluralists say, then, is (a) the affections (according to which *we say* alteration takes place) are the differentiae of the elements, and (b) the elements do not change into each other; and it follows from these two principles that alteration is impossible. Now Aristotle, as we have seen, claims not only that alteration is *possible*, but that it is an observable phenomenon (314b13-15). But it doesn't follow that he is necessarily bound to reject both of these principles. For alteration is impossible according to principle (a) only if it is proposed in tandem with (b). If one were to claim that alteration is possible, then this would necessitate only the rejection of principle (b), and consequently the admission that the elements change into one another. It would not be necessary to reject also principle (a). Indeed, if principle (a) is retained, then the thesis that the elements change into one another would offer the possibility of an explanation as to how alteration is possible. Alternatively, one might simply reject both principles (a) and (b), and thereby deny that the elements and elemental change have anything at all to do with the affections and alteration.

I think it is clear which course Aristotle chooses. Recall that in the passage at *De Gen. et Cor.* II.1, Aristotle says that the elements change into each other, adding 'it is not as Empedocles and the others say, for then there would be no alteration', (329b1). In other words, it is not the case that the elements are immutable, because if it were, then alteration would be

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[80] Thus Williams (1982), 62, wonders 'why Aristotle should credit Empedocles, let alone Pluralists in general, with such a strange belief as this'.

impossible. This is a denial of principle (b); and by linking the possibility of alteration to elemental change, it points fairly clearly towards an acceptance of principle (a). The argument at *De Gen. et Cor.* II.4 removes any doubt about Aristotle's acceptance (to some extent at least) of principle (a). It is worth quoting again:

> Since it has been established earlier[81] that the generation of the simple bodies is out of one another, and at the same time also (*hama*) it is clear to perception that they come to be—for there would be no alteration; for alteration is according to the affections of the tangible things (*kata gar ta tôn pathê haptôn*)—we must now discuss the way they change into each other… (331a7-11).

To bring out its hidden premiss, the argument here can be reconstructed like so:

(i) Alteration is change according to the affections of a tangible body that persists through the change

(ii) Change according to the affections of a tangible body that persists through the change is an observable phenomenon

(iii) If the elements could not change into each other, then alteration would be impossible, because

(iv) The affections according to which alteration takes place are the differentiae of the elements

(v) But from (ii) it is clear that alteration does occur

(vi) Hence the elements can change into each other

Step (iv) is essential to the argument. Without it, we fail to see the connection between alteration and elemental change, and why the evidence of the former allows us to infer the occurrence of the latter. Unless Aristotle presumes step (iv), or at least a modified version of step (iv), then the appeal to alteration to support the claim that the elements change into each other is obscure.

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[81] 'Earlier' may refer to *DC* III.6, 304b23ff., rather than an earlier passage in the *GC* itself; Joachim (1922), 220, Williams (1982), 161.

4.3 It remains to consider how to interpret step (iv). For, as stated earlier, Aristotle cannot mean that any affection whatsoever in respect of which a body may alter is a differentia of the elements. Firstly I shall explain why this can't be his meaning, and then I propose to determine what I think he does mean.

At 331a9 Aristotle defines alteration as change 'according to the affections of tangible things' (*kata ta tôn pathê haptôn*).[82] Now since all bodies are tangible things, it seems obvious that the *pathê* of the *hapta* must include not only the primary tangible contrarieties, i.e., hot, cold, dry, wet, and the other affections of touch that are derived from them (*GC* II.2, 329b16f.), but also affections pertaining to the other senses, i.e. colour, sound, flavour, and scent.[83] If each of the affections according to which alteration takes place were differentiae of the elements, then it would follow that among the latter we must include, beside the primary tangible contrarieties, the primary non-tangible contrarieties, e.g., black and white, and the other affections of colour that are derived from this contrariety (cf. *Phys.* I.5, 188b23). If, for instance, water is black and fire white, then a change from black to white would demand a change from water to fire. Likewise a change of flavours would also need to be accounted for by attributing contrarieties of taste, e.g., sweet and bitter, to the elements as differentiae, and so on for changes in affections pertaining to the remaining senses. But Aristotle rules this out at *De Gen. et Cor.* II.2: he says that bodies differ through a tangible contrariety, and for this reason he looks for the differentiae of the elements among the tangible contrarieties only (see s. **3.3**). As he puts it, none of the perceptible non-tangible contrarieties, such as whiteness and blackness, or sweetness and bitterness, 'make an element' (329b8-13). So, even if it were the case that certain colours are associated with the elements,[84] as non-tangible affections they cannot be admitted among the differentiae of the elements. Hence Aristotle cannot mean that any and every affection can be identified as a differentia of an element.

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[82] Naturally what is at issue here, and throughout, is alteration in tangible or bodily affections, as opposed to alterations proper to *psuchê*; see *GC* II.6, 334a9f.
[83] Joachim (1922), 220.
[84] See below, esp. notes 94, 95.

It seems better, then, to think that by 'the affections of tangible things' Aristotle is referring only to the affections of tangible body *qua* tangible, i.e., those of which touch is the sense. Thus while black and white are certainly affections of tangible things, they are so not insofar as these tangible things are tangible, but insofar as they are visible (cf. 329b7-16).[85] This view, however, has its own difficulties. Does it mean, for instance, that Aristotle is thereby restricting alteration to those cases of change involving the tangible affections only? Or does he mean to suggest that *all* cases of alteration, including changes involving affections pertaining to the senses other than touch, are to be accounted for as alterations in respect of the tangible affections?

If the former, then it would be fairly clear how the affections can be identified with the differentiae of the elements. For, as we have seen (s. **3.3**), the tangible affections (with the exception of heavy and light; II.2, 329b20) are derived from the primary contrarieties hot and cold, dry and wet (329b24ff). A change, e.g., from hard to soft is a change from an affection that 'belongs to the dry' (*to skleron tou xerou*) to an affection that 'belongs to the wet' (*to malakon tou hugrou*). And since dry and wet are differentiae of the elements, then it is clear how such an alteration would involve change in the elements, e.g., from earth (dry) to air (wet) in this case. There is no evidence, however, that Aristotle intends to redefine alteration in this way. Something is altered if, remaining the same thing, it changes in respect of its perceptible qualities, and it is alteration whether or not the perceptible quality is a tangible affection (cf. *GC* I.6, 323b19-20, *Phys.* VII.2-3).

Hence it rather seems that Aristotle must intend the second alternative, and this, indeed, is how commentators have understood him.[86] But, as Philoponus wonders, how can an alteration of non-tangible affections, e.g., from white to black, or sweet to bitter, be explained in terms of changes in tangible affections, i.e., from hot to cold, or dry to wet? Philoponus answers his own question by suggesting that all other alterations, that is, those that do not

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[85] See Williams (1982), 162.
[86] Philoponus *In de gen et corr*, on 331a8; Joachim (1922), 220; Williams (1982), 162.

involve tangible affections, are determined by and hence consequent upon changes in the tangible affections.[87] This seems a plausible interpretation. Indeed, it finds some support in the *Meteorologica*, where Aristotle claims that natural change in general is the work of the tangible affections of body (IV.1, 378b28-29). But modern commentators find it hard to accept. Williams, for instance, wonders how one could prove that every instance of alteration in non-tangible affections implies change in tangible affections. He asks: 'how would [Aristotle] show that the fading of the colours of the rainbow involved a change in the basic affections of some tangible body, a change which itself involved the corruption of one simple body and the generation of another?'[88] That there may be problems understanding how the affections, according to which alteration takes place, can be identified as the differentiae of the elements is, of course, no objection to the argument that Aristotle accepts this identification. It is important, however, to judge the extent to which the identification can be borne out according to Aristotelian principles. So let's take up Williams' challenge to show that colour change involves alterations in the tangible affections of body, and, thereby, elemental changes.

Would it really be very strange or surprising that Aristotle might think that the colours of things give an indication of the tangible affections of things? And consequently that a change in colour could follow upon an alteration in the coloured thing's tangible affections, the latter alteration being due to change in the constituents of that thing? In the context of his time, such a view would not be uncommon. Diogenes of Apollonia, for instance, with whose work Aristotle is certainly familiar (see e.g., *GC* I.6, 322b16, *HA* III.2, 511b30), says that the state of one's health is revealed by one's appearance, and this is because one's complexion or colour reveals which of the humours (*chumoi*) is dominant.[89] For the humours—blood, phlegm, black and yellow bile—are associated with four colours—red, white, yellow and black respectively. The Hippocratic author of *De Natura Hominis*—identified by Aristotle as Hippocrates' son-in-law Polybus (*HA* III.3, 512b12)—further associates the four humours with the contraries hot

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[87] *In gen et corr* 232.7f.

[88] Williams (1982), 162; Joachim (1922), 220, flatly denies that every alteration implies a change in the primary tangible contrarieties.

and cold, dry and wet. Thus blood is hot and wet, phlegm cold and wet, yellow bile hot and dry, and black bile cold and dry (ch. 4-7). Evidently, on this view, when a patient progresses from illness to health, this will be due to the restoration of balance among the humours, which in turn will show itself in a change in the patient's colour. From the further association of the humours with the contraries (or 'powers', *dunameis*), one may presume also that change in the patient's temperature, e.g., going from being cold (phlegmatic) to being hot (sanguine), will typically result in an appropriate change in the patient's colour, e.g., from pale to red or ruddy. Thus an alteration in colour is a sign of alteration in the tangible contrarieties, which latter is itself due to change in the constituents of body. For the humours are simply the most obvious basic constituents of body, out of which the body is composed and into which the body is resolved (*De Natura Hominis*, 3.24-9, with 2.1-10 and 1.1-19).

Aristotle also believes that health is a matter of balancing bodily constituents.[90] At *Physics* VII.3 he says that good bodily states (*aretai tou sômatos*), such as health and fitness, depend on the proportionate blending or mixing (*krasis*) of hot and cold (246b4-6).[91] Indeed he suggests that the changes whereby such bodily states (*hexeis tou sômatos*) are acquired or lost, while not alterations (246a10f., 246b12-14), necessarily involve the alteration of something, 'for instance, hot or cold or dry or wet, or whatever it is in which the states are primarily present' (246b14-17). This is offered only as a suggestion, but it gives a clue, at least, as to how alteration of tangible affections must be presupposed in changes involving non-tangibles. And if we admit that a change from a bad to a good bodily state, e.g., from illness to health, will typically (if not necessarily) coincide with an alteration in the patient's outward appearance, then it gives a clue, in particular, to the role of the tangible affections in alterations between colours. For, after Diogenes and the Hippocratics, it would be natural to infer that the patient's colour is

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[89] See Galen, *De Humor.*, xix.495 Kühn.

[90] Aristotle says little about the humours, at least in the Hippocratic sense; for while he does use the term *chumos*, e.g., in *DA* and *Sens.*, usually it means 'flavour'. Only occasionally do we find *chumos* employed in something approaching the typical Hippocratic usage, for instance, in the spurious *Problemata*; see, e.g., I.11, I.12.

[91] A view similar to that of Alcmaeon of Croton, for whom health was a balance (*isonomia*) of the 'powers' (*dunameis*), i.e. hot cold, dry wet, sweet bitter, and so on; and disease a dominance of one of them (*monarchia*), DK 24 B4.

a sign of balance or imbalance in the blending of hot and cold, dry and wet in the patient's body; that is to say, a sign of the blending of the constituent elements, of which these tangible affections are differentiae. Moreover, it is evident that any change in this blend, e.g., if there is an imbalance, then a change towards balance, will imply alteration in the tangible affections, and that, not necessarily, perhaps, but in many cases, an alteration in the patient's colour will follow on from this change.

Elsewhere, indeed, Aristotle is quite frank about the complicity of the tangible contrarieties in alterations from one colour to another. In the *De Generatione Animalium*, for instance, he discusses change in the colours of natural phenomena with reference to change between hot and cold, dry and wet as their causes (V.4-6). So, for instance, hair goes grey in old age due to a loss of heat and moisture and an increase of coldness and dryness (V.4, 784a30ff, cf. V.5, 785a29-b1; cf. V. 6, 786a9-12). Even more striking is his account of colour change in semen (II.2, 735b32-37). Semen is white, and firm, when it issues from the animal, Aristotle explains, because of the hot air (*thermotêtos pneuma*) which is in it due to internal heat. When the air has cooled, and the heat has evaporated, it becomes moist and dark, because what is left in the semen as it dries is water and bits of earth (*hugron gignetai kai melan*).

What, then, of Williams' 'rainbow' challenge? Presumably Williams has chosen the example of a rainbow because a rainbow is not a tangible body. Nevertheless, if we look at Aristotle's account of the production of rainbows in the *Meteorologica*, it is clear that he explains this phenomenon in terms of alterations in the tangible affections of bodies. In particular, the conditions in which rainbows appear are set up by the action of cold on air, and both this and the fading of the rainbow evidently involve elemental change. Aristotle explains that a rainbow (*iris*) is a kind of reflection (*anaklasis*, III.2, 372a17-18, III.4, 373a32). A reflection occurs when the upper air is condensed, or cooled. When thus condensed, the air takes on a smooth surface, like water, and smooth surfaces are necessary for reflections to occur (III.2, 372a31, III.4, 373a35-b2). It is not unusual (*atopon*), Aristotle continues, that under such conditions a variety of colours will appear (I.5, 342b1-7). These appearances do not last long, as the condensation

of the air passes quickly (342b13); after all, air cannot be cooled indefinitely, for at some point it will turn into water, in the form of rain. At some point, in other words, there will be an elemental change (and the change from air to water is one of those changes Aristotle describes as a 'quick' change, *GC* II.4, 331a22-32). Now in that moment when the air has condensed into clouds, but has not yet changed into rain, we have the key conditions for the formation of rainbows. For when the air in the clouds is condensing into raindrops, and it is about to rain, but it is not yet raining, the cloud presents a smooth surface, and is thus ideally modified to act as a mirror. All that remains is for the sun, or some other bright object, to shine on it. The reflection of the colour of the object will then appear to sight (373b19-24). These, then, are the conditions under which rainbows appear (b31). Rainbows fade away when the condensed cloud turns to rain or is dissolved by the sun, i.e., the air in the cloud gets colder, and turns into water; or hotter, and turns into fire.

So here we have changes in colour explained in terms of changes between the tangible affections hot and cold, dry and wet. But there might still be a doubt or two, in particular about the nature of the causation involved. For instance, Aristotle says that there is 'nothing unusual' (*ouden atopon*) about a variety of colours appearing when a certain tangible change is occurring, e.g., air affected by the cold, and condensing into cloud (342b4). Now one might object that this tells us nothing about the relationship between colours and the tangible affections, and that unless Aristotle indicates that, and how, certain colours are associated with certain tangible affections, and thus with certain elements, then all we have is mere simultaneity or coincidence of changes. Against this, however, while it may be admitted that a rainbow may not *always* appear when a certain alteration in the tangible affections takes place, this would imply merely that such alteration is not a sufficient condition for the appearance of rainbows. Nevertheless the appropriate alterations of the tangible affections of bodies certainly are necessary conditions for the appearance of rainbows. A rainbow is a reflection, and reflection, evidently, does not take place if the surface of the body from which sight is to be reflected does not have the tangible affection necessary for reflection, i.e., smoothness. And cloud takes on this affection

when it is condensed, or cooled. In other words, the rainbow will certainly *not* appear unless particular alterations in the tangible affections take place. A brief review of some aspects of Aristotle's theory of colour, both of its production and perception, will, I think, go some way towards supporting this point.

Empedocles, as we have seen, says that fire is white, and water black (B21, quoted at *GC* I.1, 314a20-23; cf. B 96). Moreover, he appears to have claimed that all the other colours come to be from the combination or juxtaposition of tiny and individually imperceptible white and black particles, i.e., the combination of the elements fire and water.[92] Aristotle also thinks that every colour is produced by the mixture of black and white (*chromata ek leukou ai melanos*, *Phys.* I.5, 188b23). Likewise he explains the variety of colours as being due to the different ratios of black to white, some expressing numerical relationships, others simply the dominance (*huperochê*) of one over the other (*Sens.* 3, 440b18-21). As he points out in the *De Sensu*, however, the difference between his and other, e.g., Empedocles', views is that what is involved isn't mere juxtaposition of particles, but complete mixture or *mixis* (440b3, b11), in the sense of *mixis* explained at *De Gen. et Cor.* I.10—to which work Aristotle refers in the *De Sensu* discussion (440b3, b13). He says: 'it is clear that it is necessary that when things are mixed [their] colours also must be mixed, and that is the real reason why there are many colours' (440b13-15). It may be tempting to think that what Aristotle means here is that each simple body or element has a simple colour, such that when simple bodies are mixed, their simple colours are also mixed. For if this were so, then change of colour would necessarily involve some change between elements. But happily we do not need to defend such a claim.[93] While there is some evidence that Aristotle, like Empedocles, associates white with fire, and black with water,[94] it is enough

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[92] Aristotle describes such a view in *Sens.* (3, 439b18-440a6), and it is reasonable to think he has Empedocles in mind. See Ierodiakonou (2005), 18.

[93] We find a doctrine that simple colours belong to the elements in the *De Coloribus*, which, however, is not regarded as a genuine work of Aristotle's, but is sometimes ascribed to his pupil Theophrastus (Ross (1923, 12). Fire is said to be yellow, air and water white, and earth white. Black is the colour of the elements in change, and it is repeated that the remaining colours come to be from the mixing of these simple colours (791a1-12). Cf. the following note.

[94] A survey of the genuine works suggests that Aristotle attributes white to fire, while air is said to be lighter in colour than water; the latter, and earth, are sometimes said to be dark or black; see, e.g., *Phys.* IV.9, 217b6-7, *Meteor.* III.4, 374a1-7; *GA* II.2, 735b32f.; cf. *Sens.* 3, 439b1f.

for our purposes to note that colours belong to bodies (or more strictly, to the surfaces of bodies, *Metaph.* V.18, 1022a14-19), and that they can mix in the appropriate way because the bodies to which they belong can mix with each other.[95] For what enables bodies to mix with each other is precisely the fact that some bodies are capable of affecting, and others are capable of being affected by, other bodies (*GC* I.10, 328a18-19; a28f.). And bodies are capable of acting on or being affected by other bodies in virtue of their tangible contrarieties, in particular the primary differentiae hot and cold, dry and wet (II.2, 329b20-32). This is because a necessary condition of bodies mixing with each other, or, generally of bodies acting on, or being affected by, each other, is that they be in contact (*haphê*), or literally, touching (I.6, 322b21-24, 26-29). Contact involves something touching something, that in turn touches the first thing (323b25). Thus the existence of a variety of colours is due to the interaction and mixing of coloured bodies, and the possibility of such interaction and mixing must be accounted for in terms of the tangible affections, i.e., the affections of bodies qua bodies.

Change between colours is likewise dependent on the tangible affections of bodies. At *Physics* VII.2 Aristotle explains that all alteration is change of a body, in respect of its perceptible (or 'affective') qualities (*aisthêtai or pathêtikai poiotêtes*), i.e., the affections, by the action of the affections of some other body. Since it involves action of body on body, it presupposes contact between the two bodies (244b2-245a5). In other words, the bodies must be touching. This is a necessary condition of all alterations. So, for instance, when there is an alteration from one colour to another, this is due to the action of another colour; e.g., white changes to grey due to the action of black on white. But white is the colour of some body, and black is the colour of another body, and for the latter colour to affect and the former colour to be affected, it is necessary that the bodies to which they belong come into contact. And if it is the action of bodies qua bodies upon each other that enables alteration in colour to take place, then

[95] In any case it is not clear how the elements would possess their colours. For the colours cannot be affections of the elements, nor can they be differentiae.

alteration in colours is determined by, and consequent upon, the alteration of tangible qualities.[96]

Thus we can understand the claim that every alteration in the affections of body presupposes a change in the tangible affections of body. For the tangible affections of body are the affections according to which alterations occur, i.e., without which alterations *do not* occur. Now this is not to suggest that all non-tangible affections are reducible to the affections of touch. Aristotle scolds Democritus precisely for reducing all the sense-qualities to that of touch (*Sens.* IV. 442a29-b26). Rather, the point is that all qualitative change is consequent on alteration of the tangible affections, in the sense that the explanation of an alteration in non-tangible affections ought necessarily to include reference to alteration in the tangible affections. But, for completeness, the explanation ought also to include reference to change in the elements, because the tangible affections are, or belong to, the differentiae of the elements. It follows that all of the alterations a body may undergo must involve some change, however minor, in the body's constituent elements. It is for this reason, I take it, that Aristotle points to the fact of alteration for evidence that the elements change.

4.4 Before rounding off this chapter, let's return to a question that was raised earlier (ss. **2.5**, **3.3**). Are the elements perceptible? It might seem that they are, since they are defined as being hot and cold, dry and wet; and, as I have argued, these differentiae of the elements do affect the senses (s. **3.3**). On the other hand, simply reflecting on the nature of an element ought to be sufficient to lead one to the conclusion that the elements cannot be perceived *in themselves*—to the conclusion, that is, that there isn't anything that we can see, touch, taste, smell or hear, and say of it: 'this is the element fire'. An element (of body) is by definition a material constituent of

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[96] Colour perception is also dependent on the alteration of tangible qualities. In general, we perceive things either by direct contact with the thing, i.e., touch; or by virtue of media (III.1, 424b27-29; cf. II.11, 423b12-15). This means that perception involves contact of body on body; for the medium too is a body (II.7, 419a13-15-20). But bodies are defined in terms of tangible qualities; moreover, perception, for Aristotle, is a kind of alteration (II.5, 416b33-4; II.11, 4242a1). Thus perception, be it tangible, visual, aural, or olfactory, always presumes alteration in the tangible qualities.

a composite body (*Metaph.* V.3, 1014a26-b15; see Ch. **1**, s. **2.1**). But what we perceive is the whole body, the composite of matter and form, and not its particular material constituents (cf. *Metaph.* VII.3, 1029a30-2). In other words, while the differentiae of the elements affect the senses—the hot of fire, and the cold of water, are perceptibly hot and cold (see s. **3.3**)—we do not perceive the element itself, precisely because it is an 'element'. What we perceive is the composite body of which these differentiae are affections.

Other commentators have also stressed that the elements cannot be perceived, but their reasons for drawing this conclusion tend to reveal some confusion regarding the nature of the elements, and the status of elemental change. One recent scholar summarises what she regards as the prevailing view like so: 'Modern commentators often consider the elements strictly speaking as 'ideal' substances… According to this view, the elements in their current state could not exist in concrete form in Aristotle's universe: they are ideal abstractions and the elemental transformations described in *GC* 2 are theoretical elaborations'.[97] The sense in which elemental changes are 'theoretical elaborations' is explained by another scholar like so: '[they are] 'theoretical' because it is important to recall that the elemental transformations which *GC* 2 discusses *may never actually take place.* The elements in their purified state do not seem ever to exist in the Aristotelian universe'.[98] It seems to me that these two quotations display a fundamental breakdown in the understanding of an element. It is simply not the case that an element must be either a concrete thing, or else an ideal, abstract entity. On the one hand, the notion of an *element* existing as a 'concrete' thing, or in a 'purified state', would appear to be a contradiction in terms. For an element, if 'purified'—which I presume means 'unmixed with other elements', or 'separated from that of which it is an element'—is *ipso facto* no longer an element. On the other hand, from the point that elements do not exist in a 'concrete', or actually perceptible, form, it certainly does not follow that the elements are abstract, ideal

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[97] Gannagé (2005), 44, n. 175, citing, among others, King (1956), Sokolowski (1970), and Lewis (1996). G. herself apparently shares this view.
[98] E. Lewis (1996), 40, L.'s italics.

entities without any real existence. For whereas an ideal or abstract entity is imperceptible by definition, an entity that is not actually perceptible is not necessarily imperceptible *per se*. Aristotle makes this point in the *De Sensu*, as part of an argument against the possibility of bodies being composed of imperceptible parts (6, 445b3ff.). His argument is that, if a body were infinitely divisible, then we could reach parts of the body that are imperceptible. So we would have imperceptible parts of bodies. But magnitudes are necessarily perceptible: to posit a magnitude that is not necessarily perceptible would be to posit a body that has neither colour nor weight nor any other such perceptible attribute (b9-13). This, for Aristotle, is impossible (cf. *GC* II.1, 329b10). So, therefore, if there were imperceptible parts of bodies, and yet bodies are necessarily perceptible, then a perceptible body will be composed out of imperceptible parts (445b13-14). This too is impossible. It is necessary that bodies are composed out of perceptible parts (b14), for the following reasons: (i) bodies cannot consist of mathematical entities (*ek tôn mathêmatikôn*, b14-15), (ii) it would not be possible to distinguish and to know such things—not by thought or reason (*nous*), for instance, because thought does not conceive external things without perception (b16-7); and (iii) because this is, essentially, the atomic thesis, which Aristotle has rejected already in other texts (b17-20). The first reason here is highly relevant, as mathematical entities are a kind of abstract entities (cf. *DA* III.7, 431b12-17). Aristotle's general argument against mathematical entities composing perceptible bodies is at *De Caelo* III.1 (298b35-300a19).

To tailor this argument for our purposes, the elements fire, air, water, and earth cannot be abstract entities, because such items are by definition imperceptible, and this would mean that perceptible bodies are composed of imperceptible parts, which is impossible. So the elements are perceptible then? Not quite. The argument in the *De Sensu* does not lead to the simple conclusion that bodies must be constituted out of *perceptible* parts. Instead Aristotle continues by marking a distinction between what is actually and what is potentially perceptible (445b30). Something may be potentially perceptible, he explains, but not actually so (446a4). Very small quantities, for instance, are potentially visible, but, unless they are separated off from

that of which they are a part, they are not actually visible (*dunamei gar horata, energeiâi d' ou, hotan mê chôris êi*, 446a5). Sometimes, even when they are separated off, they are still too small to be perceptible; but they remain potentially perceptible, and can become actually perceptible through attachment to one another (*prosgenomenon*, 446a12-15).

Now if we consider what Aristotle says elsewhere about the elements, I think this argument offers some scope for a solution to our question. In the *De Caelo*, when Aristotle is considering the nature of the elements, at first he leaves it open as to whether they exist actually, or potentially, in the body that they constitute (III.3, 302a16). But almost immediately he suggests that it is the latter: he says that fire and earth are potentially in flesh and wood (302a21-23). In *Metaphysics* Zeta he confirms that this is his view, listing the elements alongside the parts of animals as mere potentialities (*dunameis*), rather than unified substances (VII.16, 1040b5-10). It seems plausible, then, to suggest that since the elements exist only potentially in the body that they constitute, then they are merely potentially, rather than actually, perceptible.

They are not, of course, potentially perceptible in the manner implied in the *De Sensu* argument (see, e.g., 446a5f.). For it is not that the elements are very small quantities of matter that are placed alongside each other. If a body were composed out of elements of this nature and in this way, then we would have an aggregate or juxtaposition. In such aggregations the elements would be imperceptible relative to our vision (cf. *GC* I.10, 327b31-328a17). Aristotle's elements, on the other hand, mix with each other (*GC* II.2, 329b23), and 'mixing' (*mixis*) means a good deal more than mere juxtaposition. True mixing, for Aristotle, occurs when things that were separate come together to form something else; each changes from its own nature and becomes something in between, and common to both (*metachu kai koinon*, I.10, 327b27, 328a29-31). Such a process renders the mixed things imperceptible quite simply because they no longer actually exist. That is not to say, however, that they have been destroyed—rather, their potentiality is saved or preserved in the mixture (*sôzetai gar hê dunamis autôn*), and thus it remains possible for them to separate out from it (327b28-31). If we apply this notion to the elements, then, if anything, the elements are only potentially perceptible.

But what about the elemental changes that Aristotle describes at *De Gen. et Cor.* II.4? What happens when an element comes to be? Does it not come to be an actually existing, concrete thing in its proper place, and as such actually perceptible?[99] Or is an elemental transformation an occurrence that may never really take place? The latter suggestion ought to be dismissed immediately. The ubiquitous phenomenon of alteration is for Aristotle evidence that the elements can and do change into each other. Consider again the claim that it is clear to perception that the simple bodies come to be (331a8). Evidently Aristotle does not mean that we can actually perceive fire, the simple body, coming to be from air or water. For, as we have seen, he supports this claim by appealing to alteration. Now the simple bodies do not undergo alteration. Hence only a non-simple, i.e., composite, body can undergo alteration in its affections. A subject of an alteration must be a substance, for only substance can persist as the same thing through a change in its affections (*Cat.* 5, 4a10f.). This means that the evidence that we have for claiming that fire comes to be from water is given to us by the observable phenomenon of alteration, in particular, the alteration of a substance from cold to hot. In other words, Aristotle supports the claim that the simple bodies change into each other by pointing to the observable phenomenon of the alteration of *composite* bodies. If there were independent observable evidence that the simple bodies change into each other, then that there would be no need to appeal to the alteration of composite bodies. But because the possibility of alteration is premised on the possibility of elemental change, then the observable phenomenon of alteration is at the same time indirect evidence that the simple bodies change into each other. It is indirect, as we don't actually see the simple bodies themselves changing into each other.

The claim that the simple bodies change into each other, then, is an inference based on the observation of the alteration of sensible substances. The crucial point here is that elemental change takes place *within composite bodies* (cf. *GC* II.8, 335a6-9). A substance or composite body that is cold becomes hot under the influence of an external source of heat, because, within that body, water has changed into fire. Of course, for such elemental change to be an alteration of

[99] Cf. Gill (1989), for whom the elements are 'actually perceptible bodies', 247.

that body, not all of the water that is in the body as a constituent changes into fire, but only some of it. Recall that Aristotle defines alteration or *alloiôsis* in terms of the survival of the subject of the change (*GC* I.4, 319b10-12). If the change were to alter radically the elemental balance of the substance, such that it cannot persist as the same substance, then we would have a destruction rather than an alteration (319b14f.; cf. *Meteor.* IV.2, 379b32-5). But even when a composite substance is destroyed, and each element begins to move away to its own, 'natural' place, it would still be a mistake to expect that they may eventually become actual, or 'pure', in their own places. Fire and earth, since they are bound for the extremes of the sublunary world, reach states approximating purity, without actually attaining it; while water and air remain in the middle, mixed up with each other (*GC* II.3, 30b30-331a1). So the elements, as they disperse from a decomposing body, do not become pure entities, perceptible in themselves: they remain elements in, and of, the sublunary world.[100] As Aristotle explains in the *Meteorologica*, the whole of the sublunary world (*kosmos*) is like a body, composed (*sunestêke*) out of fire, air, water, and earth (I.2, 339a19-20).

If the elements are not perceptible entities in themselves, however, their effects are nevertheless felt in every material thing. For the bodies that we do perceive owe their perceptible qualities to the four elements (cf. *GC* II.6, 334a13-14). Fire and water, for instance, are the causes of the heat or coolness in composite bodies (*Metaph.* II.1, 993b25-6). Now this is not to say that we can always or necessarily determine the nature of the elemental balance of a body simply by examining its tangible affections. Rather, each body reveals which element predominates in its constitution according to its powers or potencies (*dunameis*), i.e., according to the manner in which the body reacts to external phenomena (*Meteor.* IV.4, 382a5-6). In other words, the peculiar ratio of the mixture of the elements in the material structure of a sensible substance is indicated by the substance's tendencies to react in particular ways under different environmental conditions. So, for instance, a substance that melts easily under the influence of

[100] At *Metaph.* VII.16, 1040b56-8, Aristotle says of the parts of animals that 'even when separated, they are as matter'. It is not completely clear whether or not the same goes for the elements, but I think it would make sense so to presume; Cf. VII.2, 1028b9-10, and *DC* III.8, 306b19-20.

heat must have in its elemental mixture a high proportion of water to earth, and thus may be described as 'watery'; but under normal conditions or 'room temperature' it may be dry, not wet (*Meteor.* IV.II, 389a7-9). Likewise a substance containing much fire (or air) need not be perceptibly hot under every condition, but it will probably be highly inflammable, i.e., it will have the power or capacity to become very hot (cf. *Meteor.* I.4, 341b18-22; I.3, 340b29). The extent, then, to which a body has the power to become hotter or colder, drier or wetter, is indicative of the ratio of the mixture of the elements (cf. *GC* II.7, 334b13-16).

What this means is that the differentiae of the elements hot and cold, dry and wet are, for Aristotle, the *powers* of the elements. This view of the contraries is in line with that of many of Aristotle's predecessors: Alcmaeon of Croton, for instance, and the Hippocratics, identify hot and cold, dry and wet as *dunameis* (DK 24B4.2; *On Ancient Medicine*, 14, 7; cf. 20, 22, 3-5); and Aristotle himself is not averse to referring to them quite explicitly in this way (*PA* II.1, 646a15; *Meteor.* IV.1, 378b29, IV.2, 379b11).

4.5 In this chapter I have attempted to clarify the status of the contraries hot and cold, dry and wet. Firstly, I rejected the claim that Aristotle believes that the contraries are more deserving of the name *stoicheia* than fire, air, water, and earth, thus completing the argument of the first chapter (s. **2**). Secondly, I emphasised Aristotle's description of the contraries as differentiae of the elements, and discussed its implications (see ss. **3**, **4**). Finally, I examined the relationship between alteration and elemental change, and the implications of this relationship for our understanding of the contraries and their relationship to the elements (s. **4**).

There remains an outstanding problem: it is not clear how Aristotle can admit elemental change. Consider the following points: (i) there is no alteration, or change in general, unless there is something which acts and something which is affected (*De Gen. et Cor.* I.6, 322b9-11); (ii) there is no action and affection unless there is a single underlying substratum or *hupokeimenon* (322b13-19; cf. *Phys.* I.7, 190b32f.). Now, as we have seen, Aristotle insists that the elements change into each other (s. **4.3**). The elements are able to change into each other

because they each possess a pair of differentiae that renders each one contrary to the others (*GC* II.4, 331a12-20). But what is the *hupokeimenon* that allows fire, air, water, and earth to change into each other?

It would have to be a matter that the elements have in common. On a number of occasions Aristotle seems to confirm this (e.g., *Meteor* I.3, 339a36-b2, *De Caelo* IV.5, 312a30-3). But fire, air, water, and earth, as I have argued, are genuinely elemental; they are the basic forms of matter. Unless Aristotle admits some other matter besides these elements, from which they come to be, and which underlies the change of one into the other, it would seem that he cannot admit elemental change. Yet, on the other hand, if Aristotle *does* posit a single matter for the elements, then he is in danger of reducing generation and corruption to alteration. The problem here, which I address in Part II of this thesis, is this: What does Aristotle identify as the matter of the elements?

Texts for Chapter 2

[a] *De Gen. et Cor.* II.2-3, 330a24-b7

Δῆλον τοίνυν ὅτι πᾶσαι αἱ ἄλλαι διαφοραὶ ἀνάγονται εἰς τὰς πρώτας τέτταρας. Αὗται δὲ οὐκέτι εἰς ἐλάττους· οὔτε γὰρ τὸ θερμὸν ὅπερ ὑγρὸν ἢ ὅπερ ξηρόν, οὔτε τὸ ὑγρὸν ὅπερ θερμὸν ἢ ὅπερ ψυχρόν, οὔτε τὸ ψυχρὸν καὶ τὸ ξηρὸν οὔθ' ὑπ' ἄλληλ' οὔθ' ὑπὸ τὸ θερμὸν καὶ τὸ ὑγρόν εἰσιν ὥστ' ἀνάγκη τέτταρας εἶναι ταύτας. Ἐπεὶ δὲ τέτταρα τὰ στοιχεῖα, τῶν δὲ τεττάρων ἓξ αἱ συζεύξεις, τὰ δ' ἐναντία οὐ πέφυκε συνδυάζεσθαι (θερμὸν γὰρ καὶ ψυχρὸν εἶναι τὸ αὐτὸ καὶ πάλιν ξηρὸν καὶ ὑγρὸν ἀδύνατον), φανερὸν ὅτι τέτταρες ἔσονται αἱ τῶν στοιχείων συζεύξεις, θερμοῦ καὶ ξηροῦ, καὶ θερμοῦ καὶ ὑγροῦ, καὶ πάλιν ψυχροῦ καὶ ὑγροῦ, καὶ ψυχροῦ καὶ ξηροῦ. Καὶ ἠκολούθηκε κατὰ λόγον τοῖς ἁπλοῖς φαινομένοις σώμασι, πυρὶ καὶ ἀέρι καὶ ὕδατι καὶ γῇ· τὸ μὲν γὰρ πῦρ θερμὸν καὶ ξηρόν, ὁ δ' ἀὴρ θερμὸν καὶ ὑγρόν (οἷον ἀτμὶς γὰρ ὁ ἀήρ), τὸ δ' ὕδωρ ψυχρὸν καὶ ὑγρόν, ἡ δὲ γῆ ψυχρὸν καὶ ξηρόν, ὥστ' εὐλόγως διανέμεσθαι τὰς διαφορὰς τοῖς πρώτοις σώμασι, καὶ τὸ πλῆθος αὐτῶν εἶναι κατὰ λόγον.

[b] *De Gen. et Cor.* II.3, 330b21-30

Οὐκ ἔστι δὲ τὸ πῦρ καὶ ὁ ἀὴρ καὶ ἕκαστον τῶν εἰρημένων ἁπλοῦν, ἀλλὰ μικτόν. Τὰ δ' ἁπλᾶ τοιαῦτα μέν ἐστιν, οὐ μέντοι ταὐτά, οἷον εἴ τι τῷ πυρὶ ὅμοιον, πυροειδές, οὐ πῦρ, καὶ τὸ τῷ ἀέρι ἀεροειδές· ὁμοίως δὲ κἀπὶ τῶν ἄλλων. Τὸ δὲ πῦρ ἐστιν ὑπερβολὴ θερμότητος, ὥσπερ καὶ κρύσταλλος ψυχρότητος· ἡ γὰρ πῆξις καὶ ἡ ζέσις ὑπερβολαί τινές εἰσιν, ἡ μὲν ψυχρότητος, ἡ δὲ θερμότητος. Εἰ οὖν ὁ κρύσταλλός ἐστι πῆξις ὑγροῦ ψυχροῦ, καὶ τὸ πῦρ ἔσται ζέσις ξηροῦ θερμοῦ. Διὸ καὶ οὐδὲν οὔτ' ἐκ κρυστάλλου γίνεται οὔτ' ἐκ πυρός.

[c] *De Gen. et Cor.* II.4 331a7-11

Ἐπεὶ δὲ διώρισται πρότερον ὅτι τοῖς ἁπλοῖς σώμασιν ἐξ ἀλλήλων ἡ γένεσις, ἅμα δὲ καὶ κατὰ τὴν αἴσθησιν φαίνεται γινόμενα (οὐ γὰρ ἂν ἦν ἀλλοίωσις· κατὰ γὰρ τὰ τῶν ἁπτῶν πάθη ἀλλοίωσίς ἐστιν), λεκτέον τίς ὁ τρόπος τῆς εἰς ἄλληλα μεταβολῆς

[d] *De Gen. et Cor.* I.1, 314b17-26

Τὰ γὰρ πάθη, καθ' ἃ φαμεν τοῦτο συμβαίνειν, διαφοραὶ τῶν στοιχείων εἰσίν, λέγω δ'οἷον θερμὸν ψυχρόν, λευκὸν μέλαν, ξηρὸν ὑγρόν, μαλακὸν σκληρὸν καὶ τῶν ἄλλων ἕκαστον, ὥσπερ καὶ φησὶν Ἐμπεδοκλῆς ἠέλιον μὲν λευκὸν ὁρᾶν καὶ θερμὸν ἁπάντῃ, ὄμβρον δ' ἐν πᾶσιν δνοφόεντά τε ῥιγαλέον τε. Ὁμοίως δὲ διορίζει καὶ ἐπὶ τῶν λοιπῶν. Ὥστ' εἰ μὴ δυνατὸν ἐκ πυρὸς γενέσθαι ὕδωρ μηδ' ἐξ ὕδατος γῆν, οὐδ' ἐκ λευκοῦ μέλαν ἔσται οὐδὲν οὐδ' ἐκ μαλακοῦ σκληρόν· ὁ δ' αὐτὸς λόγος καὶ περὶ τῶν ἄλλων· τοῦτο δ' ἦν ἀλλοίωσις.

PART II

3

The Matter of the Perceptible Bodies

Introduction to Part II

1.1 In Part I of this thesis I have considered some of the key exhibits of evidence in favour of the popular view that Aristotle does *not* believe that the 'so-called elements' fire, air, water, and earth are truly elemental, and I have argued that the evidence is not compelling. In particular, I have rejected the view that the contraries hot and cold, dry and wet constitute the so-called elements, and explained how the relationship between the contraries and the so-called elements ought to be conceived. This argument, of course, will not by itself furnish the conclusion that the so-called elements are, for Aristotle, the *genuine* elements of bodies, i.e., the most basic kinds of matter that Aristotle recognises; nevertheless it certainly points us towards that conclusion.

And yet it may seem as if I have thus far ignored the elephant in the room. For Aristotle claims that the elements come to be; in particular, he says they come to be from the matter of the perceptible bodies (*GC* II.1, 329a24-6). This raises a difficulty if one wants to argue, as I do, that the so-called elements are truly elemental, i.e., that there is no matter (or matters) more primitive than the so-called elements, out of which they are composed, or into which they are analysable. In Part II of this thesis I face up to this difficulty. I intend to explore the extent to which the view of the so-called elements defended in Part I can be maintained in the light of Aristotle's insistence that there is some matter from which the so-called elements come to be. The interpretation of what we might call 'the matter of the elements'[1] that I shall propose in what follows is, I believe, original, and while I readily admit it is not entirely free

[1] I use the expression guardedly, as whether or not there is a matter *of* the elements, i.e., *of which* the elements are made or composed, as opposed to a matter *from which* the elements come to be out of, is precisely what is at issue. See Ch. **4**, s. **1.1**.

from teething difficulties, as it were, I hope its merits will be apparent notwithstanding these difficulties. For I believe it has merits, particularly in relation to the main alternative interpretations, namely, that the matter of the elements is (a) 'prime matter', i.e., a bare or completely formless substratum that exists only potentially, or (b) the four elements themselves.

Much of my interpretation will be worked out in the final chapter, but the present chapter is pivotal. For I approach the question of the matter of the elements in the following way. At *De Gen. et Cor.* II.1 Aristotle identifies what he calls 'the matter of the perceptible bodies' as that from which the elements come to be (s. **1.3**). My aim in this chapter is to unpack what is intended, in this context, by the expression 'the matter of the perceptible bodies'. To do so, however, involves clarifying what the 'perceptible bodies' are, in this context. This latter task takes up the bulk of the chapter (ss. **2-4**). I argue that these perceptible bodies, in this context, are not, nor do they include, the simple bodies or elements fire, air, water, and earth. The significance of this argument is that it opens up the possibility, which I intend to exploit, that the matter of the perceptible bodies, although it *is* that from which the elements come to be, is not a matter more primitive than the elements. On the contrary, as I shall suggest in the last section of this chapter, and defend more thoroughly in the final chapter, the matter of the perceptible bodies is something that the elements *compose*.

1.2 Aristotle begins the second book of the *De Gen. et Cor.* with a summary of the discussion up to this point (328b26-31). Following this summary he announces the next topic for discussion (328b31-3):

> It remains to consider the so-called elements of bodies. For the generation and corruption of all substances constituted by nature (*pasais tais phusei sunestôsais ousias*) are not without the perceptible bodies (*ouk aneu tôn aisthêtôn sômatôn*).[a]

What does it mean to say that the generation and corruption of all naturally constituted substances are not without the perceptible bodies? The phrase *ouk aneu* usually indicates a condition the absence of which ensures that an endeavour, process or item will not be successful, completed, or existing.[2] It indicates what is *necessary* for some thing to occur, or to be. So Aristotle is saying that the perceptible bodies are necessary for the generation and corruption of all naturally constituted substances. But what are these 'perceptible bodies', and why is the generation and corruption of all naturally constituted substances thus dependent upon these things? Williams complains that the explanations given by commentators of this assertion are unconvincing.[3] Admittedly, it is not a problem that has fired the imagination of very many scholars. But it seems to me that how we read 328b32-3 is of great significance. This is because what Aristotle intends by the phrase 'the perceptible bodies' at 328b33 is presumably just what he intends when he uses the same phrase some thirty lines later, at 329a25. The latter reference occurs in a passage where Aristotle presents his own account of the matter (*hulê*) that underlies generation and corruption:

> We say that there is some matter of the perceptible bodies (*tina hulên tôn sômatôn tôn aisthêtôn*), but this is not separate but always with a contrariety, from which (*ex hês*) the so-called elements (*ta kaloumena stoicheia*) come to be. A more accurate discussion about them (*peri autôn*) is in another work. But since this is also (*kai*) the way the primary bodies (*ta sômata ta prôta*) [come] from the matter (*ek tês hulês*), we should also talk about these (*peri toutôn*), taking as principle and primary the inseparable matter that underlies the contraries… (329a24-31).[b]

Aristotle appears to assert here that the 'so-called elements' come to be from the matter of the perceptible bodies (see s. **1.3**). Now, as I stated, the task in the second part of this thesis is to determine what Aristotle identifies as the matter of the elements. If the matter of the perceptible bodies is that from which the elements come to be, then it makes sense to consider, firstly, the matter of the perceptible bodies. In order to do so, however, we need to

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[2] See, e.g., Euripides, *Bacchae*, 764, *Iphigenia in Aulis* 809; Xenophon, *Memorabilia* 3.11.17.l.5; Plato *Laws*, 811c8.

[3] Williams (1982), 152.

clarify what Aristotle intends by his use of the phrase *ta aisthêta sômata* in the context of *De Gen. et Cor.* II.1. Hence the importance of considering Aristotle's use of this phrase at 328b33. In this chapter I duly examine the assertion at 328b32-3.

Now one way, *indeed the most common way*, to approach this assertion is to assume that the expression 'the perceptible bodies' can be given a determinate reference, i.e., that Aristotle is referring to some particular kind or class of perceptible bodies, e.g., the simple bodies fire, air, water, and earth. Another approach, however, is to focus upon Aristotle's description of the items in question as *perceptible bodies*. On the latter approach, Aristotle is not referring, at 328b32-3, to *particular kinds* of perceptible bodies. His intention, rather, is to make a more general point, i.e., that there is something about the *perceptibility* of perceptible bodies, something about what being perceptible entails, that explains why such bodies are necessary for the generation and corruption of naturally constituted substances. In other words, there are certain features or capabilities that a thing has by virtue of being perceptible, and it is the possession of these features or capabilities that renders perceptible bodies (or *some* perceptible bodies) the things without which the generation and corruption of all naturally constituted substances do not take place.

In what follows I consider the merits of both approaches. In my discussion of the former (ss. **2-3**), I offer reasons to reject the view most commonly found in the secondary literature, i.e., that the perceptible bodies in question are, or include, the simple bodies. If these reasons are good reasons, then it ought to follow that by *ta aisthêta sômata* at 328b33, and hence at 329a25, Aristotle intends *composite* bodies—for if they are not simple, then they must be composite (see e.g., *DC* I.2, 268b26-7). But this conclusion is not unproblematic, and for this reason I turn to consider the second approach (s. **4**). Indeed I proceed to argue that the assertion at 328b32-3 is best understood if we reflect that perceptible bodies (or rather, the perceptible bodies *in question*), by virtue of being perceptible, in particular, tangible, are capable of contact, in particular, *mutual* contact. That they are thus capable is crucial because, as

Aristotle explains at *De Gen. et Cor.* I.6, unless bodies come into contact with one other, there can be no action and affection, mixing, or alteration—all of which are necessary for generation and corruption to occur. Hence the generation and corruption of naturally constituted substances are not without bodies that are capable of mutual contact, i.e., not without perceptible, in particular, *tangible*, bodies.

But although, on the second approach, the assumption is that Aristotle does not intend a specific reference to a particular kind or group of perceptible bodies, but is interested in perceptible bodies insofar as they are perceptible, nevertheless, as I shall argue, it is apparent from the context that not *everything* that can be called a 'perceptible body' is necessary for the generation and corruption of naturally constituted substances. The philosophically interesting question, then, is precisely *which* perceptible bodies, in this context, *are* necessary for the generation and corruption of naturally constituted substances. I believe this to be a question we can, and ought to, try to work out. I want to show that the second approach leads inevitably to the same conclusion as that of the first approach, i.e., that the perceptible bodies in question are (corruptible) composite bodies (s. **4.4**).

It follows, therefore, that when Aristotle speaks of the *matter* of the perceptible bodies, we should understand: the matter of those things that are capable of mutual contact, i.e., *corruptible composite bodies.* In the last section of this chapter I consider the matter of these bodies (s. **5**), and I shall suggest that the matter of the perceptible bodies is something composed of the four elements, or, to borrow a phrase, 'some mixture of the elements'.[4] The stage is thus set for the final chapter, where I establish that Aristotle identifies this stuff as that from which the elements come to be, and I attempt to explain how this stuff can act as that from which the elements come to be. As I say, my proposed explanation is not without difficulties. But, not only does it seem to have reasonable textual support, it may also evade the problems that Aristotle finds in the theories of material monism and pluralism of his predecessors.

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[4] Bostock (1994), 73. See s. **5.5**.

1.3 I begin with some preliminaries. Since the overall plan of this and the next chapter is largely motivated and guided by two claims, it is worth pausing to try to justify them immediately. The first is that, at 328b33 and 329a25, the phrase 'the perceptible bodies' is used in the same way. The second is that, at 329a24-26, Aristotle is saying that the so-called elements come to be from the matter of the perceptible bodies.

It needs only a moment's consideration of the structure of *De Gen. et Cor.* II.1 to see that 'the perceptible bodies' at 328b33 are 'the perceptible bodies' at 329a25. The context demands that this is so. Following his assertion that the generation and corruption of naturally constituted substances are not without the perceptible bodies (328b32-3), Aristotle considers what previous thinkers posit as the underlying matter of 'these' (*toutôn de tên hupokeimenên hulên*, 328b33-4), where 'these' must be 'the perceptible bodies'.[5] Thus he is considering what his predecessors posit as the matter of the perceptible bodies (328b33-329a24). At 329a24-b3, Aristotle gives us his own view about the matter of the perceptible bodies. Since he evidently wants to contrast his own conception of the *matter* of the perceptible bodies with that of his predecessors, the expression 'the perceptible bodies' must have the same meaning on both occasions in which it is used in *De Gen. et Cor.* II.1.[6]

As for the second claim, there are two possible interpretations. The more common is that Aristotle is saying that the matter of the perceptible bodies is that from which the so-called elements come to be. But there is room for doubt that this is correct. For the Greek is ambiguous as to whether the antecedent of *ex hês* is *hulên* or *enantiôseôs*; i.e., whether the 'that from which' is the matter, or the contrariety.[7] Some commentators are inclined to opt for the latter interpretation, and say that the elements come to be from the contrariety, rather than from the matter.[8] For this to make sense we presumably have to understand by *enantiôsis* here a

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[5] Taken thus by Joachim (1922), 191, King (1956), 379, Mugler (1966), Williams (1982), 152, Rashed (2005).
[6] But cf. Joachim (1922). J. appears to delineate the perceptible bodies at 328b33 in such a way that 'fully formed' or ensouled composite substances are excluded (192-3), yet he takes those at 329a25 in the sense of 'any and every perceptible body' (198, 199). See note 44 below.
[7] See Broadie (2004), 140, n. 53, Rashed (2005), 154.
[8] King (1956), 381, argues that *enantiôseôs* is the most natural antecedent of *ex hês*. Cf. Mugler's translation (1966) of 329a24-6.

reference to the primary contrarieties, hot and cold, dry and wet. The suggestion, then, is that the so-called elements are constituted by hot, cold, dry and wet.[9] Now much of the first part of this thesis is concerned with the rejection of this view of the relationship between the so-called elements and the contraries (see esp. Ch. **2**, s. **2**). So we have already offered reasons why such a suggestion is somewhat suspect. There are, in any case, one or two contextual difficulties that the suggestion faces. For one thing, at this point in the treatise, Aristotle hasn't yet introduced the primary contrarieties. This point might not seem crucial; it is crucial, however, that *enantiôsis* is in the singular—if Aristotle were referring to hot and cold, dry and wet, we might expect him to use the plural 'contrarieties' (*enantiôseis*), as he does, for instance, at 329a34, when he is undoubtedly referring to the primary contrarieties.[10] Furthermore, at 329a29-30, Aristotle commits himself to the view that the primary bodies come to be from the matter. The primary bodies are fire, air, water, and earth. This ought to clinch the issue: the so-called elements come to be from the matter of the perceptible bodies.[11]

It should be emphasised, however, that we are not really being presented with a choice between the matter and the contrariety as that from which the elements come to be. For the matter is always with a contrariety, and a contrariety is likewise never without some *hupokeimenon* or underlying subject; contrary attributes are not ontologically independent entities (see *GC* I.5, 320b12-17, b22-25; I.7, 324b19-21; cf. *Phys.* I.6, 189a27-34). What comes to be, then, comes from 'the matter that is always with contrariety'. For although one may say that, in one sense, what comes to be comes to be from the matter, while in another sense, what comes to be comes from its contrary, strictly speaking Aristotle's point of view is that what comes to be comes to be from *both* (see *Phys.* I.7, 190b10-17; b19-23; b29-35; 191a4-5; *Metaph.* VII.7, 1033a8-16; cf. also *GC* I.7, 324a14-24).

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[9] Thus King (1956), 381-2.
[10] See Gill (1989), 244, Rashed (2005), xcv, and 154. Cf. Williams (1982), 156.
[11] See Rashed (2005), 154. Joachim (1922), 199, and Williams (1982), 155-6, also think this reading is preferable.

There is, however, a further ambiguity about the claim at 329a24-6 to which I want to draw attention, which will be of particular importance in the final chapter. To say that the so-called elements come to be from (*ek*) the matter of the perceptible bodies is ambiguous: for to say that the former are from the latter may be taken as a claim either about the constitution of the elements, or about the origin or source of the elements. The claim at 329a24-6 is usually taken in the first way, thus the so-called elements are thought to be composed of the matter of the perceptible bodies.[12] But another way of taking 'from' is that it indicates the stuff from which the elements have come to be, or emerged, after a process; as such it does not necessarily imply that the matter of the perceptible bodies is the *constitutive* matter of the elements. This point I will return to in the final chapter, where I argue that the matter of the perceptible bodies is 'that from which' in the latter understanding of 'from'.

Perceptible Bodies

2.1 What are the perceptible bodies in the context of *De Gen. et Cor.* II.1? In this section I make a start on this question. But let's begin by clarifying the reference of the phrase 'substances constituted by nature' (*hai phusei sunestôsai ousiai*). For, whatever the perceptible bodies are, Aristotle identifies them as necessary factors or causes of the generation and corruption of all of these substances.

In the widest sense, things constituted by nature are opposed to things that are man-made (*kata technên*), i.e., artefacts (*ta mê phusei sunestôta*, *Phys.* II.1, 192b12-3, b16; *PA* I.1, 639b15-16; *Metaph.* VIII.3, 1043b22). The former are not necessarily restricted to items of the sublunary world: Aristotle refers to naturally constituted substances that are not subject to generation and corruption, i.e., the heavenly bodies (*PA* I.5, 644b22). And he occasionally talks as though the simple bodies are included among the substances constituted by nature (*Phys.*

[12] See, e.g., Bostock (1995), 217: '[Aristotle] believes that his four elements… are each made of the same matter…' Those who think the *ex hês* at 329a26 refers to the contrarieties, rather than the matter, obviously take 'from' in the constitutive sense also.

II.1, 192b10-13; b32-4; cf. *Metaph.* V.8, 1017b10-12, and *DC* I.1, 268a4-6). It seems clear, however, that the naturally constituted substances, at least in the context of *De Gen. et Cor.* II.1, do *not* include the heavenly bodies. For the former are subject to generation and corruption, whereas the latter are ungenerated and incorruptible.[13] There are reasons also why we might think that the naturally constituted substances in question do not include the simple bodies either. Joachim rules them out precisely on account of their being 'simple': the naturally constituted substances are, he writes, 'the products of natural processes which have brought, and hold, together a plurality of constituents'.[14] But in any case the context itself would appear to indicate that the simple bodies are not among these naturally constituted substances. For, some lines after the claim that the generation and corruption of these substances are not without the perceptible bodies (328b32-3), Aristotle remarks that the generation and corruption of things (*pragmata*, 329a4-5) result from changes in the *primary* things (*ta prôta*, a5-8). Now the former presumably are naturally constituted substances, for it is the generation and corruption of these that is at issue. The 'primary things', on the other hand, are, or at least include, the simple (or primary) bodies, fire, air, water, and earth. So Aristotle is saying that the naturally constituted substances come to be, and pass away, due to changes in the simple bodies. This would seem to imply a distinction between the two: the latter are *in*, or *constitute*, the former (see also *De Long.* 2, 465a13-17).

So what are the naturally constituted substances in this context? For the ancient commentators, they are the homoeomerous bodies.[15] But Joachim is surely right to extend the reference beyond such bodies to include also 'whole' organic substances,[16] such as, e.g., plants

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[13] See, e.g., *Metaph.* XII.1, 1069a30-b1, and Joachim (1922), 192. On the distinction between heavenly, or superlunary, and sublunary bodies, and its origin with Aristotle, see Burnet (1892), 27, n. 2; cf. Lloyd (1968), 134f. There is no reason to think that this distinction is inapplicable here (cf. *GC* II.9, 335a33-b5).

[14] (1922), 191. Scaltsas (1998), www.archelogos.com/project/archie-frameset.jsp?xmlfile=gcii1.xml, takes the naturally constituted substances to be composite substances; cf. translations of 328b32-3 by Williams (1982) and Rashed (2005).

[15] See Rashed (2005), 152.

[16] Aristotle often uses the phrase 'the whole body', *to sunolon sôma*, *to soma holon* if he wants to speak about body in the sense of the body of a substance such as an animal; see, e.g., *PA* I.4, 644b7-8. See also entry for *sôma* in Bonitz (1870), 742b56ff., and Everson (1997), 64-65.

and animals, as well as their homoeomerous (and anhomoeomerous) parts.[17] In terms of Aristotle's system, the naturally constituted substances at 328b313 are the composite substances of the sublunary world (and their parts). What then are the perceptible bodies?

2.2 It seems clear that, in general, if something is a *body*, then it is either a simple body, a composite (or mixed) body, or a heavenly body. That is to say, it falls into one of the three classes of things that are generally agreed to be substances. For there are a few occasions when Aristotle offers what we might call an inventory of the sorts of things that are generally thought to be substances, and on these occasions he names the simple bodies, fire, air, water, and earth; composites such as plants and animals, and their parts; and the heavenly bodies, e.g., the Sun, moon and stars (*Metaph.* VII.2, 1028b8-13, VIII.1, 1042a6-11; *Phys.* II.1, 192b9-12, and *DC* III.1, 298a29-32). But it is clear that these things are thought to be substances because bodies, i.e., natural bodies,[18] are generally thought to be substances (*DA* II.1, 412a11, *Metaph.* XII.1, 1069a30-1; cf. *DC* III.1, 298b1-4; *Metaph.* V.8, 1017b10-13). But natural bodies, by definition, are *perceptible* bodies: a natural body is something that has perceptible characteristics, which is to say, it is something perceptible (*Cat.* 8a1; *GC* II.1, 329a10-12; *DA* III.12, 434b12; cf. *Phys.* VII.2, 244b5).[19]

So it is clear that the sorts of things that Aristotle identifies as perceptible bodies are simple bodies, corruptible composite substances, and heavenly bodies. It seems reasonable, then, to consider whether 'the perceptible bodies' at *De Gen. et Cor.* II.1 are identifiable with one, two, or all three of these classes of things. Indeed, if we reflect upon the causes of the

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[17] (1922), 191-3.

[18] By 'bodies' what is meant are *natural* bodies, i.e., those things that have within themselves an internal principle to change or to rest (*Phys.* II.1, 192b8-16, b20f.), as opposed, e.g., to artefacts.

[19] Aristotle doesn't specify natural bodies in these contexts, but it is clear that these are what he has in mind. Artefacts, of course, are corporeal and hence *perceptible*. But they are so in virtue of being made from natural bodies, such as, for instance, wood and stone (see *Phys.* II.1, 192b16-20). And although Aristotle occasionally appears to countenance mathematical *bodies* (*Metaph.* I.8, 990a15-6; cf. V.13, 1020a14, XI.1, 1059a38-b2, with 1059b9-14), strictly speaking, he does not think that there are such bodies as opposed to natural bodies. Rather, he believes that the 'bodies', or better, the *objects*, of mathematics, are abstractions from certain properties of natural bodies. In general, natural bodies (*ta phusika*) are the principles of these other 'bodies' (*tauta gar tôn allôn archai*, *DA* II.1, 412a11-13, cf. *Phys.* 193b24-194a7).

generation and corruption of naturally constituted substances, one could make the case that the generation and corruption of naturally constituted substances are not without *all three* of these classes of things. For we might consider *the simple bodies* as the material causes of generation and corruption, while the formal (including final[20]) and efficient causes, are not separate from individual *corruptible composite substances*, such as plants and animals. In particular, there must be substances that are already existing in a mature state, i.e., parents, which, by their actions, are responsible for the generation of corruptible composite substances of the same kind. This is because the efficient cause of the generation of corruptible composite substances, i.e., composites of form and matter, is that which is transmitted by the parents (cf. *GA* I.2, 716a4-17; I.22, 730b1, b10; II.1, 734b21).[21] The efficient causes of the *continuity* of generation and corruption, on the other hand, are *the eternal perceptible bodies* (*GC* II.10, 336a32f., 336b15f., b34; cf. *DC* II.3). Thus Aristotle, at *Metaphysics* XII.5, identifies all three classes of perceptible bodies as the causes of the generation of corruptible composite substances: the causes of man, he writes, are 'the elements, [e.g.] fire and earth, as matter, and the particular form; and yet also something else that is external (*kai eti ti allo exô*), such as the father, and besides these (*para tauta*) the sun and the ecliptic; these latter things are… the moving causes' (1071a13-17). Elsewhere he is more succinct: 'both man and the sun generate man' (*Phys.* II.2, 194b13). Hence one could well argue that the generation and corruption of all corruptible composite substances are not without *all* the things that can be described as 'perceptible bodies'.

2.3 But is *this* what Aristotle is saying at *De Gen. et Cor.* II.1? The test is whether or not this interpretation fits the immediate context, and it is a test with which each of these kinds of perceptible bodies appear to struggle. So there is reason to doubt that Aristotle is thinking

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[20] Often when discussing generation Aristotle identifies the final cause or 'that for the sake of which' (*ou eneka*), with form, in the sense of the essence or the definition of each thing; see, e.g., *PA* I.1, 63915; cf. *Metaph.* VIII.4, 1044a36-1044b1.

[21] Thus Aristotle's frequent remark 'man begets man' (see, e.g., *Phys.* II.1, 193b8-12, *PA* I.1, 640a18-25, *GA* II.1, 735a20-1, *Metaph.* XII.3, 1070a7-8; VII.7, 1032a25).

about *all* of the things that may be described as 'perceptible bodies' at *GC* II.1. Consider, for instance, the heavenly bodies.

The status of the heavenly bodies poses something of a problem. Aristotle calls them the eternal *perceptible bodies* (*Metaph.* XII.1, 1069a30), and, as we have seen, they are necessary factors in the explanation of the generation and corruption of things.[22] But the possibility that the heavenly bodies are among the perceptible bodies at 328b33 is never taken very seriously.[23] It is usually presumed that Aristotle's concern is limited to the things of the sublunary world; hence the perceptible bodies at 328b33 are presumed to be those perceptible bodies of the sublunary world. But this presumption needs to be defended. One way of defending it is to look ahead to 329a24-b3, where Aristotle gives his own view of the matter of the perceptible bodies (see s. **4.4** for another way of defending it). Here it is quite clear that the heavenly bodies are excluded from consideration. This is because Aristotle identifies the so-called elements as 'fire, water and such things' (a35). Fire, air, water, and earth are the elements of the bodies of the sublunary world; the eternal bodies are composed of a different element (see, e.g., *DC* I.2, 268b26ff.). Indeed, Aristotle says that the former elements change into each other (329a35-b1), thus ruling out any slim possibility that within the vague reference to 'fire, water and such things' he may be smuggling the immutable element of the heavenly bodies.[24] So when he refers to the matter of the perceptible bodies, Aristotle must be talking about the matter of the perceptible bodies of the sublunary world.

The evident exclusion of the eternal perceptible bodies from among 'the perceptible bodies' at *De Gen. et Cor.* II.1 indicates that when Aristotle uses the phrase *ta aisthêta sômata* in this ocntext he does not intend all the perceptible bodies there are. The 'perceptible bodies' in question, in this context, are of the sublunary world. But is the domain of discourse to suffer further restriction? Is Aristotle referring, in other words, to all *sublunary* perceptible bodies, i.e.,

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[22] Cf. Frede, 'Introduction' in Frede and Charles (eds) (2000), 11f.
[23] Joachim (1922), Williams (1982), Scaltsas (1998), and Rashed (2005) don't even consider the possibility. But cf. Philoponus, *In de gen et cor* 205.34-206.4.
[24] See also Broadie (2004), 141.

composite *and* simple bodies, or to some only, i.e., composite *or* simple bodies? This is what I consider in the next section.

The Perceptible Bodies of the Sublunary World

3.1 The most common view in the secondary literature is that, in the context of the *De Gen. et Cor.* II.1, *ta aisthêta sômata* at the very least *include* the simple bodies, or so-called elements, fire, air, water, and earth. For the ancient commentators the perceptible bodies *are* the simple bodies.[25] This was the view also of Zabarella, the 16th century Aristotelian commentator, who claimed to be following Aquinas and Averroes.[26] Modern scholars, while often silent about 328b32-3 itself, reveal something of their views in what they say about the matter of the perceptible bodies at 329a25, and it is clear that the majority opinion is that the perceptible bodies in question certainly *include* the elements fire, air, water, and earth.[27] This is because fire, air, water, and earth are often taken to be the '*primary* perceptible bodies',[28] and so, at 329a24-35, Aristotle is presumed to be presenting his view of the matter of these primary perceptible bodies; indeed the phrase 'potentially perceptible body' at 329a33 is often taken to mean 'what is potentially an *element*'.[29]

Certainly there is much to say for this interpretation. For one thing, the simple bodies fire, air, water, and earth are, evidently, *bodies*, in particular, *natural* bodies, and hence perceptible. And, of course, at *De Gen. et Cor.* II.2, Aristotle distinguishes the simple bodies according to perceptible characteristics (see Ch. **2**, s. **2**). Moreover, the simple bodies are intrinsically involved in the generation and corruption of corruptible composite substances. Looking to the *De Gen. et Cor.* II.1 itself, Aristotle says that changes in the primary things (*ta prôta*), by which he presumably intends the simple, or primary, bodies, result in the generation

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[25] See Rashed (2005), 152.
[26] Reported by Joachim (1922), 191.
[27] See, e.g., Solmsen (1958), 245, McMullin (1963a), 206, n. 47, Jones (1974), 499, n. 21, Robinson (1974), 182, Graham (1987), 476, n. 5, Furth (1988), 226.
[28] A phrase used by Joachim (1922), 198-9, Longrigg (1993), 154; cf. King (1956), 379, n. 27, Guthrie (1981), 129.
[29] For Gill (1989), 246, 'the actually perceptible bodies are the four elements', 247; she presumably means *in this context*. See also Loux (1991), 243, n. 8, de Haas (1997), 71-2, Broadie (2004), 140-1, with n. 59.

and corruption of things (329a5-8). In other words, the generation and corruption of naturally constituted substances do not occur without the simple bodies and the changes that they undergo (cf. *De Long.* 2, 465a13f.; see also *DC* I.12, 283b21).

But is it the case that Aristotle is using the phrase *ta aisthêta sômata* at 328b33 to refer to the simple bodies *exclusively*, or to a group of bodies that *includes* the simple bodies? Joachim complains that there is no reason to restrict these perceptible bodies to the simple bodies alone.[30] It is not too difficult, however, to discern possible motivating factors. If, e.g., the 'naturally constituted substances' at 328b32 are taken to be the homoeomerous bodies (see s. **2.1**), then the conclusion that the simple bodies are the things without which the naturally constituted substances do not come to be will be within reach on the acceptance of two, not *obviously* unreasonable, assumptions, i.e., (a) that the things described here as 'the perceptible bodies' are not the naturally constituted substances (an assumption upon which I have more to say below, ss. **3.4**, **4.5**); and (b) that the perceptible bodies in question are items of less complexity than the naturally constituted substances, and are identifiable as the material cause of the latter.[31]

To raise a doubt about the identification of the perceptible bodies at 328b33 with the simple bodies, then, it seems sufficient to deny that the extension of the phrase 'naturally constituted substances' at 328b32 is restricted to the homoeomerous bodies (s. **2.1**). For instance, if the 'naturally constituted substances' are, as suggested above (s. **2.3**), corruptible composite substances, then it is difficult to justify the restriction of 'the perceptible bodies' to the simple bodies, even if we retain assumptions (a) and (b). One could, for instance, take the perceptible bodies to *include* the simple bodies, but also the composite parts of naturally constituted substances, i.e., the homoeomerous and anhomoeomerous parts.[32] Of course, we

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[30] (1922), 191.
[31] Cf. note 46 below.
[32] See notes 42 and 46 below.

could refuse to accept assumptions (a) and (b), and thus allow the inclusion of 'whole' composite substances in the extension of 'the perceptible bodies' at 328b33 (see ss. **3.4**, **4.5**).

Consider, indeed, the following text, which seems to echo in some aspects that under consideration. At *De Caelo* III.1, Aristotle says that, having spoken in previous books about the 'primary element', which moves in a circle, 'it remains to consider the other two' (*loipon de peri toin duoin eipein*, 298b6-8; cf. 328b31), i.e., the other two to each of which one of the other possible motions are assigned, namely, fire (upward rectilinear motion) and earth (downward rectilinear motion).[33] He immediately says that, in considering these elements, we should inquire also into generation and corruption, and he explains why: 'For surely generation either does not exist at all, or else only in these elements and the things that come to be out of them' (b8-11). Aristotle, of course, believes that generation does take place; hence his view is that generation and corruption must take place in the elements and the things composed from them. This claim bears comparison to the assertion at 328b32-3. So perhaps a view weaker than what we might call the 'ancient' view is attractive, i.e., that the simple bodies are *among* the perceptible bodies at 328b33, together with the things made out of the simple bodies, i.e., composite bodies. This seems to be the view many modern scholars hold about the perceptible bodies at 329a25.

And yet even this weaker claim is dubious. For there are good contextual reasons to think that the simple bodies are not included among the perceptible bodies in question *at all.*

3.2 Consider again that the reason why we should discuss the so-called elements of bodies is that the generation and corruption of naturally constituted substances are not without the perceptible bodies (328b31-3). It seems fairly clear that 'the bodies' at line b31-2, the elements of which we are now to consider, are 'the perceptible bodies' of line b33, upon which the generation and corruption of naturally constituted substances depend. Aristotle is saying,

[33] Water and air are considered as intermediates between these (cf. I.3, 270b26, I.8, 277b13). See, e.g., Dalimier and Pellegrin (2004), 443, n. 3.

apparently, that since generation and corruption do not take place without the perceptible bodies, then we must consider the so-called elements of these perceptible bodies. Now if Aristotle intends to inquire into the elements of the perceptible bodies, then the perceptible bodies must be things that have elements. In other words, the perceptible bodies at 328b33 must be things that can be analysed into more basic constituents, which is to say that the perceptible bodies at 328b33 are composite bodies. Another way of putting this is to say that the perceptible bodies in question have matter, and indeed Aristotle proceeds by considering what his predecessors identified as the matter of the perceptible bodies (328b33-29a5, taking *toutôn* to refer to the perceptible bodies). But the very fact that he turns to consider the matter of the perceptible bodies leaves no doubt that the perceptible bodies in question are composites, of matter and form (as is obvious at 329a24f.). It follows that fire, air, water, and earth, insofar as they are elements or constituents of bodies, are not, nor are they among, the perceptible bodies at 328b33.

Further difficulties arise if we take the perceptible bodies to be the simple bodies fire, air, water, and earth. To begin with, at 328b33-329a3 Aristotle would appear to be suggesting that his predecessors named one or more of fire, air, water, and earth as the matter of the *elements* fire, air, water, and earth. Empedocles, for instance, would appear to be credited with the view that the matter of the perceptible bodies, i.e., the elements fire, air, water, and earth, is fire, air, water, and earth.[34] So for the survey of his predecessors' views to be coherent, we must distinguish between the elements and the perceptible bodies in question.

Looking ahead to the discussion at 329a24f., Aristotle says that there is a matter of the perceptible bodies, 'from which the so-called elements come to be'.[35] But why would he say this, if the latter were, or were included among, the perceptible bodies? One would think that it goes without saying that the matter of something is that from which the thing comes to be (see, e.g., *Phys.* II.3, 194b23-6). Those who take the perceptible bodies in question to include

[34] See Williams (1982), 152.
[35] See s. **1.3** above for a defence of this reading.

the simple bodies rarely offer a reason *why* Aristotle would feel it necessary to make this apparently obvious point, beyond the suggestion that he wants to emphasise that *every* perceptible body, i.e., including the simple bodies (the 'primary' perceptible bodies), comes to be from some underlying matter.[36] But Aristotle then appears to indicate that separate accounts are necessary of the matter of the perceptible bodies, and of the matter from which the elements, or simple bodies, come to be (329a27-29). For he says that a more accurate account of the former has been given elsewhere (probably *Physics* I.7; see s. **5.1**), and that now, in the *De Gen. et Cor.*, an account must be given of the latter. Since the matter is held to be the same for both (a24-26; see s. **1.3**), and the *way* (*tropon*, 329a27-9) in which the perceptible bodies and the primary bodies come to be is apparently the same, the difference between, and the consequent need for separate accounts for, these subjects would appear to be due to a difference between the class of things referred to here as 'the perceptible bodies', and the simple or *primary* bodies (*ta sômata ta prôta*). The former, then, does not appear to be identical with, *nor even to include*, the latter.

This conclusion is supported by *De Gen. et Cor.* II.2, where Aristotle proposes to investigate 'the principles of perceptible body' (*aisthêtou sômatos archas*, 329b7). Now this, of course, is not a new investigation, but rather the beginning of the investigation into the so-called elements of (perceptible) bodies: he refers to principles (*archai*), but, as he says at 329a5-8, *stoicheia* and *archai* are both good names for the primary things whose changes entail generation and corruption (cf. 329b3-4). What this once again implies is that the set of things that make up the extension of the phrase 'the perceptible bodies', in this context, do not include the elements; rather these 'perceptible bodies' are things that can be analysed into elements. Once more we are obliged to presume a distinction between the perceptible bodies in the context of *De Gen. et Cor* II.1, and the so-called elements, or simple bodies.

Finally, it is never really explained by those who claim that 'the perceptible bodies' at 328b33 are the simple bodies, or so-called elements, why, given that he has just referred to the

[36] See, e.g., Joachim (1922), 198. Cf. Williams (1982), 156.

'so-called elements of bodies' in the preceding line, Aristotle would suddenly and without warning refer to the elements as 'the perceptible bodies'. For, if it were the case that these perceptible bodies are fire, air, water, and earth, it would surely be more natural for Aristotle to say that the reason why we must enquire into the so-called elements is because the generation and corruption of all naturally constituted substances are not without the *so-called elements.* It is worth highlighting this difficulty, as it is a problem faced by all attempts to identify *ta aisthêta sômata* at 328b33 with any restricted or determinate set of perceptible bodies (see below, s. **3.4**). Any claim that Aristotle intends to refer to this or that particular *kind* of perceptible bodies at 328b33 must explain why, instead of specifying clearly which particular kind of perceptible bodies he has in mind, Aristotle uses the rather more general phrase 'the perceptible bodies'.

3.3 Perhaps it is worth re-emphasising that whether or not Aristotle is, in general, prepared to call the simple bodies 'perceptible bodies' is not here in doubt (see s. **2.2** above). Indeed Aristotle sometimes appeals to a general rule that the principles and elements of perceptible bodies must themselves be perceptible (see, *DC* III.7, 306a9-11; *Phys.* IV.1, 209a14-17). Hence the elements of bodies are perceptible, indeed *must* be perceptible, and therefore corporeal. What is in question, rather, is whether or not the simple bodies are, or are among, the things to which Aristotle refers by the expression *ta aisthêta sômata* in the context of *De Gen. et Cor.* II.1. And it seems that they are not. Nor is this a unique use by Aristotle of the expression *ta aisthêta sômata*: in a number of texts we find a distinction between elements, or simple bodies, and things described as 'the perceptible bodies' (*Metaph.* XII.1, 1069a30-3; XII.4, 1070b10-19; XIV.3, 1090a32-35; cf. I.8, 989b31-990a18; *Phys.* IV.1, 209a14-17).[37] So clearly there are occasions when Aristotle wants to distinguish between simple bodies and other kinds of

[37] Cf. also Alexander's distinction between the perceptible bodies (*ta aisthêta sômata*), and the elements fire, air, water, and earth in his discussion of the principles of the Pythagoreans (Diogenes Laertius 8.24; Fragment 58.B.1a, ll.6-7, DK).

bodies, i.e., composites, and on these occasions, or some of them, he refers to the latter as *ta aisthêta sômata.*

But, given that the simple bodies *are* perceptible bodies, why draw the distinction in this way? Here is a suggestion: the simple bodies are not perceptible in the same way that a composite body is perceptible. As I argued in the previous chapter, the simple bodies are not the sort of things with which we come into direct contact—one cannot, for instance, directly perceive the simple body fire, or the simple body earth, by the organ of touch (ss. **3.4**, **4.4**). For instance, we do not directly observe elemental change, but we *infer* that it occurs, from the observable fact of the alteration of composite bodies (see Ch. **2**, s. **4**). This is because the simple bodies are not, as it were, available for direct perception: they are not the sorts of things that one can discover by the senses as discrete objects alongside more familiar, composite, perceptible bodies. Rather, they are always found *in* a composite, i.e., a mixed body;[38] it is the latter that we actually perceive, and not (or not *directly*) its constituent material elements.[39]

Nevertheless, the characteristics of the simple bodies, and the ratio of their mixture in a composite, is inferred from the observation of the perceptible composite, and its reactions to its environment. For the simple bodies are *responsible* for the perceptible characteristics of composite bodies. The perceptible characteristics of composites, in other words, are explained in terms of their constituents. If, e.g., a body is mainly wet, then we can say that it has a high proportion of the simple body water in its constitution. But, although it may seem natural to say that the simple body water *is* wet, and hence perceptible, the way in which water is wet is not the same as the way in which some mainly wet composite is wet.[40] Thus, e.g., at *Meteorologica* IV.4, Aristotle says that determinate, i.e., composite, bodies (*ta sômata ta suntheta kai hôrismena*, *Meteor.* IV.5, 382a26), display certain characteristics, e.g., they are mainly dry or

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[38] Cf. Puig-Montada (1996), 7: the simple bodies are 'physical entities existing always in a body'.

[39] As Aristotle puts it elsewhere, the composite is 'obvious' (*dêlê*)—presumably because this is what we perceive directly, whereas matter is evident 'in a way' (*phanera de pôs kai hê hulê*, *Metaph.* VII.3, 1029a30-2), perhaps because it is grasped by analogy, or by consideration of substantial change; see Ross (1924), II, 166, Burnyeat and others (1979), 16.

[40] Cf. Frede (1992), xxv: 'The latter is wet by somehow *having* wetness, the former by *being* wetness or water'. Cf. *Metaph.* II.1, 993b24-6: '[Fire] is the cause of heat in the other things [that are hot]'.

mainly wet; but they have these characteristics because they are constituted by the simple bodies, e.g., earth and water (382b26-b6; cf. *Timaeus*, 31b6). And while earth is dry, and water wet, the latter are the differentiae, and not affections, of the former.

The point is that the simple bodies fire, air, water, and earth are posited as the sources or principles (*archai*) of perceptible bodies (cf. *GC* II.2, 329b7). They are appropriate principles of perceptible bodies because, as I explained in the previous chapter, their differentiae, hot, cold, dry, wet, are the affections, or sources of the affections, according to which alteration takes place (ss. **3**, **4**). By contrast, *imperceptible* principles, e.g., mathematical objects, cannot, for Aristotle, be the constituents of perceptible bodies because such 'elements' cannot be the sources of affections (see, e.g., *Sens.* 6, 445b13f., discussed in Ch. **2**, s. **4.4**; cf. *GC* I.2, 316a2-4, *DC* III.1, 299a17-18, III.8, 306b22-9; *Metaph.* XIV.3, 1090a32-35). So, on this suggestion, it is in a somewhat extended sense of 'perceptible', i.e., which is applicable not just to those things that are straightforwardly perceptible, but also to the things that are the sources of the perceptibility of the former, that the simple bodies can be said to be perceptible. And if this suggestion is correct, then, at *De Gen. et Cor.* II.2, when Aristotle revises 'perceptible body' to '*tangible* body', i.e., that which can be perceived by touch (329b7-8; cf. *DA* II.11, 423b27-30), we have another instance where he is distinguishing 'perceptible bodies' from simple bodies.

3.4 The foregoing discussion tends to point towards the conclusion that the 'perceptible bodies' in the context of *De Gen. et Cor.* II.1 are to be identified as composite bodies. For it seems fairly safe to say that, if they are not, nor do they include, simple bodies, then they *must* be composites. For bodies are either simple or composite (*DC* I.2, 268b26-7, I.5, 271b17-19; see also III.7, 306b1; *DA* I.5, 410b8-9, III.12, 413b9-10; *Phys.* IV.1, 209a14-15). Nevertheless it is surprisingly difficult to find advocates of this identification.[41] There seems to be a worry that

[41] Williams (1982), 152, points out that the naturally constituted substances 'surely *are* perceptible bodies' (W.'s italics). Scaltsas (1998) takes W. to be identifying the naturally constituted substances with the perceptible bodies, but, as far as I can see, W. does not make *this* claim.

it would render the assertion at 328b32-3 trivial. For if the expressions 'naturally constituted substances' *and* 'the perceptible bodies' at 328b32-3 both designate the same things, i.e., corruptible composite bodies, then Aristotle would appear to be saying no more than that the most significant changes that corruptible composite bodies undergo necessarily involve corruptible composite bodies. Thus interpreted, he appears to be stating something fairly obvious, indeed uninformative.

Fear that Aristotle would be making a rather uninformative claim may go some way towards explaining why so many commentators are keen to distinguish the naturally constituted substances from the perceptible bodies at 328b32-3 (see s. **3.1**). Scaltsas, for instance, openly admits that this is the motivation behind his reading. He insists that taking the naturally constituted substances to be the perceptible bodies in question would not explain *why* the generation and corruption of the naturally constituted substances are not without the perceptible bodies. If the assertion is to have explanatory value, he says, 'clearly a differentiation is required', i.e., between the naturally constituted substances and the perceptible bodies in question.[42] Now there is a flaw in this reasoning is, as I shall explain below (s. **4.5**). But, in any case, even if it *were* correct to say that the assertion at 328b32-3 lacks explanatory value if the perceptible bodies in question are identified as the naturally constituted substances, it need not follow that this *must* be the wrong way to interpret 'the perceptible bodies' at 328b33. For it would still be the case that the assertion, so understood, expresses a truth, albeit a trivial one. Scaltsas' rejection of the identity of the naturally constituted

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[42] Scaltsas (1998). S. proceeds to identify the perceptible bodies with the matter of corruptible composite substances, i.e., the stuff composed by the elements and composing the naturally constituted substances. But this is very questionable. For matter is always the matter *of* some thing, in particular, of some composite thing (*Phys.* II.2, 194b8-9; IV.2, 209b22, IV.4, 212a1). So, while matter is perceptible in some sense (cf. *Metaph.* VI.1, 1025b34), what we perceive is not the matter itself, on its own, but the *composite* of matter and form (see note 39). Thus S.'s explanation is, at best, incomplete: it would be more informative to say, e.g., that the generation of composite substances is not without the matter of composite substances, *and that this latter is itself not without composite substances.* Cf. Pseudo-Plutarch: 'All things that come to be, and generation itself, is not without potentiality, and potentiality is not without (*ouk aneu*) substance' (*De Fato*, 570f7-571a2).

substances and the perceptible bodies at 328b33 thus rests on an assumption that the assertion at 328b32-3 is non-trivial.[43]

Nevertheless it seems right to try to avoid imputing to Aristotle trivialities. And perhaps one way of attempting to interpret the assertion at 328b32-3 non-trivially, i.e., while maintaining the identification of the perceptible bodies in question with corruptible composite bodies, is to take it to be analogous to Aristotle's frequent remark 'man begets man'.[44] This is another claim that, on the face of it, may appear somewhat uninformative. But what Aristotle intends by this, of course, is that there must be substances of a certain kind, or nature, if substances of that kind are to come into being (cf. *Metaph.* VII.8,1033b29-32; VII.9, 1034b16-18; VII.7, 1032a15-25; *PA* I.1, 640a22-26, b4-13). The assertion at 328b32-3, if we understand the phrases 'naturally constituted substances' and 'perceptible bodies' to be interchangeable, might thus be taken as a variation, or generalisation, of this claim. Indeed Aristotle has already invoked this principle earlier in the *De Gen. et Cor.* (I.5, 320b17-20; cf. II.6, 333b7-9, b13-18). Taken this way, the assertion implies an interpretation of 'the perceptible bodies' in question, i.e., corruptible composite bodies, as the primary substances in the world, upon which other things are ontologically dependent (see *Phys.* I.2, 184a31-1), and with reference to which other things and processes, e.g., change, must be explained.[45] If this point is reckoned to be so tediously familiar as to be uninformative, then we are in danger of losing sight of the original philosophical milieu in which Aristotle is working.

Be that as it may, it is doubtful that *this* is Aristotle's point at 328b32-3. One of the difficulties we noted above regarding the identification of the perceptible bodies at 328b33 as the simple bodies is again applicable here (s. **3.2**). The problem is that, if 'the perceptible bodies' and 'the naturally constituted substances' *are* different expressions designating the same things, then we require a reason why, in the space of one line, Aristotle uses first one and then

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[43] The assertion may be intentionally 'trivial', or commonplace, e.g., for dialectical reasons; see note 49.
[44] For references see note 21.
[45] See, e.g., *Metaph.* XII.5, 1071a2, where Aristotle says that change in general is not without substance (*tôn ousiôn aneu ouk esti*); cf. *GC* I.3, 318b33-19a14, *Metaph.* VII, 1042b1-3, XII 1069b9-11.

the other expression. Indeed, if the assertion is supposed to be making a point analogous to that expressed by the remark 'man begets man', it would surely be more natural to stick to one, or the other, expression, than to switch between them; to say, e.g., 'the generation and corruption of *naturally constituted substances* are not without *naturally constituted substances*'. But Aristotle doesn't say this, and that he does not say this is probably sufficient to undermine the analogy. The complaint, then, that the identification of the perceptible bodies with the naturally constituted substances at 328b32-3 does not explain *why* Aristotle says that the generation and corruption of the latter do not occur without the former, is a serious one, and a real obstacle to our interpretation of what the phrase 'the perceptible bodies' means at 328b33. I return to it below, and suggest a solution (s. **4.5**).

The Perceptible Bodies at *De Gen. et Cor.* II.1

4.1 Let's consider the results of the discussion thus far. Firstly I established that the naturally constituted substances are corruptible composite substances (s. **2**); I then surveyed and criticised some ways to interpret the assertion at 328b31-3, including the most popular interpretation in the secondary literature (s. **3**). In general, it seems that commentators are keen to identify particular kinds of perceptible bodies as the perceptible bodies without which the generation and corruption of naturally constituted substances do not take place. Thus, e.g., the ancients and many moderns think that what Aristotle is referring to by the expression *ta aisthêta sômata* in the context of *De Gen. et Cor.* II.1 are, or include, the simple bodies.[46] But we have found reasons to question the candidacy of the simple bodies (ss. **3.2-3**)—as well as that of the heavenly bodies (s. **2.3**). Hence, from the point of view of the threefold classification of the perceptible bodies (see s. **2.2** above), we are left, almost by dint of elimination, as it were, with (corruptible) composite bodies. And yet, alarmingly, we are really no closer to divining

[46] Others, e.g., Scaltsas (1998), suggest the matter of composite substances; see note 42 above. Cf. also Joachim (1922) 192-3: 'we cannot understand [the generation and corruption of composite substances] unless we study the *genesis* and *phthora* of their matter. For their matter is 'the perceptible bodies', i.e., a matter itself 'informed', itself the product of development, presupposing more elementary conditions for its emergence', (193).

Aristotle's point at 328b32-3. For there are problems also if we take the perceptible bodies to be composite bodies (s. **3.4**). We seem to be at a dead end.

A fresh approach is needed. For, taking our cue from the approach typical of the secondary literature, what we have been seeking is a determinate *reference* for the expression 'the perceptible bodies'. But, while I think it is certainly important to get this clear (see s. **4.4**), perhaps what we should be focussing upon is the very fact that Aristotle describes these things, whatever they are, as 'the *perceptible* bodies'. This is because it seems that, for all one may try to establish that some particular kind of bodies, e.g. the simple bodies, or the composite bodies, or even the matter of the latter, are the things without which the generation and corruption of naturally constituted substances do not take place, we won't have a satisfactory explanation of 328b32-3 until we can say *why* Aristotle describes these things as *perceptible bodies*. This change of focus is the starting point of what in the introduction I called the 'second approach' to the interpretation of the assertion at 328b32-3 (s. **1.1**).

4.2 Let's recall the reason why Aristotle makes the assertion at 328b32-3. He says that it 'remains to consider the so-called elements of bodies. For (*gar*) the generation and corruption of naturally constituted substances are not without the perceptible bodies'. Evidently the aim at the beginning of *De Gen. et Cor.* II is to investigate the so-called elements of bodies, and the problematic assertion would appear to be offered as the reason *why* we ought now to consider the so-called elements of bodies.[47] Perhaps the thought is that the feature of the bodies relevant to the explanation of generation and corruption is that they are *perceptible*, and that this is due to the elements, in particular, the properties that the elements contribute to the perceptible bodies (see s. **3.3** above). In other words, if the generation and corruption of naturally constituted substances are not without the perceptible bodies, and this is so precisely because the latter are *perceptible*, then, if we want to understand why and how these changes

[47] This point is obscured in Williams' translation (1982), as he omits the conjunction 'for', and begins the assertion on a new paragraph.

occur, it makes sense to look into the causes of the perceptibility of these bodies, i.e., their elements or principles. And this indeed is what Aristotle proceeds to do at *De Gen. et Cor.* II.2-3 (see Ch. **2**, s. **2**). There Aristotle examines the perceptible characteristics of body qua body or 'body insofar as it is a body'.[48] These, he explains, are the *tangible* contrarieties (329b10). Aristotle proceeds to name a number of pairs of tangible contrarieties, e.g., hot and cold, dry and wet, heavy and light, hard and soft, viscous and brittle, rough and smooth, and coarse and fine (329b18), before identifying the first pair as the primary contrarieties from which the others are derived. These contrarieties are then identified as the differentiae of the elements (II.3, 330b6), and elsewhere as the distinctive characteristics of bodies (*DA* II.11, 423b27; *Sens.* 6, 445b23; cf. *Phys.* VII.2, 244b5). Presumably, then, it is by virtue of being *tangible* that perceptible bodies are necessary for generation and corruption.

But why might perceptibility, in particular, *tangibility*, be thought crucial to explaining generation and corruption? The way Aristotle makes the assertion at 328b32-3 it is as though he thought he were saying something fairly obvious and uncontroversial. As it happens, at least one scholar *has* suggested that the assertion at 328b32-3 is somewhat commonplace, at least to the extent that Aristotle expects his contemporaries, and in principle even his predecessors, readily to agree with it.[49] Another possibility, however, is that, in making this assertion, Aristotle is in fact saying something that he believes he has already established by argument. If this is so, then for clues as to how the assertion is to be understood, we should be looking to the preceding discussion. And indeed I think there is an important clue in the statement at the very beginning of *De Gen. et Cor.* II.1: 'About mixing and contact and action and affection, it has been said how they belong to things that are subject to change by nature' (328b26-28). Those 'things that are subject to change by nature' are natural bodies, and natural bodies are *perceptible bodies* (s. **2.2**). So what Aristotle is saying, in effect, is that it has been explained that

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[48] See Joachim (1922), 201, Williams (1982), 157.

[49] For Cleary (1995), 138, Aristotle is working within a 'framework of shared agreement… there is a consensus about the necessity [of perceptible bodies] for the formation of compound natural substances'. Cf. Broadie (2004), 140, for whom Aristotle is reporting an *endoxon* at 329a5-8.

mixing, contact, action and affection belong to perceptible bodies. The reason why I think this statement offers a valuable insight into the point of 328b32-3 is that, as Aristotle makes clear in *De Gen. et Cor.* I.6, the generation and corruption of things are not possible without things that are capable of mixing, contact, action and affection—to wit, *not without the perceptible, i.e., tangible, bodies.*

So it seems that the solution to our difficulty lies in the discussion prior to *De Gen. et Cor.* II.1, in particular *De Gen. et Cor.* I.6. This makes sense also of Aristotle's remark at 328b31, i.e., that it 'remains to discuss the so-called elements of bodies'. For this is a fairly explicit reference back to *De Gen. et Cor.* I.6. In turning to consider the so-called elements, Aristotle is fulfilling a promise made in the latter chapter. There he had announced his intention to discuss 'the matter, i.e., the so-called elements' (*tês hulês kai tôn kaloumenôn stoicheiôn*)' (322b1-2; see Ch. **1**, s. **4.3**). But he postpones discussion of the elements, in order to clarify some preliminary issues, the notions of 'contact' (*haphê*), 'mixture' (*mixis*), and action and affection (*poiein kai paschein*, 322b5, b25-6). Aristotle proceeds to clarify them in *De Gen. et Cor.* I.6-10. This is why, at the beginning of *De Gen. et Cor.* II.1, he says that it *remains* to consider the so-called elements of bodies.

My suggestion, then, is that the key to the explanation of the assertion at 328b31-3 can be found at *De Gen. et Cor.* I.6-10, in particular *De Gen. et Cor.* I.6, because I think this text clarifies why the existence of perceptible bodies—i.e., bodies which, being perceptible, and in particular, *tangible*, are capable of being in contact with each other, and hence of interacting with each other—is a necessary condition for the generation and corruption of naturally constituted substances. I shall now endeavour to support this suggestion.

4.3 At *De Gen. et Cor.* I.6 Aristotle says that it is necessary to clarify the notions of contact, mixture, and action and affection before embarking on an investigation of the matter, or the so-called elements. This is because he thinks that one must appeal to these notions if one is to

discuss the role of matter and the so-called elements in the generation and corruption of substances. Hence it is important to be clear about them, and their implications. Other philosophers, in their explanations of generation and corruption or change in general, also appeal to these notions, without however being clear about what they intend by them. For, Aristotle claims, all philosophers who make the elements come to be, as well as those who make things come to be from the elements,[50] make use of aggregation and segregation, i.e., 'mixing', and action and affection, i.e., 'alteration' (322b6-8, b9-10).[51] But what is meant by 'mixing' isn't clear (b8-9); moreover 'mixing' and alteration are not possible unless there is *something* that acts and *something* that is affected (b9-11). But acting and being affected are themselves changes that cannot occur unless the things that act on and are affected by other things are in *contact* with each other (b22-25, b26-29; cf. *Phys.* VII.2, 245a2-5; and s. **4.4** below). So, Aristotle concludes, if we are to clarify the notions of action and passion and mixing, we must first discuss contact (b29; b21-26).

Thus the plan for much of the remainder of *De Gen. et Cor.* is laid down. As Aristotle puts it at *De Gen. et Cor.* II.1, the elements are the primary things whose changes, whether aggregation and segregation or alteration, result in the generation and corruption of things (329a3-8); but aggregation and segregation is mixture, which in turn, as with alteration, presupposes things which act on and affect each other, which *in turn* presupposes that these things are in contact. So, reversing the order, contact is the first issue that needs to be discussed (I.6), action and affection follows (I.7-9), then mixture (I.10), and finally the elements (II.1-5).

But what is contact, and what things are capable of being in contact with each other? Contact, Aristotle explains, belongs in the strict sense (*kuriôs*) to things that have position

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[50] Joachim (1922) says that Aristotle means 'all the *pluralist* philosophers' (140), but by the first group I think A. intends monists, i.e., those who make the elements come to be *from some single underlying matter*, which is either an element itself or some indeterminate stuff besides the elements (cf. 322b3-4; II.1, 329a8-10, II.5, 332a6-26; *Phys.* III.5, 204b234). For monists, the change by which things come to be is alteration, whereas for the pluralists it is aggregation and segregation (I.1, 314a6-13, b2-8; II.1, 329a3-5).

[51] For the glossing of action and affection as 'alteration', see Rashed (2005), 129.

(*thesis*), and position belongs to things that are in place (*topos*, 322b32-323a1). Aristotle then recalls his definition of contact from the *Physics* (V.3, 226b23), according to which being in contact is 'having the extremities (*ta eschata*) together' (323a4). Thus at 323a4-6 he offers as a provisional account of what it is for things to be in contact with each other: 'those… separate[52] objects with magnitude (or size, *megethos*) and position, and which have their extremities together'.

Now since they occupy place, he continues, all things that are in contact with each other will be heavy or light, 'either both or just one' (323a6-9).[53] This is because the contrariety 'up and down' (or 'above' and 'below') is the primary differentia of place (*prôte diaphora topou*, 323a6-7; cf. *Phys.* IV.1, 208b12-3, III.5, 206a5-6); and up and down presuppose heaviness and lightness, for something heavy will have the tendency to move up, something light, down (*DC* I.3, 269b23-4; cf. IV.3, 310a31-3).[54] But things that possess heaviness or lightness are things that are capable of acting and being affected (323a9-10). Hence Aristotle offers a fuller account of contact, and the things that are capable of contact: 'it is clear that the things that are naturally able to be in contact with each other are those separate things of magnitude whose extremities are together and which are capable of moving and being moved by each other' (323a9-11).

This account restricts contact, properly speaking, to physical or natural bodies, as opposed to mathematical entities.[55] Indeed, the point of insisting that all things that are in contact must be heavy or light, or both, is precisely to rule out the possibility that mathematical entities can, in *the strict sense*, be said to be capable of contact.[56] For there is, as Aristotle admits, some sense in which mathematical entities may be said to be in position, and thus in place, and

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[52] The objects must be, and remain, separate, or discontinuous, objects; if they were to merge, then we would be talking about continuity, not contact; see *Phys.* V.3, 227a10-17, and Rashed (2005), 130.
[53] On the suggestion that bodies may be *both* heavy and light, see discussion in Williams (1982), 114-5. Cf. *DC* I.3, 269b26-28; IV.4, 311a22, a29-31.
[54] Cf. Joachim (1922), 143f., Williams (1982), 114, Morison (2002), 29.
[55] See note 19 above.
[56] See Williams (1982), 115.

hence in contact (323a1-3).[57] But mathematical entities are neither heavy nor light. At *Metaphysics* XIV.3, for instance, Aristotle complains that the Pythagoreans compose the natural bodies (*ta phusika sômata*) out of numbers, with the result that things that are heavy or light are composed of things that are neither heavy nor light (1090a32-34; cf. *DC* III.1, 300a14-19; cf. 299b14-15). Thus Aristotle concludes *De Gen. et Cor.* I.6 by saying that he has defined contact as far as 'natural things' (*ta phusika*) are concerned (323a33-4).

But, as we pointed out above (s. **2.2**), 'natural things', or natural bodies, are *perceptible bodies*. That they are perceptible is the most obvious characteristic of natural bodies.[58] Indeed Aristotle often uses the descriptions 'natural bodies' and 'perceptible bodies' interchangeably. At *De Gen. et Cor.* II.5, 332a4, for instance, he refers to 'the matter of *natural* bodies' (*tôn phusikôn sômatôn hulê*); this is clearly the same thing as 'the matter of the *perceptible* bodies' (*tôn sômatôn aisthêtôn hulê*) at II.1, 329a24-5.[59] And, at *Metaphysics* XIV.3, after criticising the Pythagoreans for composing natural bodies (*ta phusika sômata*) out of numbers, Aristotle concludes that they must be talking about some other kind of bodies, but not the perceptible bodies (*all'ou tôn aisthêtôn*, 1090a32-5). Hence the things that are capable of contact are perceptible bodies.

This, indeed, is clear if we consider the conditions that something must meet to be something that is capable of being in contact. To be thus capable, a thing must occupy place; but nothing that is not a perceptible body can occupy place (*DC* I.7, 275b6-7, b11; *Phys.* III.5, 205a10, 205b31, b35; IV.1, 208b28). If something occupies place, it follows, as we have seen, that it is either heavy or light or both; Aristotle says that every perceptible body has weight or lightness (*DC* III.1, 299a26, *Phys.* III.5, 205b26). In particular, whatever is *tangible*, or perceptible to touch, has weight or lightness (*Phys.* IV.7, 213b34-a2, 214a8-9, 214a7-8). Indeed,

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[57] See Joachim (1922), 143-4.

[58] Cf. Granger (2000), 421: 'Foremost in [Aristotle's] mind when he considers natural objects is their perceptibility … [it is] the fundamental point in his thought about natural objects'.

[59] Cf. *DC* I.9, 278b22-23, where Aristotle says that the universe, understood as all body or matter within the extreme circumference (278n18-21), 'necessarily consists of all natural and perceptible body (*tou phusikou kai tou aisthêtou sômatos*). I think we can take *kai* here to be explicative; cf. 278b7-9, 279a8-9.

Aristotle says that whatever is heavy must be hard or soft, i.e., tangible (*DC* III.1, 299b11-12, b13-14); and he names heavy and light, and hard and soft, among the tangible contrarieties of body (*GC* II.2, 329b19). Hence anything that is heavy or light is a tangible, and so perceptible, body. Furthermore Aristotle says that things that possess heaviness or lightness are capable of acting or being affected (323a9-10); but every perceptible body has the power to act or to be affected, or both (*DC* I.7, 275b5-6). For the differentiae of the elements of perceptible bodies, hot and cold, dry and wet, are respectively active and passive, such that possession of these, in the appropriate ratios, renders the bearer either active or passive (*GC* II.1, 329b24-32, *Meteor* IV.1, 378b12-26, b31-34).[60] In general, for Aristotle, perceptible things are moving, or *changing*, things (*kinoumena*), and vice-versa; so something that is changeable is perceptible, while something that does not change is imperceptible.[61]

Having made it clear that contact, and thus mixing and action and passion, apply to natural things (*GC* I.6, 323a33-4), Aristotle begins *De Gen. et Cor.* II.1 with the summary of the discussion in the preceding five chapters: 'we have discussed how mixing, contact, action and being affected belong to *things which are subject to change by nature*' (*kata phusin*, 328b26). Things which are subject to change by nature are perceptible bodies; hence mixing, contact, action and being affected belong to the perceptible bodies. With this in hand, let's summarise Aristotle's reasons for discussing contact:

(i) The generation and corruption of things are thought to be by aggregation and segregation, i.e., mixing, or alteration.

(ii) Mixing and alteration are impossible without action and affection

(iii) The generation and corruption of things are impossible without action and affection (i, ii)

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[60] Since all bodies are constituted out of the four elements (*GC* II.8), all bodies will be more or less hot or cold, more or less dry or wet (*Meteor* IV.8, 384b28-30); see Alexander *In Meteor. 4*, 213,5f. Of course, bodies have other tangible properties, but each of these, Aristotle thinks, can be traced back to these two primary contrarieties (see Ch. **2**, s. **4.3**).

(iv) Action and affection are impossible without things that are capable of being in contact with each other

(v) The generation and corruption of things are impossible without things that are capable of being in contact with each other (iii, iv)

Or, the generation and corruption of things are *not without* things that are capable of being in contact with each other. These things are the perceptible bodies. Hence

(vi) The generation and corruption of things are not without the perceptible bodies

And if we take 'things' to be substances constituted by nature, i.e., the things of which generation and corruption are applicable without qualification (*Phys.* I.7, 190a31-3), then

(vii) The generation and corruption of naturally constituted substances are not without the perceptible bodies

Here, then, is the explanation of the assertion at 328b32-3. It seems that, in saying that the generation and corruption of naturally constituted substances are not without the *perceptible bodies*, Aristotle is putting into a nutshell the findings of *De Gen. et Cor.* I.6 to I.10. For the prerequisites for generation and corruption are things that are capable of being in contact with each other, because without such things there is no action and affection, and no mixing: and therefore no generation and corruption. The things that are capable of being in contact must be in place, which entails that they have perceptible, in particular tangible, qualities. Thus the things capable of being in contact with each other are perceptible bodies. Hence the generation and corruption of naturally constituted substances are not without the perceptible bodies.

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[61] See, e.g., *Metaph.* I.8, 989b29-33, with Granger (2000), 421, and XII.1, 1069a3; see also Politis (2004), 84-85; Plato had already stressed the point that whatever is perceptible is subject to change (see, e.g., *Phaedo* 78d-79a), as Aristotle himself reports (*Metaph.* I.6, 987a33-4, b6-7).

4.4 Now that we have explained *why* Aristotle specifies that *perceptible* bodies are the things necessary for generation and corruption of naturally constituted substances, let's consider the question: *which* perceptible bodies, in this context, are the ones that fulfil this role? For instance, are they simple or composite, corruptible or eternal?

It doesn't seem inappropriate to consider this question. For even if we accept that when he uses this expression, in this context, Aristotle intends no specific reference to any particular kinds of bodies, it is nevertheless apparent that the perceptible bodies that are necessary for generation and corruption, in this context, do not include all the perceptible bodies there are. And if it is *not* Aristotle's point at 328b32-3 that the generation and corruption of naturally constituted substances are not without *all* the perceptible bodies there are, then it seems eminently justifiable to enquire as to *which* perceptible bodies *are* necessary for the generation and corruption of naturally constituted substances.

As I say, it is apparent that what is in question is not *all* the perceptible bodies there are, because once again the superlunary bodies must be ruled out (cf. s. **2.3**). Indeed, if the view of most commentators is correct, Aristotle himself is already at pains in the second half of *De Gen. et Cor.* I.6 to restrict the domain of discourse to the perceptible bodies of the sublunary world (323a12-25). For he appears to specify that the things capable of being in contact, in the strict sense of *mutual* contact, i.e., where something touches another, and is touched in return (323a25-28), are bodies of the sublunary world.[62] Indeed, even if this interpretation is questionable,[63] it is clear that all things that are in mutual contact are heavy or light, from which it follows that things capable of contact, in this strict sense, are of the sublunary world.[64] For the things that are heavy or light are perceptible by touch, i.e., tangible (see *GC* II.2, 329b7-8, 329b19). But the superlunary bodies do not appear to possess tangible qualities.[65] At *De Caelo* I.3 the heavenly bodies are said to be neither heavy nor light (270a5-6).

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[62] See Joachim (1922), 142-3, Rashed (2005), 131.
[63] See Williams (1982), 115-117.
[64] See Rashed (2005), 130.
[65] Rashed (2005), 154-5.

And notoriously Aristotle denies that the heavenly bodies possess the tangible quality *heat*, but produce it, and the light by which they are visible, through friction (*DC* II.7, 289b20-1). But although they are thereby in contact with the sublunary sphere, the contact is 'asymmetric', not mutual—the heavenly bodies are not themselves touched or affected when they act upon the sublunary bodies (323a12-17). Indeed Aristotle says that the heavenly bodies are not merely eternal, i.e., ungenerated, but *unalterable* (270a12-35), apparently because they do not possess qualities that admit of contrariety (270a20-21). Hence they cannot undergo change in respect of whatever qualities they may have (270a27-35). There can be no doubt, then, that the *eternal* perceptible bodies are not among those perceptible bodies deemed necessary for the generation and corruption of naturally constituted substances at *De Gen. et Cor.* II.1.

So the perceptible bodies at 328b33 must be those of the sublunary world. But are they simples or composites, or both? The reasons offered earlier for the exclusion of the simple bodies from among the perceptible bodies in question at *De Gen. et Cor.* II.1 are still relevant (s. **3.2**). The inescapable point is that Aristotle conceives the perceptible bodies as things that can be analysed into elements. Also relevant is the question of the perceptibility of the elements (s. **3.3**). For the crucial feature of the perceptible bodies at 328b33, and indeed *De Gen. et Cor.* II.1-2, is that they are tangible, and as such capable of mutual contact. The simple bodies, however, as constituents of composite bodies, are not tangible in themselves. Rather they are principles or causes of the tangible contrarieties by which (tangible) bodies are distinguished (see *GC* II.2; cf. *DA* II.11, 423b27-9, *Phys.* VII.2, 244b5).

Thus it seems that *ta aisthêta sômata* at *De Gen. et Cor.* II.1 must be composite bodies of the sublunary world. For if these perceptible bodies are not simple, they must be composite. There may, indeed, be a further argument to support this conclusion, if we consider some remarks Aristotle makes at *Physics* VII. As we have seen, the perceptible bodies in question are those that act on and affect each other, which presupposes that they are in contact, and entails

that they are subject to alteration.[66] At *Physics* VII Aristotle explicitly links alteration and contact: that which alters and that which is altered must have their extremities together (VII.2, 245a2-5; cf. 244b2f., VII.3, 245b3). Aristotle proceeds to suggest at *Physics* VII.3 that when something such as a man or a house comes to be, 'it is perhaps necessary for each of these to be generated when something is altered, for instance, when the matter undergoes condensation or rarefaction or is heated or cooled' (246a4-9). In other words, while the generation of a substance is not due to the alteration of that substance, it may be that the generation of a substance is the result of something else being altered. Later in the same chapter Aristotle repeats the idea that generation and corruption of things, e.g., physical and mental states, may be due to alterations in other things (246b14-17; cf. 247a16-18). The interpretation of these remarks is disputed.[67] But the suggestion that generations and corruptions of some things result from alterations in others invites the following speculation. The things that undergo alteration are perceptible bodies, because things that undergo alteration are changed in respect of their perceptible qualities (VII.2, 244b5f., 245a2-3; VII.3, 245b3-5; cf. Ch. **2**, s. **3.2**). But if alterations are necessary for the generation and corruption of substances, then the existence of perceptible bodies—those bodies that can alter, or act and be affected by perceptible qualities—is necessary for the generation and corruption of substances. Hence the generation and corruption of naturally constituted substances are not without perceptible bodies. But only particular composite bodies are capable of undergoing alteration, for the elements, as we established in Chapter **2**, do not *alter*, in the strict sense of persisting as the same thing through a change in its affections (see Ch. **2**, ss. **3.2-3**, **4**). This points again to the conclusion that the perceptible bodies without which the generation and corruption of substances do not take place, i.e., those in question at *De Gen. et Cor.* II.1, are composite bodies.

It seems clear, then, that the reason why Aristotle says that the generation and corruption of naturally constituted substances is impossible without perceptible bodies is

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[66] See Joachim (1922), 147, Rashed (2005), 129.
[67] See, e.g., Wardy (1990), 204f., Everson (1997), 269f.

because the perceptible bodies in question have certain capabilities by virtue of being perceptible, in particular, *tangible*. Most crucial is that they are capable of contact in the strict sense of mutual or reciprocal contact, for which it is necessary that they occupy place, which entails that they are heavy or light, and hence can act on and be affected by each other. Joachim points out that these conditions are 'satisfied only by the bodies of the Lower Cosmos', as opposed to heavenly bodies.[68] I think we can go a little further, however, and say that these conditions are satisfied only by the *composite* bodies of the sublunary world.

4.5 Before moving to consider the matter of these bodies, let's tie up some loose ends. The problem noted earlier, about identifying 'the perceptible bodies' at 328b32-3 as naturally constituted substances, is that there is a worry that such an identification renders the assertion at 328b31-3 uninformative (s. **3.4**). For it does not explain *why* Aristotle says that the generation and corruption of naturally constituted substances are not without perceptible bodies. Hence it is argued that we must distinguish the naturally constituted substances from the perceptible bodies in question.

I don't think we should accept this argument. For it does not necessarily follow that the assertion at 328b32-3 is uninformative if the expressions 'naturally constituted substances' and 'the perceptible bodies' both designate the same things. To think that it does so follow is to neglect the possibility that, to put the point in Fregean terms, the expressions capture different 'modes of presentation' of that which is designated. In other words, the expressions, in this context, may have the same 'reference' (*Bedeutung*), i.e., *corruptible composite bodies*, but different senses—the sense of the expression being that in which the mode of presentation is contained. I have argued that the expressions have the same 'reference', and it is clear that the expressions *do* have different senses—hence the difficulty in interpreting the assertion. It follows that the assertion is not trivial, but has informative, or cognitive, value, because the

[68] Joachim (1922), 147.

difference between the expressions 'perceptible bodies' and 'naturally constituted substances' corresponds to a difference in the mode of presentation of that which is designated.[69]

Presumably the error that may lead one to think that the assertion is uninformative, if the expressions involved are used to refer to the same things, is the presumption that, if they have the same reference, then the expressions ought to be interchangeable in the assertion. In other words, if 'the perceptible bodies' here are 'naturally constituted substances', then one might think that we can replace one with the other, and say, e.g., that the generation and corruption of naturally constituted substances are not without *naturally constituted substances.* And this then appears a somewhat trivial statement. But the thought, or sense, expressed by *this* statement is not the same as that expressed by the assertion at 328b32-3.[70] To think that it is is to neglect what, in this context, is the relevant aspect of corruptible composite bodies, i.e., that they are *perceptible.* For it is not insofar as they are *naturally constituted substances* that the composite bodies of the sublunary world are the things without which the generation and corruption of naturally constituted substances do not take place, but rather insofar as they are *perceptible bodies.*[71] The way to approach the assertion at 328b31-3, then, is to maintain the focus upon the *perceptibility* of the bodies without which generation and corruption is impossible, and to identify the capabilities that a perceptible body has in virtue of being perceptible. And the crucial thing about perceptible bodies is that they are capable of mutual contact, which is the basic presupposition for the possibility of alteration, mixing, action and affection, and, therefore, generation and corruption. Thus it is clear why Aristotle says that the generation and corruption of naturally constituted substances are not without *perceptible bodies.*

Another question, not unrelated to the foregoing, concerns Aristotle's procedure at the beginning of *De Gen. et Cor.* II. As we noted (s. **4.2**), there is an opinion that the assertion at 328b31-3 is sufficiently general to ensure assent, i.e., that there is, for presumably dialectical

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[69] Frege (1892), 26-27, following Max Black's translation, in Moore (1993).
[70] Cf. Frege (1892), 32.
[71] This point also provides a way to avoid a recurring objection, i.e., why, if the perceptible bodies in question are a particular kind of bodies, e.g., corruptible composite bodies, Aristotle doesn't just say so; see ss. **3.2**, **3.4**.

reasons, something rather obvious about the assertion. This suggestion now seems unlikely. Far from seeking general agreement, the assertion reflects Aristotle's distance from certain rival points of view. For it seems that other philosophers, while making use of notions such as aggregation and segregation and alteration to explain generation and corruption, fail to see clearly what these notions are dependent upon, i.e., bodies that occupy place and are capable of mutual contact, and hence of altering and being altered (*GC* I.6, 322b5f.). Hence they choose principles and elements of perceptible bodies that are inadequate for the task.

We already see evidence of this within a few lines of the assertion, when Aristotle rejects the possibility that something like the *apeiron*, a body without perceptible contrariety, could be the matter of perceptible bodies (329a8-13). His point is that the principle(s) of perceptible bodies must themselves be such as to explain the perceptibility of perceptible bodies.[72] Those who try to compose all things out of mathematical entities, face the same problem, for such things cannot be in contact in the sense required for generation and corruption. Some try to compose all things out of indivisibles, whether planes (Plato) or solids (atomists). Of the latter, Aristotle points out at that such things are incapable of acting upon or being affected by each other (*GC* I.8, 325b36-326a3), since their differences are not due to tangible characteristics (326a3-8). Thus they seem incapable of mutual contact (323a29-326b5), and therefore generation and corruption is rendered impossible. Likewise Aristotle says that, on Plato's theory, the generation of anything beyond the elements is not explained (I.2, 315a30-2, with *DC* III.8, 306b22-9). The problem is that out of indivisible planes and surfaces one can only compose solids, i.e., mathematical entities, and nothing more; 'they do not even attempt', Aristotle complains, 'to generate any affection from them' (316a2-4, cf. I.5, 320b14-17; *DC* III.1, 299a17-18).

So, far from expressing something obvious, or trivial, or reporting an *endoxon*, the assertion at 328b33 reflects a fairly sophisticated position vis-à-vis the presuppositions for the

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[72] See Rashed (2005), 153.

possibility of generation and corruption. It reveals that a certain stance has been adopted regarding the kind of investigation that Aristotle believes is appropriate to the study of nature, i.e., a physical, rather than a mathematical, explanation.[73]

The Matter of the Perceptible Bodies

5.1 In this section I turn to consider the question of the *matter* of the perceptible bodies. We are now in a good position to consider this question, as we have clarified what Aristotle means by 'perceptible bodies' in this context, and why he uses this expression. I now want to argue that the matter of the perceptible bodies is some indeterminate homoeomerous stuff, by which I mean a stuff that is composed out of the elements, but lacks the ratio or form (or is conceived without the ratio or form) that would render it a particular perceptible body.[74]

To recapitulate: as we have seen, Aristotle asserts that the generation and corruption of naturally constituted substances are not without the perceptible bodies (328b32-3). Once it is evident that the perceptible bodies in question are not *all* the perceptible bodies there are, the philosophically interesting question is *which* perceptible bodies are necessary for generation and corruption. The aim of this chapter thus far has been to establish that the perceptible bodies at 328b33 must be corruptible composite bodies, as opposed to the heavenly bodies, and the simple bodies. This is *not* to claim that Aristotle is *referring* to the corruptible composite bodies at 328b33: it is rather that such bodies are the kinds of things that best meet the conditions for being the perceptible bodies in question at 328b33, i.e., they are capable of mutual contact, because they occupy place, which entails that they are perceptible by touch, which *further* entails that they can undergo alteration (s. **4.4**). What we are talking about are particular tangible things, of determinable size or magnitude (I.6, 323a4-6, a9-11); and such things, I have suggested, are also describable as 'naturally constituted substances' (s. **4.5**; see also s. **2.1**).

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[73] Cf. *GC* I.2, 316a5-14. See also Hussey (1982), xxxiii-xxxv, Cleary (1995), 135.

[74] Note that the elements themselves are homoeomerous, as suggested at *Metaph.* V.3, 1014b30-1; cf. *Top.* V.6, 135a24-b6, *Metaph.* I.9, 992a7. But in general when I refer to homoeomers or the homoeomeries, here and in Ch. **4**, it ought to be understood that I have *composite* homoeomerous bodies in mind, e.g., flesh, bone, wood.

Now, of course, the point of establishing what these perceptible bodies are, and what they are not, is precisely to aid us in determining what Aristotle is talking about when he talks about the *matter* of the perceptible bodies at 329a24. If my explanation of the assertion at 328b33 is correct, then the matter of the perceptible bodies can be understood as the matter of those things that are capable of contact—things that occupy place, are tangible, and can undergo alteration. And if such bodies are as I have argued, i.e., corruptible composite bodies, then the matter of the perceptible bodies can be understood as the matter of *corruptible composite bodies*. But what is the matter of these bodies?

At 329a27 Aristotle says 'a more accurate (*akribesteron*) discussion about them (*peri autôn*) is in another work', and by far the most common view is that what has been discussed in more detail in this other work is precisely the matter of the perceptible bodies. This view is held by Philoponus, Joachim, and others, and the text where this more accurate account is available is generally believed to be *Physics* I.7.[75] The only alternative mooted in the secondary literature is that Aristotle is referring rather to some discussion of *the so-called elements*, and therefore to some other text.[76] Now presumably Aristotle wouldn't mention this other discussion if he didn't think it relevant to the *present* discussion, so it seems important to try to settle the target of this reference.

The problem is deciding to what the phrase *peri autôn* at 329a27 refers. The use of the plural genitive does not itself decide this question. Certainly it indicates that we shouldn't be looking for a text where Aristotle talks more accurately about *one* thing, but a text where he talks about a *number* of things. But that doesn't imply that Aristotle must be talking about the four so-called elements, rather than the singular matter (*tina hulên*) of the perceptible bodies. For if Aristotle were referring to the latter, the use of the plural could be accounted for in the following way: he is referring not just to a discussion of one thing, i.e., the matter of the

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[75] See, e.g., Philoponus on 329a27, *In de gen et cor*, at 210.25; Joachim (1922), 198-9; Charlton (1970), 70, 131, 135, and (1983), 201-2; Miller (1978), 110, Graham (1987), 478; Furth (1988), 226, Gill (1989) 244, de Haas (1997), 71.
[76] King (1956), 382, n. 32, and Williams (1982), 155-6.

perceptible bodies, but to a discussion of more than one thing, i.e., both matter and the contrariety from which it is inseparable.[77] And this point would help secure the reference to the *Physics*. For in his response to the problem of change in Book I of the *Physics*, Aristotle posits three principles, i.e., matter, or the underlying subject (*hupokeimenon*), and the primary contrariety of form and privation.

Williams, however, argues that it is more natural to take 'them' to be the so-called elements, and that Aristotle must be referring to his discussion of the elements at *De Caelo* III and IV. [78] In these books Aristotle discusses the nature of the elements, and also, briefly, the matter of the elements. But there are contextual difficulties with accepting the suggestion that 'them' at 329a27 are the elements. For, in the next lines (a28-9), Aristotle says that his aim now is to give an account *peri toutôn*, 'about these'. If we are to make sense of the passage, *peri autôn* at 329a27 and *peri toutôn* at a29 must refer to different things.[79] But by the latter it seems certain that Aristotle must be referring to 'the primary bodies', i.e., the elements.[80] This, one would think, most naturally implies that the more accurate account that has been given elsewhere does *not* concern the elements. But it seems that *peri autôn* must either be 'about the matter of the perceptible bodies', or 'about the so-called elements'. If the latter is ruled out, and we must choose between the options available, then it seems Aristotle is referring to the former, or more precisely, the matter *and* the contrariety. And if this is the case, then *Physics* I.7 seems the most likely referent of 329a27.[81]

But if we are to turn to that text expecting to find that Aristotle identifies some particular thing or kind of thing as the matter of the perceptible bodies, then we will be

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[77] Thus Joachim (1922), 199. Cf. Gill (1989), 244.
[78] (1982), 156. King suggests the text to which Aristotle refers is either *De Caelo* II, or else the later chapters of *De Gen. et Cor.* itself (382, n. 32). Rashed (2005), 154, hedges his bets: if 'these things' are matter and privation, then the text to which Aristotle refers is *Phys.* I.6-9; if it is about the elements, then it is *DC* III and IV.
[79] As Williams himself readily stresses; (1982), 155.
[80] Joachim (1922), 199. Williams (1982) follows Philoponus in claiming Aristotle is referring to the contrarieties, partly because 'the topic he is turning to is the type and number of the contrarieties', 156. But, given that the contrarieties are the differentiae of the elements, it is rather strained to claim that such a discussion is not also a discussion of the 'type and number' of the elements; see Ch. **2**, ss. **2**, **3**.
[81] Cf. *GC* I.3, 317b13f, which may be another reference to the *Physics*. Joachim thinks that 317b29 and 318a23-25 also refer to the results of *Physics* I.

disappointed. For Aristotle doesn't do any such thing. His stated aim in this study is rather to determine the number of principles there are, and why there are that many, and of what general kind these principles are (I.2, 184ab15-25; cf. I.7, 191a3-4, a20-23). In other words, Aristotle is more interested in laying down the formal elements or principles of change in general, than in identifying some particular thing or things to compete with those corporeal elements or ingredients posited by his predecessors as the matter from which all things come to be.[82]

Moreover, one might think that it is precisely the explanation of the *manner* in which things change, rather than the identification of some matter that underlies changes, that interests Aristotle at *De Gen. et Cor.* II.1, 329a27. For in the lines following the reference to the 'more accurate account', he emphasises that the primary bodies *also* come to be from the matter 'in this way' (*kai ton tropon toutôn*, 329a28), i.e., from an inseparable matter (a29-31).[83] Having said that, nevertheless it is not simply the case that the primary bodies, when they change, change in the same way as the perceptible bodies. For it seems that the perceptible bodies and the primary bodies come from the same matter (s. **1.3**). There is, as he puts it, *some* matter of the perceptible bodies, *from which* the so-called elements come to be (329a24-6). Aristotle does give some indication in the *Physics* as to what sort of thing the matter of natural substances must be like, and so to these pointers we must pay attention. Without further ado, let's turn to the *Physics* to find out what Aristotle says there that may be of use towards our understanding of the matter of the perceptible bodies.

5.2 In the first book of the *Physics* Aristotle discusses change and generation. He agrees with those of his predecessors who say that all change is into and out of contraries (*Phys.* I.5,

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[82] See Bostock (1982), 182-3: 'what is introduced as if it were a continuation of the physicists' investigation of nature has instead become a meta-investigation of the general form which any account of change must take'; see also Ch. 1, note 46. Cf. Jones (1974), 474, 476; Wieland (1975), 136.

[83] Williams (1982) questions the translation of kai as 'also', as he thinks it unclear what the manner of the coming to be of the primary bodies is being compared to (155). But clearly Aristotle means the primary bodies come to be from an inseparable matter, in the same way as the *perceptible bodies* do. Cf. Joachim (1922), 199.

188a19f., 188a26-30, 188b21-7). But he explains that change between contraries is not possible unless there is something, a *hupokeimenon* or underlying subject, that underlies the change (I.6, 187a21-189b2). For contraries themselves do not change into each other (cf. *GC* II.1, 329b2-3).[84] That this is so seems clear enough when we are talking about changes between items such as hot and cold, soft and hard, black and white, for it is always some subject, a substance, that is hot or cold, soft or hard, black or white. It is not that cold comes to be its contrary, hot; rather, the substance, e.g. Socrates, was cold, and he comes to be hot. Thus Socrates is the subject or *hupokeimenon* of the change.

In general, when non-substance items, i.e., items from the categories of quantity, quality, relation, place, come to be or to exist, it is clear, Aristotle says, that there is always some *hupokeimenon*, and this will be substance, because all items from non-substance categories are predicated of substance (*Phys.* I.7, 190a32-190b1; *Cat* 5, 2a11-12, 2b15-17). Such items cannot exist independently of substance, whereas substance exists without qualification (190b1-2). But Aristotle thinks that it is clear (*phaneron*) also that there is always something that underlies when a substance comes to be (190a13-15, b1-4). In other words, in *all* cases of change there is a *hupokeimenon* that can be analysed into an opposite, or privation, and that which is not an opposite, and the latter remains or persists through the change.[85] He offers the following example: 'for instance, plants and animals [come to be] from seed (*ek spermatos*)' (190b4-5). So the underlying thing or *hupokeimenon*, in the case of plants and animals, is *sperma*, i.e., seed, or sperm. Plants and animals are excellent examples of perceptible bodies. Is *sperma*, then, the matter of these perceptible bodies? And in general, is it something like *sperma* that we should be looking for as the matter of perceptible bodies?

But what exactly does Aristotle mean by *sperma*? It is often suggested that s*perma* in this context means 'embryo', a meaning it sometimes seems to have in the *De Generatione Animalium*

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[84] Cf. Plato's distinction in the *Phaedo* between 'contrary' and 'thing with contrary' (103b1-c1).
[85] Thus Code (1976), 358, Dancy (1978), 385, n.35, Bostock (1982), 188, Gill (1989), 100. Cf. Jones (1974), 478-9.

(see, e.g., I.18, 724b4-21, I.20, 728b32-34, II.1, 733b23-31).[86] In his commentary on this text, Balme points out that there are in fact four possible meanings of *sperma*.[87] These are: (i) the seed of a plant; (ii) the male semen; (iii) the female contribution to generation; and (iv) 'the first stage of the foetus', or the embryonic stage. More useful and apposite, however, is Balme's gloss on *De Generatione Animalium* I.2, 716a4-17, where Aristotle again states that animals come to be from *sperma* (716a8-9). Balme suggests that *sperma* in this case is 'necessarily vague because Aristotle has not yet analysed for the reader what exactly comes from the female and what from the male'.[88] It is surely also the case at *Physics* 190b5 that *sperma* is conceived rather vaguely. It is unnecessary, then, to attempt too precisely to define what is meant by *sperma* here. And indeed, perhaps, given Aristotle's concerns in *Physics* I.7, the *way* that an animal is generated from *sperma* is not really the issue.[89]

But is *sperma*, even understood vaguely, a plausible underlying thing? A major problem with its candidacy is that we might have expected the *hupokeimenon* of the generation of substance to be something that persists or endures through the change (cf. 190a13-21, and also 190b9-14). *Sperma*, however, manifestly does not persist through the change,[90] at least not in any of the senses of *sperma* that Balme identifies. But before ruling it out completely, perhaps we should first get clear about what Aristotle means by an underlying thing. Some forty lines after identifying *sperma* as an *hupokeimenon*, Aristotle writes:

> The underlying nature is known by analogy (*hê de hupokeimenê phusis epistêtê kat' analogian*). For as bronze is to the statue, or as wood to the bed, or as *the matter and* the unshaped before it has taken shape (*hê hulê kai to amorphon echei prin labein tên morphên*) to something of the others which has shape, so this is to substance and to the individual and to what is (191a7-12).[d]

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[86] See Jones (1974), 489f., Code (1976), 364-5, cf. Waterlow (1982), 47, Gill (1989), 229.
[87] (1972), 131.
[88] Ibid. Aristotle begins to do so at *GA* I.18, 724a14ff.
[89] Gill (1989), 104: 'the mode of generation of a plant or animal from seed... is not a topic that requires explanation in *Physics* I.7'. See also Miller (1978), 106.
[90] A problem often raised in the secondary literature; see, e.g. Waterlow (1982), 46; Miller (1978), 106; Charlton (1970), 75-77.

It is certainly not obvious that this passage actually advances our understanding of the *hupokeimenon.* In fact it raises some important questions. There is a problem, for instance, posed by the phrase which I have italicised in the above quote, 'the matter and' (*hê hulê kai*). In modern times this phrase was deleted by Diels, a decision endorsed by Ross, on the basis that its inclusion spoils the correspondence that Aristotle is aiming at with the analogy.[91] But the excision of *hulê* is without precedent in any of the MSS, and more recently, a number of scholars have dissented from this view.[92] It is obviously of some importance for the interpretation of the passage to decide whether or not to adopt the excision.

Let's consider briefly the question of the identity of the underlying nature and matter. That the two are identical is a view that goes back at least as far as Aquinas (*De principiis naturae*, s.14), and it is the motivation behind Diels' excision of the phrase *hê hulê kai.* For it is presumed that the analogy is designed to explain how 'matter' or *hulê* is to be understood. This involves the presumption that the underlying nature is synonymous with 'matter', or, to be more precise, *prime* matter.[93] If the analogy is meant to do this, however, then it is flawed in that it uses the same word in the explanans, i.e., *hulê* is present on both sides of the proportion, as its own analogue.[94] Instead of imputing the flaw to Aristotle, or re-interpreting the analogy, the offending phrase is removed.

If we leave the phrase there, however, then there seem to be two possibilities. Firstly, it might appear that the underlying nature, rather than being synonymous with matter, is to be *distinguished* from it.[95] For the underlying nature might appear to be *both* matter, as the persisting thing, *and* privation (*hê hulê kai to amorphon*; cf. *Phys* I.7, 190a14-21, 190b10-17, b23-27). This, indeed, is how Aristotle seems to characterise the underlying nature at *Physics* I.9. For, he says, the error of his predecessors (i.e., the Platonists), who recognised that there must be some

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[91] Ross (1936), 494. The phrase is not found in Simplicius, *In Physica* 226.7.
[92] For instance, Miller (1978), 115, n. 4, Bostock (1982), 187, n. 12, and (1996), 300, Graham (1987b), 148, n. 45.
[93] See, e.g., Ross (1936), 494.
[94] See Bostock (1982), 187, n. 12.
[95] See Bostock (1982) 187, n. 12; cf. also Ross (1936), 498.

underlying nature, was that they made it one in number and in potential (192b35-192a2; a10-11). Ross takes this to mean that they failed to distinguish, in the underlying nature, matter and privation.[96] If this is correct, then the underlying nature does not persist. For the composite of matter and privation does not persist.[97] But Aristotle's charge against the Platonists need not be taken this way. The problem he identifies seems rather to be that they did not recognise the principle of the privation: they had a material principle, i.e., the great and small, and the principle of the form, but neglected the opposite of form, the privation (192a3-6, a12). His criticism does not entail, then, that the underlying nature is composite of matter and privation.

Another possibility, if we retain the phrase *hê hulê kai*, is that *kai* be taken explicatively; thus, *hê hulê kai to amorphon* would be: 'the matter, *i.e.,* the shapeless', or 'something shapeless'.[98] This might suit the immediate context better. For Aristotle has just repeated the point that something must underlie the opposites (191a4), so it seems natural that he might then try to specify further, as far as possible, just what this thing is. And he does so by saying it is like bronze, or wood, or some shapeless matter. Immediately after the analogy passage, Aristotle says that *this*, i.e., the underlying nature, is one principle (*mia men oun archê autê*), but it is not one is the way a particular thing is one (191a12-13); another principle is the form or definition (*logos*), and *then* there is the opposite to the form, the privation (a13-14). Hence the underlying nature is distinct from the opposites (190b33-35); it is not, in other words, 'matter *and* privation'.

The identification of the underlying nature as matter seems to be the popular reading, even for those who reject Diel's emendation.[99] One might worry that this reading, again, falls foul of the problem that matter appears as an analogue of the underlying nature. A way to avoid this problem, however, may be to take the occurrence of *hulê* as consistent with its earlier

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[96] (1936), 497. Cf. Robinson (1974), 173.

[97] This suggestion should be distinguished from that of Charlton (1970). C. has argued that the matter does not persist: he writes: 'Aristotle never says that anything remains, or persists, but only that something underlies' (77). But *Phys.* I.9, 192a31-32, quoted below, would seem to contradict that claim. For criticism of C.'s thesis, see Robinson (1974), 173-76, and Bostock (1982), 186-188. Cf. Jones (1974), for a reading similar to C.'s, and Code (1976) for a critique of Jones.

[98] Cf. Waterfield's trans., in Bostock (1996).

uses in *Physics* I.7. For 'matter', at this point, would appear to have what some commentators have called a 'non-technical sense', i.e., it is being used as a general term for stuff or material (cf. 190b9, 190b25).[100] The underlying nature is indeed what Aristotle subsequently calls 'matter', in the strict sense; but he is not using the latter term in this way just yet.[101]

It seems, then, that the underlying nature must be something that pre-exists the generation of the substance, as bronze or wood pre-exist the artefact, and persists in the generated substance, as bronze or wood remain in the artefact. Later, in *Physics* I.9, Aristotle describes matter (*hulê*) in precisely these terms: it is 'the first underlying thing (*to prôton hupokeimenon*) of each thing, from which something comes to be [and which] remains present in the thing as constituent (*enuparchontos*) non-accidentally' (192a31-32). Suddenly *sperma* appears an unusual choice as an example of the underlying nature. Aristotle seems to have described the *hupokeimenon* in such a way that something like *sperma* must be ruled out.

It seems unlikely, however, that Aristotle would offer *sperma* as an example of a *hupokeimenon* if it were something that was hopelessly inappropriate. And indeed *sperma* certainly fulfils one of the functions of matter, insofar as it can be understood to be that from which or out of which an animal comes to be in the first place (*GA* I.18, 724a17-18; cf. *PA* II.9, 655b23-5).[102] S*perma* does also pre-exist the animal, in at least one of its senses, e.g., in the parents. But presumably Aristotle himself is perfectly aware that *sperma* is not the sort of thing that could fulfil the second function of matter, i.e., persistence in that which comes to be. In the biological works, he never forwards any claim that *sperma* remains as a constituent part of what is generated. It does not seem to be related to plants and animals in the way that bronze is to the statue, or wood to the bed. The latter pre-exist, and persist; *sperma* only pre-exists. Why, then, if persistence as a part of that which comes to be is so crucial an aspect of the

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[99] See, e.g., Charlton (1970), 78, Jones (1974), 496, Graham (1987b), 148, Cook (1989), 118-9, Gill (1989), 106-7.
[100] Bostock (1982), 187, and n. 12; Graham (1984), 48f., (1987b), 148. Cf. Wieland (1962), 135.
[101] Bostock (1982), 187, n. 12.
[102] At *Metaph.* VIII.4, Aristotle identifies *sperma* as the moving cause, and instead the menses are identified as the matter in generation (1043a34-36). But this is not a problem if *sperma* at *Phys.* I.7 is taken in a general sense. Cf. *Metaph.* IX.7, 1049a1-16.

matter's role, does Aristotle nominate *sperma* as the *hupokeimenon* in the case of plants and animals?

A passage that seems of relevance to our question is available at *Metaphysics* VII.11. It shows that Aristotle does not always identify *sperma* as the matter of plants and animals. At *Metaphysics* VII.11 Aristotle is commenting on the view of some philosophers (the Pythagoreans) who deny that lines and the continuous (*sunechês*) should be included in definitions of triangles and circles respectively, on the grounds that the former are merely the matter of the latter. The key text for us follows: for we speak of these things, Aristotle says, 'just as we speak of flesh and bones in the case of man and of bronze and stone in the case of a statue' (1036b8-12). In other words, matter is related to the thing of which it is the matter as flesh and bone is related to man, and bronze and stone to the statue. This remark echoes the analogy of the underlying nature at *Physics* I.7, 191a7-11. What is particularly interesting about it is that Aristotle specifies what he would consider to be the analogue of matter in the case of man. In other words, it fills out the analogy of *Physics* I.7: as bronze (and stone) is to the statue, and wood to a bed, so flesh and bone is to the man (or animal).

Indeed it is often pointed out that *sperma* is not the matter of that which comes to be, e.g., man; for the matter of man is said to be flesh and bone.[103] A moment's reflection, however, is sufficient to realise that flesh, and bone, are also inappropriate candidates for matter as characterised at *Physics* I.9 (192a31-32). Unlike *sperma*, flesh and bone are constituents of the man, and they will persist or endure as non-accidental constituents through his life. Neither flesh nor bone, however, can be said to be the matter *from which* the man came to be. It is as if s*perma*, on the one hand, and flesh and bone, on the other, fit different parts of the definition of matter that Aristotle gives at *Physics* I.9; the latter are the matter *of* the animal, as it is right now; the former the matter *from which* or *out of which* it comes to be.[104] Perhaps if it could

[103] Thus Charlton (1970), writes: 'it ought to be flesh and bone which is the material factor', 76. See also Jones (1974), 489, Code (1976), 364-5, Miller (1978), 106.
[104] Cf. Charlton (1970), 76-77.

be shown that *sperma*, and flesh and bone, have something in common, then that common thing could be identified as the underlying nature and the matter of animals, and perceptible bodies in general. But, of course, there is something that they have in common. For *sperma*, flesh and bone are all homoeomerous bodies (see *GA* I.18, 724b29-30, with b21-3; cf. *PA* II.9, 655b23-5). (see, e.g., *GC* I.1, 314a19, *Meteor.* IV.12, 390b5). So perhaps we might say that the matter of plants and animals, and other perceptible bodies, is this or that homoeomerous body, or, more generally, the homoeomerous bodies. And if we say this then we seem to getting somewhere. For we find that this is precisely what Aristotle himself is sometimes prepared to say..

5.3 Near the beginning of the *De Generatione Animalium*, Aristotle declares that the matter for animals is their parts (*hê hulê tois zôiois ta merê*)—'the anhomoeomerous parts (*ta anomoiomerê*) for every whole animal, the homoeomerous parts (*ta homoiomerê*) for the anhomoeomerous, and the so-called elements of bodies (*ta kaloumena stoicheia tôn sômatôn*) for the homoeomeries' (I.1, 715a9-11).[105] The homoeomeries are those bodies or body parts that are completely uniform or homogeneous in nature; they are so constituted that the part is synonymous with the whole, i.e., hence any part of flesh, for instance, is flesh; a drop of blood is blood. Apart from *sperma*, flesh and bone (see *GA* I.18, 724b29-30, with b21-3; cf. *PA* II.9, 655b23-5; *GC* I.1, 314a19, *Meteor.* IV.12, 390b5), other examples of such bodies include tissue, sinew, marrow, lard, milk, bile (see *PA* II.2, 647b13f.); and also wood, bark, leaves, roots (*Meteor* IV.10 388a19-20). All these are homoeomerous parts of animals and plants (*ta en tois zôois kai phutois*, 388a16; cf. *PA* II.1, 646a21); but there are also homoeomerous bodies that are not found in animate bodies, for instance metals and things that are mined, e.g. gold, silver, copper, tin, iron, stone (388a13-16; see also IV.8, 384b30-33; cf. Ch. **1**, s. **4.2**). The anhomoeomerous parts are the internal and external organic, or 'instrumental', parts, e.g., heart, liver, lungs; hands, feet, head. These parts

[105] Translation Balme (1972), with some modifications. See Ch. **1**, n. 56.

are more complex in structure; a part of a hand, for instance, is not a hand (see *HA* I.1, 486a5-14; cf. also *PA* I.1 640b19, and *GC* I.1, 314a20, and I.10, 328a10f.).

So, on this account, the elements are the matter of the homoeomeries, the homoeomeries are the matter of the anhomoeomeries, and the latter are the matter of animals, i.e., of whole organisms.[106] Often, however, Aristotle seems content to identify the homoeomerous bodies and body parts as the matter of animals—indeed, as the matter of all natural things. 'The homoeomerous bodies come to be from the elements,' he writes in the *Meteorologica*, 'and from these as matter come the complete works of nature' (*ta hola erga tês phuseôs*, IV.12, 389b26-8). Lest this be dismissed as a somewhat loose remark, other passages may be cited where Aristotle takes the homoeomeries to be the matter of natural substances. For instance, flesh and bone are regularly identified as the matter of man. We have already noted one instance at *Metaphysics* VII.11. Just before that passage Aristotle identifies 'flesh and bone and other such parts', i.e., other homoeomerous parts, as the matter of man (1036b3-6). Again, at *Metaphysics* VII.8, Aristotle says that an individual substance is a certain form in matter, and that in the case of man, it is such and such a form 'in this flesh and these bones' (1034a4-6; cf. *Metaph.* VII.10, 1035a4-5; VII.11, 1036b10-12; VII.17, 1041b11-25; X.9, 1058b7). On other occasions, Aristotle names blood—also homoeomerous—as 'in a sense' the matter for the whole body (*PA* III.5, 668a5f.; see also III.4, 665b5ff.; and *GA* I.19, 726b5f., III.1, 751a34).[107]

Thus Aristotle's identification of *sperma* as the underlying nature of plants and animals at *Physics* I.7 seems to be in keeping with his view that the homoeomeries are the matter of natural bodies. But, as suggested above (s. 5.**2**), he doesn't mean that *sperma* itself is the matter of whole bodies, since it does not persist; nor does he mean that flesh and bone, nor any other particular homoeomerous body or body-part in itself, is the matter of the perceptible bodies. For no one of them is both that from which the body comes to be, and that which persists in

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[106] See Ross (1924), II, 357. Cf. *Metaph.* XII.3, 1070a19-20, *PA* II.1, 646a12-24.
[107] See Lloyd (1996), 87f., Lewis (1994), 257f.

the body as constituent.[108] On the other hand, Aristotle is certainly not simply saying that different homoeomerous bodies fulfil the role of matter at different stages in the generation and development of the plant or animal. For this would be mere temporal succession of states (cf. *GA* I.18, 724b1f.; cf. 724a20-30). Rather, *sperma* becomes flesh and bone, and all the other parts of the body (see *GA* I.19, 726b11-12, b15-19; cf. *PA* III.5, 668a25f.), and these latter persist as constitutive parts of what comes to be. *Sperma*, then, does not persist qua *sperma*; i.e., as a particular thing, but, to provide the continuity through these stages of development that one is bound by Aristotle's account of matter to expect, there is evidently something that is now *sperma*, and later flesh and bone, and the other homoeomeries, i.e., some *hupokeimenon* common to these homoeomerous bodies, that does persist through these changes. And, given that the homoeomerous bodies are composites of the simple bodies, it is presumably this *hupokeimenon* that is the matter of perceptible bodies: for, as I have argued, the perceptible bodies in the context of *De Gen. et Cor* II.1 are corruptible composite bodies. But what is the *hupokeimenon*? What is the matter of the homoeomerous bodies?

5.4 Now the matter of the homoeomeries is, as we have seen, sometimes said to be the so-called elements fire, air, water, and earth (*GA* I.1, 715a9-11, *Meteor.* IV.12, 389b26-7).[109] Indeed at *De Gen. et Cor.* II.7 Aristotle explains how the homoeomerous bodies come to be from the elements, and at II.8 he emphasises that the homoeomeries are composed of each of the four elements. But I don't think we can accept the four elements as the matter of the perceptible bodies at *De Gen. et Cor.* II.1. Firstly, a plurality of matters would give us something like Empedocles's theory. Furthermore, at *De Gen. et Cor.* II.1, 329a24, the matter of the perceptible bodies is said to be that from which the elements come to be. If the former is understood as the four elements, then this would mean that the elements act as the matter from which the

[108] Perhaps blood comes closest; see Lewis (1994), 257f.
[109] See Ch. **1**, s. **4.2**.

elements themselves come to be. This indeed has been proposed by some commentators.[110] But the suggestion at *De Gen. et Cor.* II.1 is quite plainly that the matter of the perceptible bodies, and the four elements fire, air, water, and earth, are different, for it would appear that Aristotle wants to distinguish his view of the matter of the perceptible bodies from those of his predecessors, and one view among his predecessors is precisely that the four so-called elements are the matter of the perceptible bodies.

Recall also *Parts of Animals* II.1, where Aristotle shows some caution about naming the elements as the matter from which the homoeomerous bodies come to be (646a12f.). As we have seen (Ch. **1**, s. **4.2**), he suggests that it is 'better' to say that the composition of the homoeomerous bodies is from the 'powers', hot and cold, dry and wet, than from the elements fire, air, water, and earth (646a14). Indeed he states that hot and cold, dry and wet are the matter of the composite, i.e., homoeomerous, bodies (a17). Now, when we discussed this passage earlier, I pointed out that hot and cold, dry and wet are the differentiae of the elements, and hence it is somewhat dependent on one's point of view whether the elements, or the contraries, are identified as the matter of homoeomerous bodies. I think we might now refine this suggestion.

At *Meteorologica* IV Aristotle again identifies the contraries as the matter of the homoeomerous bodies. In particular, he names the passive contraries dry and wet as the underlying matter of each thing, while the active contraries hot and the cold act upon these, and in this way determinate bodies emerge (see IV.1, 378b33-79a1, IV.8, 389a28-30, IV.10, 388a21-26; cf. *GA* II.6, 743a2-11). Some have taken these claims, together with that at *Parts of Animals* II.1, as evidence that the contraries are the constituents of the elements, and hence more truly *stoicheia.*[111] But it seems that by 'the dry', or 'the wet' Aristotle is talking about a *mixture* of all four elements. For instance, immediately after naming the moist and the dry as

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[110] For a recent defence of this view, see Broadie (2004). See also King (1956), Charlton (1970), appendix, and (1982), 201; Furth (1988), esp. 221-227, and Gill (1989), 243f. For criticism, see Robinson (1974), 179-183.
[111] See, e.g., Lewis (1996), 15f.; and Ch. **1**., note 52.

the matter of homoeomerous bodies at *Meteor* IV.10 (a21-2), he explains that he means by these water and earth, which possess these powers most of all (388a22-23; see also IV.4, 382a3-6, IV.8, 384b30-33, IV.11, 389a29-31). He then says that he intends to classify the homoeomerous bodies according to whether they are composed of earth or water, or both (188a25-26). But, of course, he isn't suggesting that there are homoeomerous bodies that are composed of *nothing but* earth, or *nothing but* water. Rather, to say that the matter of a particular homoeomerous body is dry is not to say that it is composed out of earth alone, but rather that it is composed *mostly* out of earth, and hence the characteristic it displays most prominently is that it is dry (cf. IV.4, 381b24-27, 382a5-6).[112] But if it is *mostly* of earth, then this means it is a mixture—and indeed not simply a mixture of earth and water, but a mixture of *all four elements.* For all composite or mixed bodies (*ta mikta sômata*) consist of all four elements (*GC* II.8, 334b31-335a9; cf. *Meteor* IV.8, 389b28-30).

So the classification of homoeomerous bodies is not into those made of earth, and those made of water, but depends rather on the relative proportions of earth and water in the mixture (IV.7, 384a3-4). Evidently the formation of particular homoeomerous bodies begins with these mixtures: matter that is dry (mostly earth) is acted upon by hot or cold, and this leads to one kind of determinate homoeomerous body; matter that is wet (mostly water), acted upon by hot or cold, leads to a different kind.[113] But the matter in every case, out of which the homoeomerous body comes to be, although described as earth or water, is a composite or mixture of earth, water, air and fire. I think it is along these lines that we can understand the claim at *Parts of Animals* II.1 that hot and cold, dry and wet are the matter of the homoeomerous bodies. We need not worry, for instance, about whether or not Aristotle thus hypostasizes the contraries, or complain that elsewhere Aristotle is clear on the point that contraries cannot be without a subject (e.g., *GC* I.7, 324b18-21, I.10, 327b22), for the

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[112] See Alexander, *In Meteor 4*, 214, 10-14; 219,35, and Lewis (1996), 144, n. 244.

[113] As Alexander puts it, 'hot and cold…bring about the composition of the homoeomerous [bodies] out of… earth and water', (trans. Lewis, *In Meteor 4,* 219, 25).

statement *presupposes* that the elements have already been mixed. It is 'better', then, to say that the matter of composite bodies is the hot and the cold, the dry and the wet, because the matter has these qualities, or has them potentially, precisely because it is a mixture of the elements.

5.5 Let's draw some conclusions. At *De Gen. et Cor.* II.1, 329a27, Aristotle directs our attention to 'a more accurate account', and I have followed the majority of scholars in thinking that this is a reference to *Physics* I.7, and that the account concerns the matter of the perceptible bodies. Now Aristotle in *Physics* I.7 appears to identify *sperma* as the underlying matter from which perceptible bodies such as plants and animals come to be. But something like *sperma* seems to many commentators an unsuitable candidate for the matter of the perceptible bodies. Reflection on Aristotle's claim that the homoeomerous bodies are the matter of all natural things leads to the possibility that the matter of the perceptible bodies—i.e., the matter of composite bodies—is not quite the four elements fire, air, water, and earth, but rather some mixture of these elements.

Can we return, then, to the *Physics* with the conclusion that the underlying nature is a mixture of the elements? Other scholars have indeed drawn this conclusion in relation to *Physics* I.7. Bostock, for instance, writes: 'this matter (at *Physics* I.7) is no doubt some mixture of the four elemental stuffs'.[114] But neither Bostock nor anyone else has really developed the suggestion in any detail, and it is in need of clarification if it is to stand. There is, for instance, an obscurity in the notion of 'some mixture' of the elements. The notion of 'some mixture of the elements' is presumably meant to convey some indeterminate homoeomerous stuff—for as a *mixture*, it must be homoeomerous (*GC* I.10, 328a9-11). But the suggestion here is presumably *not* that the underlying nature is some indeterminate homoeomerous stuff existing independently of a ratio that defines it as one thing or another. Indeed one might reasonably

[114] (1994), 73. B. doesn't defend this claim, however, and indeed elsewhere he seems to think the matter is prime matter; see (1995), 217-8, (2000), 4. See also Miller (1978), 108: '[the persisting matter in substantial generation] is a quite obscure and unfamiliar aggregate of elements'; Gill (1989), 107-8: 'earth, or a combination of elements… is the starting point of organic generation'.

object that to be a mixture presumably involves the elements of the mixture being mixed according to a certain proportion, or according to a certain ratio (cf. *GC* II.7, 334b15, b23-29). In that case we would have some *determinate* homoeomerous body, e.g., flesh, if this ratio; bone, if that, and so on, and as we have seen, such determinate items are not appropriate candidates for the underlying nature.

It seems rather that, while the 'mixture' must always be specified with reference to one determinate homoeomerous body or another, nevertheless it is not, for instance, the mixture of the elements in the ratio that defines *sperma* that acts as the underlying nature in a change from *sperma* to, e.g., flesh; for the persisting matter here is not *sperma*. Rather, the mixture of the elements that persists through the change from *sperma* to flesh has neither the ratio that defines *sperma*, nor that which defines what it is coming to be, i.e., flesh. The suggestion is that we must construe this mixture as something lacking the ratio that would determine it to be one thing or another. This is not to say it has no ratio whatsoever; it just has no *determinate* ratio during the change. It is indeterminate, or 'unshaped', in the sense that it is conceived without the shape or form or ratio that will identify it as one of the homoeomerous bodies, e.g., flesh, *sperma*, blood. In the final chapter I will have more to say about mixture; above all I want to show how this stuff is that from which the elements come to be.

Texts for Chapter 3

[a] *De Gen. et Cor.* II.1, 328b31-329a24

Λοιπὸν δὲ θεωρῆσαι περὶ τὰ καλούμενα στοιχεῖα τῶν σωμάτων. Γένεσις μὲν γὰρ καὶ φθορὰ πάσαις ταῖς φύσει συνεστώσαις οὐσίαις οὐκ ἄνευ τῶν αἰσθητῶν σωμάτων. Τούτων δὲ τὴν ὑποκειμένην ὕλην οἱ μέν φασιν εἶναι μίαν, οἷον ἀέρα τιθέντες ἢ πῦρ ἤ τι μεταξὺ τούτων, σῶμά τε ὂν καὶ χωριστόν, οἱ δὲ πλείω τὸν ἀριθμὸν ἑνός, οἱ μὲν πῦρ καὶ γῆν, οἱ δὲ ταῦτά τε καὶ ἀέρα τρίτον, οἱ δὲ καὶ ὕδωρ τούτων τέταρτον, ὥσπερ Ἐμπεδοκλῆς· ἐξ ὧν συγκρινομένων καὶ διακρινομένων ἢ ἀλλοιουμένων συμβαίνειντὴν γένεσιν καὶ τὴν φθορὰν τοῖς πράγμασιν. Ὅτι μὲν οὖν τὰ πρῶτα ἀρχὰς καὶ στοιχεῖα καλῶς ἔχει λέγειν, ἔστω συνομολογούμενον, ἐξ ὧν μεταβαλλόντων ἢ κατὰ σύγκρισιν καὶ διάκρισιν ἢ κατ' ἄλλην μεταβολὴν συμβαίνει γένεσιν εἶναι καὶ φθοράν. Ἀλλ' οἱ μὲν ποιοῦντες μίαν ὕλην παρὰ τὰ εἰρημένα, ταύτην δὲ σωματικὴν καὶ χωριστήν, ἁμαρτάνουσιν· ἀδύνατον γὰρ ἄνευ ἐναντιώσεως εἶναι τὸ σῶμα τοῦτο αἰσθητῆς· ἢ γὰρ κοῦφον ἢ βαρὺ ἢ ψυχρὸν ἢ θερμὸν ἀνάγκη εἶναι τὸ ἄπειρον τοῦτο, ὃ λέγουσί τινες εἶναι τὴν ἀρχήν. Ὡς δ' ἐν τῷ Τιμαίῳ γέγραπται, οὐδένα ἔχει διορισμόν· οὐ γὰρ εἴρηκε σαφῶς τὸ πανδεχές, εἰ χωρίζεται τῶν στοιχείων. Οὐδὲ χρῆται οὐδέν, φήσας εἶναι ὑποκείμενόν τι τοῖς καλουμένοις στοιχείοις πρότερον, οἷον χρυσὸν τοῖς ἔργοις τοῖς χρυσοῖς. Καίτοι καὶ τοῦτο οὐ καλῶς λέγεται τοῦτον τὸν τρόπον λεγόμενον, ἀλλ' ὧν μὲν ἀλλοίωσις, ἐστὶν οὕτως, ὧν δὲ γένεσις καὶ φθορά, ἀδύνατον ἐκεῖνο προσαγορεύεσθαι ἐξ οὗ γέγονεν. Καίτοι γέ φησι μακρῷ ἀληθέστατον εἶναι χρυσὸν λέγειν ἕκαστον εἶναι. Ἀλλὰ τῶν στοιχείων ὄντων στερεῶν μέχρι ἐπιπέδων ποιεῖται τὴν ἀνάλυσιν· ἀδύνατον δὲ τὴν τιθήνην καὶ τὴν ὕλην τὴν πρώτην τὰ ἐπίπεδα εἶναι.

[b] *De Gen. et Cor.* 329a24-b3

Ἡμεῖς δὲ φαμὲν μὲν εἶναί τινα ὕλην τῶν σωμάτων τῶν αἰσθητῶν, ἀλλὰ ταύτην οὐ χωριστὴν ἀλλ' ἀεὶ μετ' ἐναντιώσεως, ἐξ ἧς γίνεται τὰ καλούμενα στοιχεῖα. Διώρισται δὲ περὶ αὐτῶν ἐν ἑτέροις ἀκριβέστερον. Οὐ μὴν ἀλλ' ἐπειδὴ καὶ τὸν τρόπον τοῦτόν ἐστιν ἐκ τῆς ὕλης τὰ σώματα τὰ πρῶτα, διοριστέον καὶ περὶ τούτων, ἀρχὴν μὲν καὶ πρώτην οἰομένοις εἶναι τὴν ὕλην τὴν ἀχώριστον μέν, ὑποκειμένην δὲ τοῖς ἐναντίοις· οὔτε γὰρ τὸ θερμὸν ὕλη τῷ ψυχρῷ οὔτε τοῦτο τῷ θερμῷ, ἀλλὰ τὸ ὑποκείμενον ἀμφοῖν. Ὥστε πρῶτον μὲν τὸ δυνάμει σῶμα αἰσθητὸν ἀρχή, δεύτερον δ'αἱ ἐναντιώσεις, λέγω δ' οἷον θερμότης καὶ ψυχρότης, τρίτον δ' ἤδη πῦρ καὶ ὕδωρ καὶ τὰ τοιαῦτα· ταῦτα μὲν γὰρ μεταβάλλει εἰς ἄλληλα, καὶ οὐχ ὡς Ἐμπεδοκλῆς καὶ ἕτεροι λέγουσιν (οὐδὲ γὰρ ἂν ἦν ἀλλοίωσις). αἱ δ' ἐναντιώσεις οὐ μεταβάλλουσιν.

[c] Pseudo-Plutarch *De Fato*, 570f7-571a4

ὡς τὸ γινόμενον ἅπαν καὶ ἡ γένεσις αὐτὴ οὐ δίχα δυνάμεως, ἡ δὲ δύναμις οὐκ ἄνευ οὐσίας. οἷον (ἀνθρώπου) εἴτε γένεσις εἴτε γενητὸν οὐκ ἄνευ τῆς δυνάμεως, αὕτη δὲπερὶ ἄνθρωπον, οὐσία δ' ὁ ἄνθρωπος.

[d] *Physics* 191a7-12

ἡ δὲ ὑποκειμένη φύσις ἐπιστητὴ κατ' ἀναλογίαν. ὡς γὰρ πρὸς ἀνδριάντα χαλκὸς ἢ πρὸς κλίνην ξύλον ἢ πρὸς τῶν ἄλλων τι τῶν ἐχόντων μορφὴν ἡ ὕλη καὶ τὸ ἄμορφον ἔχει πρὶν λαβεῖν τὴν μορφήν, οὕτως αὕτη πρὸς οὐσίαν ἔχει καὶ τὸ τόδε τι καὶ τὸ ὄν.

4

The Matter of the Elements

Introduction

1.1 At *De Gen. et Cor.* II.1 Aristotle says that there is some matter of the perceptible bodies, and that it is from this that the so-called elements come to be (329a24-6; see Ch. **3**, s. **1.3**). The whole of the second part of this thesis, and to a large extent the first part too, can be seen as an attempt to unpack this assertion. In the previous chapter I explored the claim that there is some matter of the perceptible bodies. I established firstly that the so-called elements, the simple bodies fire, air, water, and earth, are not included among the 'perceptible bodies' in question; hence the latter must be composite bodies. I then attempted to determine what the matter of these bodies might be. In this chapter I want to try to make sense of the clause 'from which the so-called elements come to be'. Given that the perceptible bodies here are not, nor do they include, the so-called elements, how can the matter of the perceptible bodies be that from which the so-called elements come to be?

This question might be paraphrased, 'what is the matter of the elements?'. For it may seem natural to describe 'that from which the elements come to be' as 'the matter of the elements'. But a word of warning about this latter expression is in order, for whether or not Aristotle posits a matter *of the elements* is, in a sense, precisely what is at issue.[1] Let me explain. Aristotle asserts that there is something from which the elements come to be, and on occasion he is happy to refer to some matter that is 'common' to the elements (see *DC* IV.5, 312a30-3, *GC* II.5, 332a17-18, cf. II.7, 334a16-18; *Meteor.* I3, 339a36-b2). This much is not in question. What *is* in question is whether or not this matter, *from which* the elements come to be, is that *of which* the elements are composed.

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[1] Only once does Aristotle himself use the expression, 'the matter of the elements', at *PA* II.1, 646b6.

On the traditional view, as we have seen (e.g. Ch. **2**, s. **1**), the so-called elements are conceived of as composites of a bare substrate, prime matter, and a pair of non-opposing contraries; thus there is a matter of which the elements are composed or made.[2] But in the first part of this thesis I argued that the relationship between the contraries and the elements ought *not* to be conceived in this way, i.e., as constituents to what is constituted (see esp. Ch. **2**). And, this being so, the claim that prime matter is that from which the elements come to be is thus placed in doubt. Unlike other critics of the tradition, however, I don't think that, if we were to reject prime matter, then it follows that we must thereby reject the claim that there is something from which the elements come to be, i.e., something which is different from the elements, in that it is neither one of the four elements, nor identical to the four elements taken collectively.[3] For I believe there is scope in Aristotle's texts for an interpretation that accommodates *both* the claim that the four so-called elements are the most fundamental kinds of matter, *and* the claim, central to the tradition, that there is some matter from which the elements come to be, which is other than, but common to, the elements. In other words, I do not believe that the acceptance of the latter claim (and it seems to me we cannot but accept it) threatens the elementary status of the so-called elements fire, air, water, and earth. In this chapter I want to clarify and defend such an interpretation.

1.2 Let me show my hand. A key distinction to which I shall appeal in what follows, and to which I have already hinted in the preceding paragraph, is that between two ways in which one thing may be said to be 'from' (*ek*) another. If we say, for instance, that A is *from* B, then there is more than one way to understand the relation between A and B. Aristotle recognises a number of ways (see, e.g., *Metaph.* V.24); there is no need to rehearse them all. Relevant to our purposes

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[2] Cf. Bostock (1995), 217: '[fire, air, water, and earth] are each made of the same matter, with different combinations of the four forms 'hot', 'cold', 'wet', and 'dry".

[3] Typically the 'critics' argue that the four elements are themselves the matter of their own changes; see, e.g., see King (1956), and Charlton (1970), appendix, and (1982), 201; Gill (1989), 243f. (but see Ch. **2**, note 7), and cf. Broadie (2004), 139-15. For criticism of this view, see Robinson (1974), 179-183. I reject the other alternative, that the contraries are the matter of the elements (see Furth (1988), esp. 221-227, Lewis (1996), 15f.), in Ch. **2**, s. **2**.

are two: firstly, 'A is from B' in the sense that B is that out of which A is *made*, or *composed*, e.g., as a statue is made from bronze; secondly, 'A is from B' in the sense that B is that out of which, as the *source* or *origin* or *principle* of, or the starting point in the change that leads to, A. The distinction is important because, whereas with the former use of 'from', B is a *constituent* of A, with the latter, B need not be, and generally is not, a constituent of A (see, e.g., *Metaph.* XIV.5, 1092a29-30). We might call this a distinction between 'constitutive' and 'non-constitutive', or 'originative', uses of 'from'.[4] I will say more about the distinction below (s. **2.2**). But, for now, to put the interpretation that I shall defend in this chapter in a nutshell, I intend to argue that the elements come to be from the matter of the perceptible bodies according to the second use of 'from'. In other words, the elements come to be from (*ek*) some matter, in the sense that they emerge from this matter, or are generated from it; the matter is, as it were, the *origin* of the elements, but it does not persist as material constituent of the elements. It is not, then, the matter 'of' the elements in the constitutive sense of 'that of which each of the elements is composed', or 'made of'.

So, if my interpretation is right, the admission of something, some *matter*, from which the so-called elements come to be, need not entail that the so-called elements are not genuinely elemental. In other words, the matter from which the elements come to be is not the *constitutive* matter of the elements. Indeed, this matter is perhaps best described not as 'the matter of the elements' at all, but rather as '*the matter of the perceptible bodies*'—which, or course, is precisely how Aristotle puts it: he says that there is 'some matter *of the perceptible bodies*, from which the so-called elements come to be' (my italics, *GC* II.1, 329a24-6). Drawing on the above distinction of the uses of 'from', I suggest we understand this claim to be that there is some matter of which the perceptible bodies—the composite bodies of the sublunary world— are *composed*, and thus the perceptible bodies can be said to be *from* this matter in the constitutive use of 'from'; but it is *also* from or out of this stuff that the so-called elements come to be, or emerge, and this

[4] Thus Barnes (1979), 30 distinguishes 'constitutive' and 'originative' uses. This distinction has been identified by other names: Furth, e.g., refers to the 'vertical' and 'horizontal' senses of *ex hou*, (1988), 196f. See also Williams

is so in an originative, and non-constitutive, use of 'from'. And this fits with the conclusion of the previous chapter. For the tentative, and admittedly rather vague, conclusion reached there is that the matter of the perceptible bodies is 'some mixture of the elements' (s. **5**). Clearly, if that conclusion is correct—and we shall have further evidence in this chapter to think it *is* correct—then for the assertion at 329a24 to make sense, we *must* presume a non-constitutive use of 'from' when Aristotle says that the elements are 'from' the matter of the perceptible bodies. Otherwise we have the absurdity of the elements themselves being composed of mixtures of the elements. The interpretation I wish to defend here, then, is that the elements come to be from stuff that is itself composed of the elements, and while we may say that this stuff is the 'matter' of the elements, it is not the matter of the elements in the sense of that which persists as constituent in the elements.

For all its novelty, in one sense this is not a difficult thesis to defend. For, as we shall see, Aristotle states quite clearly, on more than one occasion, that the elements come to be from composite bodies. He appears to think it is obvious that they do so; it is, he says, evident to the senses that, e.g., fire and earth come to be from composite homoeomerous bodies, such as flesh and wood (see, e.g., *DC* III.3, 302a21-23).[5] Hence the problem is not to establish *that* it is Aristotle's view that the elements or simple bodies come to be from composite bodies: it clearly *is* his view. The problem, rather, is to explain *how* the former come to be from the latter. This explanation is the main task of this chapter, and it involves a close examination of *De Gen. et Cor.* II.7. The explanation is deceptively simple: the homoeomeries are mixtures, in determinate ratios, of the elements, hence, in accordance with Aristotle's theory of mixture,[6] the elements persist in the mixed bodies in potentiality, and are capable of separation from the mixture, i.e., they can come to be 'from', in the non-constitutive use of 'from', the mixture.

(1982), 80-1, and Cohen (1984), 185.

[5] See note 74, Ch. **3**.

[6] Note that Aristotle's account of mixture, and any difficulties therein, is not my concern here; the aim is to establish *that* he appeals to this account to explain how the matter of the perceptible bodies is that from which the elements come to be.

1.3 Before we begin, however, I want to draw attention to a deliberate limitation on the aims of this chapter, and by extension of the thesis as a whole. The concern of this chapter, as I hope I have made clear, is to make sense of the claim that the so-called elements come to be from the matter of the perceptible bodies. Following the interpretation of 'the matter of the perceptible bodies' in the previous chapter, this means that the concern of this chapter is the clarification of the coming to be of the elements or simple bodies *from mixed or composite bodies.* A consequence of this focus is that what I have to say is not *directly* concerned with the elucidation of Aristotle's doctrine of elemental change, by which I mean his account of the coming to be of simple bodies *from simple bodies.* This is why certain texts, e.g., *De Gen. et Cor.* II.4, *De Gen. et Cor.* I.3, receive less attention that one might have expected.

Now one might worry that this places a significant limitation on what I can claim to have achieved in this thesis. For one might think that it is precisely the change of one element into another that prime matter is posited to explain.[7] Hence, without an account of the mechanics of the change of one element into another element, one might object that I cannot claim, for instance, to be able to establish that Aristotle does not appeal to prime matter to explain these changes. But, while I accept that I cannot claim to establish *beyond doubt* that Aristotle does not appeal to prime matter as the substratum for elemental change, nevertheless I believe that what I have to say in this chapter and the thesis as a whole is not only relevant, but severely damaging, to the claim that he does make such a appeal. For instance, since prime matter as traditionally understood is taken to act in concert with the contraries as the constitutive matter of the so-called elements (thus, e.g., fire is hot and dry prime matter) my rejection of the claim that the contraries are more fundamental than the so-called elements (Ch. **2**) is not propitious for the view that the substratum of elemental change is prime matter. Furthermore, one of the central texts thought to be supportive of the prime matter hypothesis is *De Gen. et Cor.* II.1, 329a24f. For 'the matter of the perceptible bodies' is taken, traditionally,

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[7] Cf. Robinson (1974), 168, Dancy (1978), 389-91, Graham (1987), 476-7, Williams (1982), 211.

to be a bare substratum, with only potential existence, i.e., prime matter. My reading of that text is clearly quite opposed to that view (Ch. **3**). Further occasion to doubt the hypothesis of prime matter will present itself below (see esp. s. **3.2**).

In general, then, it is clear that what I have to say about the coming to be of the elements from composite or mixed bodies is not without relevance to the question of what happens when one element changes into another. Indeed, the explanation of the former sort of change, it seems to me, ought to take precedence over any attempt to get to grips with the latter. For I would presume that Aristotle's discussion of elemental change is motivated by his desire to establish that any one of the elements can come to be from any part of the mixture of the elements. So the question of the manner in which the elements come to be from composite bodies, and the question of the coming to be of one element from another, are related issues, and the explanation of either ought to accommodate both processes. But, to repeat, it is the *former* process that I want to get clear about in this thesis, not the latter. For the guiding question throughout this thesis is this: what is that from which the so-called elements come to be, i.e., what is the matter of the perceptible bodies? And it is the pursuit of an answer to *this* question that has dictated the path I have taken, and it has directed the enquiry away from a full-blown discussion of what happens, or is supposed to happen, in a change of one element or simple body into another element or simple body.

Matter and Mixture: *De Gen. et Cor.* II.7

2.1 The task of this section is to clarify Aristotle's argument in *De Gen. et Cor.* II.7. The importance of *De Gen. et Cor.* II.7 is that I believe it confirms and to some extent explicates the main claim of the second part of this thesis, namely, that the elements come to be from the matter of the perceptible bodies because the latter is a mixture of the elements.

It might seem surprising to focus on this chapter. For it is typically thought that, at *De Gen. et Cor.* II.7, Aristotle's aim is to explain not how the elements come to be, but how the

homoeomerous bodies come to be from the elements.[8] There is no doubt that this is an important part of what he wants to do. But it becomes clear almost immediately that this is *not* his sole interest: he also wants to explain how the elements come to be from the homoeomeries. *That* the elements do come to be from homoeomerous bodies, such as flesh and bone, is something that he takes for granted (334a34-35); he seems to regard it as a fact of observation. At *De Caelo* III.3, for instance, Aristotle points to the perceptible evidence of the emergence of the elements from homoeomerous bodies in support of his claim that there are elements. Following his definition of an element, as 'a body into which other bodies are analysed' (302a14-19), he writes:

> Now if an element is what we have said then it is necessary that there are such bodies. For in flesh and wood and each of the others there is fire and earth in potentiality; for it is evident (*phanera*) that these latter are separated out from (*ekkrinomena*) the former. In fire, however, flesh and wood are not present, neither according to potentiality nor according to actuality; for it would have had these things separated out of it (*exekrineto*, 302a19-25).[a]

So, clearly, the problem is not to *establish* that the elements come to be out of the homoeomeries; the problem, rather, is to explain *how* it occurs.

It soon becomes clear, moreover, that the success of the explanation of the manner in which the elements come to be from homoeomeries will depend on the explanation of the manner in which the latter come to be from the former. For in *De Gen. et Cor.* II.7 Aristotle sets as a condition for the latter explanation that it ought to account not just for the fact that the elements come to be from the homoeomerous bodies, but also for the apparently evident fact that the elements can come to be from *any part* of a homoeomerous body (334a31-334b2).

Take, for instance, Empedocles—or those who give an account like that of Empedocles, i.e., pluralists (334a26; see Ch. **2**, s. **4.1**).[9] For Empedocles, such things as flesh and bone come to be from the elements by composition, 'as a wall comes to be out of bricks

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[8] Williams' subtitle for *GC* II.7 is 'Formation of the Homoeomers', (1982), 49.

[9] Aristotle certainly has Empedocles in mind, here; he mentions him by name at 334a27. But he refers to those who speak like Empedocles (334a26-7), so it is not only Empedocles; cf. Williams (1982), 173.

and stones', (334a27-8). In other words, the product is an aggregate of minuscule particles of the elements, which are preserved unchanged, and placed alongside each other (a28-30; cf. I.10, 327b31-328a17). Now the problem with this, it seems, is that the elements will not come to be from the product, e.g., flesh, in the appropriate way. Aristotle explains:

> It follows that fire and water cannot come to be from any part of flesh, in the way that from the wax a sphere comes from this part, a pyramid from some other part, but it would be possible for either of the two to come from either [part].[10] It does happen in this way, however, that both [fire and water] come to be from any part of flesh (334a31-35).[b]

On Empedocles' account, then, since the elements are preserved as actual components in the wall, fire can only come from the part where the fire particles are placed, and water, from another part, where the water particles are placed. Aristotle likens this to the way stones and bricks come out of a wall (a35-b2; cf. 334a19-20).[11] Aristotle himself, by contrast, thinks it is evident that fire and water, and indeed air and earth, come to be from *any part* of flesh or any other homoeomer.[12] And *how* this occurs is what demands explanation.

Thus Aristotle at *De Gen. et Cor.* II.7 wants to explain how the elements come to be from the homoeomeries, and not only how the homoeomerous bodies come to be from the elements. Moreover, the explanation of the manner in which the homoeomerous bodies come from the elements must be such as to accommodate the observation that any one of the elements can come to be from any part of the homoeomerous body. This is crucial: Empedocles' theory of composition appears to fail precisely because of this condition. This needs to be borne in mind, then, when we read *De Gen. et Cor.* II.7.

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[10] The reference to spheres and pyramids seems to be a reference to Plato's *Timaeus*; cf. 53c-55c with *DC* III.4, 303a32-b1; cf. also III.8, 307a24-26.
[11] Williams (1982) suggests that Aristotle already indicates that the generation of elements from composites is a problem for Empedocles at 334a19-20. This may be so, but it is, as W. admits, expressed obscurely, 173-4.
[12] See Joachim (1922), 240, Williams (1982), 174.

2.2 So we need to see how Aristotle explains the coming to be of the homoeomerous bodies from the elements, and then consider how this explanation can account for the coming to be of each of the elements from any part of a given composite homoeomer. The clarification of this process will occupy most of what follows. Aristotle's argument at *De Gen. et Cor.* II.7 is compressed and not always easy to follow, but the explanation, ultimately, is reasonably straightforward: the homoeomeries come to be through the mixing of the elements, and these latter are able to separate out from the mixture—in particular, from any part of the mixture—because, according to Aristotle's theory of mixture, the ingredients of a mixture persist in the mixture in potentiality. So it is not that in *this* part of a body we have fire, in *that* part water, as though actually present in the thing; rather any part of the thing, of flesh, for instance, is potentially fire, air, water, and earth.

But first a word on the use of 'from' in the statements: 'the homoeomerous bodies come to be from the elements', and 'the elements come to be from the homoeomerous bodies'. It is clear, even before we examine Aristotle's explanation of these processes, that the way the homoeomerous bodies are *from* the elements must be rather different to the way that the elements are *from* the homoeomerous bodies. On the one hand, the homoeomeries are composed of the elements; on the other hand, however, it cannot be that the elements are *composed* out of the homoeomeries, i.e., out of some mixture of the elements. For the elements are elemental; they are not mixtures, nor constituted of mixtures. To make the elements mixtures is close to what Aristotle accused Anaxagoras of doing; for, as Aristotle takes it, Anaxagoras made such things that Aristotle himself calls 'homoeomeries' play the role of 'elements' (*DC* III.3, 302a31, III.4, 302b13; *GC.* I.1, 314a18-9). So we need to distinguish the way that the elements are from the homoeomeries and the way the latter are from the former. And we can distinguish them like so: the homoeomeries are 'from' the elements in the *constitutive* use of 'from'; the elements *constitute* the homoeomer. But, as for the elements, these must be 'from' the homoeomeries according to a *non-constitutive*, or originative, use (see s. **1.2**).

Aristotle suggests a number of ways in which one thing can be said to come to be from another (see *Metaph.* V.23, *GA* I.18). But the main distinction, as he puts it at *Metaphysics* XIV.5, is that between cases where the thing from which is a constituent of that which comes to be, and those cases where the thing from which is not a constituent of that which comes to be (1092a29-30). Now the former sense of 'from' indicates the *matter*, strictly speaking, of which the 'product', i.e., that which comes to be, is composed; for matter is precisely 'that from which' (*ex hou*), being present in the product as a constituent (see *Phys.* I.9, 192a31-2, II.3, 195b7-9). Thus the constitutive use of 'from' indicates the material cause. Aristotle's favourite example of this use is that of the statue coming to be from bronze (*Phys.* II.1, 194b23-26, *Metaph.* V.24, 1023a29, *GA* I.18, 724a23-26). This is the use of 'from' in the statement: 'the homoeomeries are *from* the elements'.[13]

The non-constitutive, or *originative*, use of 'from', on the other hand, tends to capture the efficient cause of that which comes to be, or else the thing that is replaced by another, or else the thing that comes before another in time. Thus Aristotle speaks of the child coming to be from the parents (*Metaph.* V.23, 1023b4), or of night coming from day (1023b8, *GA* I.18, 724a21-3). The thing from which in these cases need not, and generally is not, a persisting constituent of the thing that comes to be. It is in *this* way that the elements are from the homoeomeries, i.e., non-constitutively.

But here's a question. If the suggestion is that the homoeomeries, or better, some indeterminate homoeomerous stuff, is the matter of the elements, then there seems to be a problem, because, strictly speaking, the 'that from which' as matter ought to be a constituent in the object that comes to be. How can the 'that from which' be called 'matter' if 'from' has the non-constitutive sense?

There are, I think, two ways to answer this objection. Firstly, it might be worth pointing out that there is no compulsion to insist upon using the expression '*the matter of the elements*'.

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[13] To be precise, the homoeomeries are not from four elements, taken discretely, but from a mixture of the four elements; see Ch. **3**, s. **5.5**.

Aristotle doesn't use it at all in the *De Gen. et Cor.*, and elsewhere he seems to use it once only, at *Parts of Animals* II.1 (646b3). Certainly he talks about a matter *common* to the elements (see, e.g., *DC* IV.5, 312a30-3), but again we come back to the fact that Aristotle pointedly says that the elements come to be from the matter *of the perceptible bodies.*

A second way to answer this objection, however, is to identify precedents in Aristotle for a use of 'matter' or *hulê* to designate 'that from which' in cases where there is no persistence. One example, indeed, seems to be the case of *sperma*, discussed in the previous chapter, for *sperma* does not persist as constituent of the plant or animal. (Ch. **3**, s. **5**). Admittedly Aristotle doesn't go so far as to call it *hulê*, but *sperma* is given as an example of the underlying thing or nature from which plants and animals come to be, in a context where the kind of underlying things that Aristotle has in mind include bronze, for a statue, and stone, for sculptures (*Phys.* I.7, 190b4f.).[14]

Another example, which will turn out to be particularly relevant to our discussion, of Aristotle using *hulê* to designate 'that from which' in cases where 'that from which' does not persist appears to be available at *De Gen. et Cor.* I.1. Here we find Aristotle discussing Empedocles's notion of the One (or the Sphere, *sphairos*), and its relation to the elements (or roots, 315a3f.). Aristotle asks which is the principle—the One or the Many—and his answer displays a use of 'from' that, I think, matches the use of 'from' in the case of the elements coming to be from the homoeomeries. For Aristotle says that Empedocles' One is the element (or principle) of things insofar as it is 'like *the underlying matter* from which (*hôs hulê hupokeitai ex hou*) earth and fire come to be by a change because of the motion' (315a21-3).

To grasp the significance of this assertion, it is important to emphasise that Aristotle thinks of Empedocles' One or Sphere as a sort of mixture of the elements. At *Physics* I.4, for instance, Aristotle includes Empedocles among 'those who say that what is is both one and many' (*hosoi d'en kai polla phasin einai*, 187a21-22). Anaximander and Anaxagoras are the others

[14] Cf. Furth (1988), 196, 218-220; also 120 n. 27.

who Aristotle thinks say this or something like it. Evidently what Aristotle thinks Empedocles, Anaximander, and Anaxagoras have in common is that they each posit a matter that is at once both one and many, presumably because it is a kind of mixture—as Ross puts it, 'an indeterminate mixture'.[15] Indeed Aristotle says that Empedocles and Anaxagoras have more or less the same view as Anaximander, 'because they too separate out everything else from the mixture' (*ek tou migmatos gar kai houtoi ekkrinousi talla*, 187a21-23). To be precise, Anaxagoras separates out the homoeomerous bodies, and the contrarieties; while Empedocles separates out only the so-called elements (a25-26). Note that the 'matter', being a mixture, must be destroyed when things come to be or separate out of it. Positing a mixture of the elements as principle is thus markedly different from positing the 'one' of other monistic theories, i.e., one of the so-called elements, insofar as the latter is thought to persist in what comes to be out of it, whereas the mixture cannot persist as a substratum.[16]

Returning, then, to *De Gen. et Cor.* I.1, evidently Aristotle is thinking of Empedocles' One as a mixture, and, therefore, when earth and fire come to be out of it, the mixture is destroyed. Hence the elements come to be from this 'one', the Sphere, according to the non-constitutive use of 'from'. Indeed Aristotle talks about the Many, i.e., the elements, coming to be from the dissolution (*ek dialuseôs*) of the One, i.e., when the mixture breaks up (315b23-25). So the coming to be of earth and fire from the One, in which earth and fire have been mixed,[17] is clearly not a constitutive use of 'from'. What is particularly interesting about this passage, then, is Aristotle's readiness to say that that from which earth and fire come to be is 'like the underlying matter', i.e., despite this not being a constitutive use of 'from'. Thus it seems that on occasion Aristotle is prepared to call something the 'matter' of something else, even if the latter is from the former in the non-constitutive sense.

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[15] Ross (1936) paraphrases 187a21-22: 'those... who make the underlying material an indeterminate mixture which is both one and many' (483). Theophrastus (reported by Simplicius; DK 12A9a) and Aëtius (A17a) take Anaximander's *apeiron* to be a mixture of all things (*mixis ton hapanton*).

[16] Cf. Kirk, Raven, Schofield (1983), 113, n. 2.

[17] Aristotle in this passage seems to force his own notion of *mixis* upon Empedocles; see, e.g., Curd (1998), 160f. For further discussion of the accuracy of Aristotle's interpretation of the *sphairos*, see Wright (1981), 35-6, Longrigg (1967), 1-4; Osborne (1987), 44. Cf. also Burnet (1892), 236, n. 4.

Now I think this is particularly relevant because the way the elements or roots are understood by Aristotle to be 'from' Empedocles' One is, I believe, close to the manner in which the elements come to be from the homoeomeries—or to be more precise, from the indeterminate homoeomerous stuff, i.e., the matter of the perceptible bodies (for this identification, see Ch. **3**, s. **5.5**). Hence there seems to be a precedent for thinking also of the matter of the perceptible bodies as, in a sense, the underlying 'matter' of the elements. For what seems to occur in both cases involves the destruction of the mixed body into its constituents; clearly it is not possible for there to be a single substratum persisting through this change, but it need not follow that we cannot talk about a matter from which the elements come to be. There is a 'matter' of the elements, in other words, but this is not something that the elements are made from, or that constitutes the elements.

So, to sum up, the use of 'from' when we talk about the elements coming to be from something or other, e.g., flesh, or wood, or bone, is not a constitutive use of 'from'. Rather, the elements are from these homoeomeries in the sense that the latter are the things from which the change that led to the emergence of the elements started, or originated. The difference between this use and the other use of 'from' is that we say, of the homoeomeries, that they are 'from' the elements because we can infer the presence of the elements in the body by examining its tangible characteristics, and also the manner in which it reacts to external forces (see Ch. **2**, s. **4.4**). For instance, the tangible qualities of flesh, and how it reacts under different environmental situations, 'reveal' the elements of which flesh is composed, and we can duly say that flesh is 'from' these elements. Thus the constitutive use of 'from' might also be regarded as an 'analytical' use, as it is by analysis of *this body here before us* that we divine its elemental constitution. But in establishing that flesh is so much water, so much earth, so much air or fire, we are not thereby saying that the former is 'from' the latter in the sense that at some point in time the right amounts of the four discrete elements came together to produce flesh. The

elements must always be regarded as being constituents of some (composite) body: thus flesh was generated through the action of *sperma* upon the menses.

On the other hand, the elements are 'from' the homoeomeries in a non-constitutive sense. Whereas we might say that the constitutive use of 'from' is 'static', as it were, depicting what the thing that came to be is made of *right now*, the non-constitutive use is 'dynamic', as the use of 'from' identifies what it is, or was, that was there before the elements came to be, or what gave rise to the emergence of the elements.[18] It indicates, in other words, the starting point of the change. Thus, for instance, we see fire, air, water, and earth, or rather, phenomenal manifestations of these elements, coming out of things, i.e., out of mixed bodies, in the form of liquids, or flame and smoke, or ashes.

With this clarification in hand, let's now make a start on the question: how do the homoeomeries come to be from the elements?

2.3 Aristotle begins *De Gen. et Cor.* II.7 with a distinction between those who admit elemental transformation and those who deny that the elements change into each other (334a15-21). This is another way of distinguishing monists and pluralists, for, as he immediately points out, the theses that there is a common matter for the elements, and that the elements change into each other, are mutually entailing (334a16-18; cf. *GC* I.1, 314b28-315a2). Since Aristotle too holds that there is a common matter for the elements (see, e.g., *DC* IV.5, 312a30-3, *GC* II.5, 332a17-18), and that the elements change into each other (*GC* II.4), presumably he sees himself as belonging to, or at least having an affinity with, the first group.[19] But whether one admits elemental transformation or not, explaining how the homoeomerous bodies come to be from the elements remains problematic.

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[18] Cf. Furth (1988), 195.

[19] See Joachim (1922), 239; but cf. Charlton (1983), 203, who denies that Aristotle thinks that the entailment of a common matter applies to his own account of elemental transformation.

Aristotle first points out that those who deny elemental transformation, e.g., Empedocles, will not be able to explain how the homoeomerous bodies, such as flesh and bone, come to be from the elements. He presumably means that they won't be able to explain how the homoeomerous bodies come to be from the elements in such a way that the elements can emerge from any part of the resulting composite (s. **2.1**). But then Aristotle adds that even for those who allow that the elements change into each other, it is still unclear how the homoeomerous bodies come to be from them. He writes:

> [there is] a problem (*aporia*) also for those who make them [the elements] come to be from each other, regarding the way in which something different and beyond them comes to be from them. I mean for instance from fire there is water and from this, fire comes to be (for the *hupokeimenon* is something common); but yet flesh comes to be from them and marrow; how do these [i.e., flesh, marrow] come to be from them? (334a21-6).[c]

The difficulty Aristotle states here is that those who admit elemental change must be able to account for the capacity of the elements to change in ways other than their own mutual transformations, in particular, a change whereby the homoeomerous bodies come to be from the elements (334a23-25). This is a difficulty, it would seem, even for Aristotle, because in his own account of elemental transformation, at *De Gen. et Cor.* II.4, it appeared that the destruction of one element seemed always to involve the generation of (at least) one other element. For, as we have seen, Aristotle identifies the contrary pairs hot and cold, dry and wet as the differentiae of the elements and these are allocated among the elements in such a way as to render each element contrary to one another (*GC* II.2; see Ch. **2**, ss. **2** and **3**; *GC* II.4, 331a14-19). Now change takes place between contraries (*GC* II.4, 331a14; see also *GC* I.7, 324a1-8; cf. *Phys.* I.4, 188b21-26), and Aristotle talks in *De Gen. et Cor.* II.4 as if elemental change will always involve a contrary passing into its direct opposite, i.e., as if the hot will always pass into the cold, or the dry into the wet, and vice-versa. As Williams notes, it is as if

contraries were being thought of as contradictories.[20] Thus, in most cases, an element, when it changes, will change into another element. Aristotle does countenance the possibility that two elements could be destroyed, without resulting in the generation of a new element (331b26-33), but there is little indication that *something else*, which is not an element, could come to be from element changes. Are there any further changes that the elements can undergo? One often gets the impression from the secondary literature that the elemental changes described in *De Gen. et Cor.* II.4 exhaust the possibilities for elemental transformation.[21] But, clearly, if the homoeomerous bodies come to be from the elements, then there *must* be a further kind of elemental change, one that results not in another element, but in a different kind of body altogether, such as flesh or bone. How can this occur?

Following his criticism of Empedocles (334a31-35, s. **2.1** above), Aristotle reconsiders the problem, and considers the alternatives. He writes:

> There is a similar difficulty also for those who posit a single matter[22] for them [i.e., for the elements], to say how something would come to be from both,[23] for instance, from cold and hot, or fire and earth. For if flesh is from both and it is neither of them, nor a synthesis (*sunthesis*) in which they are preserved, what is left except that the thing that comes to be from these (*to ex ekeinôn*) is the matter? For the destruction (*phthora*) of one makes either the other or the matter (334b1-7).[d]

Aristotle here airs three possibilities, two of which he certainly rejects, while the third is obscure. The first is that flesh is really either earth or fire. Perhaps this would involve taking flesh as the result of the alteration of a single persisting element. Aristotle rejects this: flesh is neither fire or earth, but something from, and other than, both. The second is that flesh is a synthesis, or juxtaposition, in which fire and earth are preserved; i.e., the elements are preserved

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[20] (1982), 175.

[21] Gill (1989), whose interpretation of elemental change has been acclaimed as the 'state of the art' (Lewis (1996), 16), gives that impression; she makes but one reference to *GC* II.7, and that comes on the very last page of her book (252).

[22] Recall that Aristotle thinks the postulation of a single matter entails and is entailed by the thesis that the elements change into each other (334a16-18). Hence he presumably includes himself in this group, and the problem is one he too faces. See Joachim (1922), 241, Williams (1982), 215, but also note 19 above.

[23] Why 'both', and not 'all four'? Aristotle sometimes works out issues to do with the elements by using, perhaps for convenience, just two of them, in particular, fire and earth; cf. *GC* I.3, 319a29f., *GC* II.5, 332a17-20; also *DC* III.1, 298b6-8.

as actual things, like the stones and bricks in a wall—this is the view of Empedocles, which Aristotle has just rejected (334a26-334b1). The third option, and, he seems to say, the only remaining possibility, is that 'the thing from these is the matter' (*tên hulên einai to ex ekeinôn*, 334b6-7); in apparent support of this, he adds that the destruction of one element results in another, or in matter. In other words, the only remaining possibility appears to be that flesh is the *matter*—presumably, the matter of fire or earth, i.e., the matter of the elements.

Why isn't there another possibility, e.g., that flesh is the result of a mixture, in which fire and earth do not exist actually, as they do in Empedoclean synthesis, but potentially, i.e., in the sense of mixture Aristotle puts forward at *De Gen. et Cor.* I.10? As we shall see, this *is* how Aristotle will propose to explain the generation of homoeomerous bodies (334b7-17). So it might seem odd he doesn't mention mixture here. It might have allowed us to avoid the strange conclusion that flesh must be the matter of the elements. But, before looking to his solution, let's dwell on this 'strange conclusion' for a moment. How are we meant to take this third possibility, that the thing from fire and earth is the matter? Is it a step in the argument, or a dead end? Does Aristotle really think that the elements change either into each other, or into matter? If so, how does an elemental change resulting in the matter of the elements differ from that resulting in a homoeomer like flesh?

2.4 Let's try to clarify how Aristotle arrives at the conclusion that flesh is (or might be) the matter of fire and earth, and what it means. He says the destruction (*phthora*) of one makes either the other, or the matter. By saying it makes 'the other', he means that, if an element, or a differentia of an element, is 'destroyed', then typically another element will come to be; if, e.g., fire, i.e., the heat of fire, is destroyed, then earth will come to be, as this is cold. In other words, the differentia is destroyed into its contrary, giving rise to another element. This talk of 'destruction', particularly in relation to contrary differentiae, may appear unusual, but it is the language Aristotle employs at *De Gen. et Cor.* II.4 (see 331b9, b13, b15, b20, b30, b36).

Note, however, that, in the above quote, he now appears to suggest that an element can also be 'destroyed' in such a way that it results in 'matter', rather than another element. There is, apparently, no other change that the elements undergo. Hence the only remaining explanation of the generation from the elements of non-elemental things, i.e., the homoeomeries, is that the thing that comes to be is the matter; hence flesh, if it is not an element (or an aggregate of elements), would appear to be matter. For many commentators this matter must be prime matter. Thus, for instance, Williams writes, 'the only alternative to gaining a contrary quality, for something which loses one of its qualities, is for it to revert to bare matter'.[24] But, leaving aside the identification of the matter as prime matter for a moment, even if this is not *the* explanation of how flesh and the other homoeomerous bodies come to be from the elements, or a step towards that explanation, then at the very least the final assertion of the above quote (334b6-7) does seem to be a statement of doctrine: in other words, the elements do not change in any other way.

But what would it mean for an element to be destroyed into matter, or rather, for two (or more) elements to act on each other such that they destroy each other and only 'matter' remains? For Williams, as we have seen, it means reverting to 'bare matter', i.e., matter without any characteristics whatsoever, or prime matter. For this reason he thinks that Aristotle is not offering a possible solution, or step towards a solution, to the question of the generation of homoeomerous bodies at 334b6-7. Aristotle, he writes, 'does not need to spell out the absurdity, on his understanding of matter, which would be involved in accepting this alternative'.[25] Fortunately for us Williams does proceed to spell it out:

> The difficulty is that something like flesh, which is regarded as a mixture of elements... may turn out to be indistinguishable from prime matter. What is there for any homogeneous body to be other than one of the elements or the matter which underlies them? If the elements do not change into one of themselves they can only change into bare matter.[26]

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[24] (1982), 175
[25] Ibid.
[26] (1982), 215.

If this is so, then the matter of, e.g., fire and earth is not flesh or some other homoeomerous body, and some other solution must be found. Thus Williams seems to think that the conclusion at 334b6-7 is something of a dead end.

But, although it may seem like plain common sense to deny that flesh is the matter of fire and earth, Williams' interpretation of 334b6-7 is worrying, in particular his appeal to a bare substrate. He gives no indication of how an element, or rather *two* elements, might be destroyed into a bare substrate; presumably it is supposed to happen if they both act on each other in such way that they each lose both of their differentiae. Now Aristotle made no mention, at least no explicit mention, of an element being destroyed into its matter in his account of elemental transformation in *De Gen. et Cor.* II.4. Perhaps that was because he was discussing change between elements, with a particular emphasis on establishing that, and how, each element can come to be from any of the other elements (331b36-332a2). The discussion of the generation of homoeomeries from the elements was thus not at issue. He did, however, appear to admit that contraries could be destroyed, without anything coming to be (331b26-33). In such cases, two elements that share a common contrary or *sumbulon*[27] act on each other, but no new element comes to be. For instance, if fire and air both pass away such that fire loses its dryness and air loses its wetness, then the heat of fire and the heat of air is what remains (331b29-32). Are these cases where the elements have been destroyed into matter?[28]

One might wonder, moreover, if by 'matter' here is meant 'prime matter', how contrary differentiae can be lost, if there is prime matter underlying it—i.e., a matter conceived as an inseparable matter that is actualised as one or other element by taking on contraries. In other

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[27] For instance, earth and fire are both 'dry': this common differentia Aristotle calls the *sumbolon*. While the English word 'symbol' is derived from the word *sumbolon*, it would not be a useful translation. In its original meaning, *sumbola* were the two halves of a bone or other object broken and shared between two parties to a contract or agreement, each party keeping one piece, in order to have proof of the identity of the presenter of the other. In Aristotle's use here, much the same meaning is retained; the *sumbola* is a part of a whole, which requires a complement to constitute or re-constitute the whole. See LSJ, and Joachim (1922), 221; cf. Aristophanes' speech in Plato's *Symposium*, for a similar use of *sumbola* (191d).

[28] Surprisingly, given the support such changes, in particular the suggestion of contraries being destroyed without a new contrary coming to be, might give to Williams' view of 334b6-7, he dismisses them as the result of Aristotle confusing himself, (1982), 162-3; as does Rashed (2005), 160.

words, if fire is hot prime matter, and earth cold prime matter, how might prime matter stop being hot, without becoming cold, or cold, without becoming hot? Even if prime matter could simply lose heat, and lose cold, without gaining a replacing feature contrary to those lost, it still wouldn't be 'bare', for it would still be dry—or is the suggestion that its dryness would disappear too? If it was no longer dry, and neither hot or cold, nor indeed something intermediate between these contraries, but completely 'bare', then this substrate would seem very close to the separable *apeiron* criticised in *De Gen. et Cor.* II.1 and II.5 (329a8-13; 332a23-6).

A further difficulty is that the matter here appears to be something that results from the interaction of fire and earth. It is said to be a product of the elements, i.e., 'the thing from these' (see also 334b20, below). But does prime matter *come to be*? That is not an obvious way to conceive of prime matter—indeed it is not an obvious way to think of matter in general. Williams, as we have seen, thinks that the conclusion is obviously absurd, and intended by Aristotle to be so. But Aristotle's intention is hardly to produce a *reductio ad absurdum* of the possibility of a homoeomerous body coming to be from the elements: he takes it for granted that flesh and bone *do* come to be from the elements. But it is still unclear what is involved in this latter kind of change.

Perhaps, however, it might be useful to recall that Aristotle thinks that the explanation of the generation of the homoeomerous bodies from the elements is a problem for anyone who posits a single matter. If Aristotle himself is indeed a member of this group,[29] it is clear he is not the only member. Perhaps, then, as Charlton suggests, the problem is one that applies more pertinently to other members of this group, in particular, those who might think that this single matter must be a determinate kind of stuff, i.e., one of the so-called elements.[30] For if fire and earth come to be from another element, e.g., water, such that fire is hot water, and earth cold water, then the changes available to these elements seem limited to (a) changes into each other (hot water changes into cold water), or (b) changes into the matter, i.e., water—this change

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[29] See notes 22 and 19 above.
[30] (1982), 203.

occurring when fire and earth are combined. For hot water and cold water, interacting with each other, would result in 'ordinary' water.[31] If the matter is like this, then it is indeed difficult to see how something else, like flesh, can arise from the elements.

Charlton's suggestion is attractive because it indicates that this is a difficulty for which Aristotle has a solution. For it is clear that he himself doesn't think that the elements come to be from, or return into, another *element* as their matter (II.5, 332a22-27; cf. *GC* I.2, 317a22-27). Moreover, it may explain why Aristotle holds back, at 334b1-7, what we know will be his solution to this problem: the homoeomerous bodies are *mixtures* of the elements. The 'new' question, however, is whether it still remains the case that the elements change in only two general ways. In other words, whether the mixing of the elements is *another* kind of change that the elements can undergo, i.e., a third change besides (a) the change of one element into another, and (b) the (still obscure) change whereby the elements give rise to the matter; or if the mixing of the elements is, for Aristotle, to be understood as a process that, in some way, might be described as a change, or destruction, of the elements into their matter. Aristotle's proposed solution to the question of the formation of the homoeomerous bodies, which immediately follows on the above quoted passage, sheds much light on this 'new' issue. For indeed it seems that what comes to be from the elements is both *mixture*, and, in another sense, *matter*.

2.5 Aristotle's solution to the question of how the homoeomerous bodies are composed of the elements is based on the thought that, when elements change, they need not change into each other, but into something intermediate between them—in other words, a mixture. He works out his solution as follows:

> … since hot and cold can be more or less, whenever one is simply actual, it would be the other potentially; while when it is not completely, but, as for instance a hot cold, or a cold hot, because being mixed they destroy each other's excesses (*dia to mignumena phtheirein tas huperochas allêlôn*), then neither the matter, nor either one of the contraries, would be simply in actuality, but something in between (*metaxu*), according to which the potentiality is on the one hand more hot than cold, or according to a ratio (*logos*) of

[31] Ibid.

> twice as hot in potentiality, or cold, or three times, or in some other way. It is as a result of the contraries, or the elements, having been mixed that the other things will exist… (334b7-17).[d]

Aristotle here appeals to his account of mixing (*mixis*) at *De Gen. et Cor.* I.10 to explain how the homoeomerous bodies come to be.[32] As he explained in the earlier chapter, when two things that can act on and affect each other come into contact, and their powers are more or less equal, 'then each changes from its own nature (*ek tês hautou phuseôs*) towards the more dominant one, not becoming the other, but becoming something intermediate and common', (*metaxu kai koinon*, 328a28-31).

The simple but crucial point here is that a contrary need not pass directly into its contrary; it may also pass into something that is in between, or an intermediate (*metaxu*, *to meson*, 334b27, b28). Now this is not really a departure from the view that a contrary changes into its contrary, i.e., into its privation; for the intermediate between contraries is also a privation—a privation of both contraries (cf. *Metaph.* X.4, 1055b1-8, b14-17). For the intermediate is composed of contraries (*Phys.* I.5, 188b21-26; see also 188a35-b2, and *GC* I.7, 323b29-324a1). Intermediates between opposites are often supposed to be themselves made up of ratios of those opposites, and as such capable of acting as contraries to either opposite (see, e.g., *Parmenides* 161d; and *Republic* 478e). The intermediate, then, is a product of contraries (cf. *GA* I.18, 724b7-12), and as such it is potentially either one or the other of its contraries. For, although each element is, in a sense, destroyed, because there is a change in the differentiae, it is nevertheless in another sense somehow preserved, i.e., in potentiality (*GC* I.10, 327b30-1; II.7, 334b15-19).

So, when, e.g., fire and earth are interacting with each other, if they are able to mix, which they will if one cannot overpower the other, the hot, for instance, might pass away without becoming cold; it can also become warm or tepid; in other words, there are differences

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[32] For Joachim (1922), 241, the passage is mostly 'a mere restatement' of *GC* I.10; see also Williams (1982), 175. Rashed's subtitle for *GC* II.7 is 'Return to Mixture, in the light of the discussion of the elements', (2005), 69. See note 6 above.

of degree of hot and cold.[33] And when they mix, something intermediate and common comes to be out of their mixture—some stuff which is something less hot, less dry, less cold, less wet than each element; but with the potentiality to become hotter, or colder, drier or wetter. It is not only what is, e.g., 'completely' cold that is potentiality hot, but also that which is between hot and cold. As Aristotle explains some lines later, flesh and bone and the others come to be when the contraries hot and cold, dry and wet approach the intermediate (334b23-9).[34] And this intermediate, as he puts it, is not an indivisible point of equal balance between the contraries, but a fairly large area, or wide range (334b28).

This, then, is Aristotle's explanation of how the homoeomerous bodies are 'from' the elements. They are mixtures of the elements. But, remember, this explanation must do double duty: it must also make evident how the elements come to be from the homoeomerous bodies (see s. **2.1**). The above quoted passage continues like so (using Williams' translation, but without his insertions):

> It is as a result of the contraries, or the elements (*ê tôn stoicheiôn*),[35] having been mixed that the other things will exist, and the elements from these latter (*ex ekeinôn*), which in potentiality, in some way are, not in the same way as matter but in the way we explained. In this way what comes to be is a mixture, in that way matter (334b16-20).[d]

This is an extraordinarily difficult passage to interpret. But the first line seems relatively clear; the 'other things' (*tall'*), as Joachim writes, are 'all bodies other than the 'simple' bodies… but Aristotle is thinking primarily of the *homoiomerê*'.[36] So this, as we have said, is the solution to the question of the generation of the homoeomerous bodies: they come to be from the mixture of the elements. After that, however, Aristotle's meaning is less clear.

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[33] See Williams (1982), 175.

[34] Again we must be wary of thinking that it is discrete elements that are involved. What are being mixed together are bodies, which are undergoing changes in their constituent elements.

[35] Aristotle is not in doubt over whether it is the contraries *or* the elements; as the primary bearers of the contraries, it is the elements that mix. Thus Joachim (1922), 243, suggests we take *ê tôn stoicheiôn* as 'or rather the elements'; Rashed (2005) puts it like so in his translation of 334b17.

[36] (1922), 242-3; see also Williams (1982), 176.

A major part of the problem is to do with the phase 'from these' (*ex ekeinôn*, 334b17). Williams translates 'from these *latter*', and thus takes the point to be that the elements come from the other things, i.e., the homoeomerous bodies.[37] This might be called a traditional view; 'all modern commentators and translators', Williams points out, take Aristotle to be referring to the *contraries*.[38] I think Williams and the tradition is surely right, and for two reasons. Firstly I have rejected the view that presumably motivates the alternative, i.e., that the elements are constituted by the contraries, in Part I of this thesis (see esp. Ch. **2**, s. **2**). Secondly, the central thesis of *De Gen. et Cor.* II.7 is precisely that the homoeomeries come to be from the elements, and the elements come to be from the homoeomeries (see s. **2.1** above). Indeed it would be difficult to see the relevance of a claim that the elements come to be from some more basic matter at this point.[39]

This move, however, doesn't clarify everything that follows. If by 'from these' we take Aristotle to mean 'from the homoeomeries', then it would seem that he goes on to say that the homoeomeries are, in some way, potentially the elements.[40] Then come the last lines (334b17-20). What Aristotle says here is presumably something like this: the homoeomeries are potentially the elements in the way that has been explained, and this is distinguished from the way that matter is potentially the elements; hence in one way what comes to be is matter, in the other way, mixture. As Williams complains, this last line 'makes altogether unreasonable demands on our abilities as exegetes'.[41] In the next section I offer a way to make sense of it.

2.6 Consider again Aristotle's 'first attempt', if you will, to explain how the homoeomerous bodies are from the elements. Recall that he suggested that the elements produce either the other, or the matter (334b7, s. **2.3** above). But it seems, as we have seen, that they also produce

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[37] (1982), 176.
[38] Williams (1982), 177. See, for instance, Joachim (1922), 243, and Rashed (2005), 70.
[39] This view 'is more in keeping with the theme of the chapter as a whole', Williams (1982), 177.
[40] Williams' interpretation, in which, as he points out, he is following Philoponus; (1982), 177.
[41] (1982), 177.

something else: the intermediate mixture. This, Aristotle says, is 'neither the matter, nor either of the contraries… but something intermediate' (334b12). There seems to be a distinction, then, between matter and the intermediate mixture. For Williams, of course, the distinction is between *prime* matter and the intermediate mixture. So prime matter and the intermediate are potentially the elements in different ways, precisely because prime matter and the homoeomeries are different things—one a bare substrate, the other a mixture of the elements.[42]

This is where I depart from Williams. As I see it, it is the *same thing*, or, rather, the same kind of stuff, that is, in one way, identifiable as mixture, and in another way, identifiable as matter. What Aristotle says, after all, is that the thing that comes to be (*to gignomenon*) is in one way mixture, and in another way matter (334b20).[43] He means, I take it, that (a) what comes to be *from the elements* is, in one sense, or from one point of view, a mixture; but (b) what comes to be *from the elements*, in another sense, is matter. This reading of 334b16-20 would fit well with the immediate and wider context: (a), of course, echoes 334b16-17, i.e., that the 'other things' are due to the mixing of the elements (although mere mixture is not in itself sufficient); but, more interestingly, (b) seems to echo 334b6-7, and the suggestion that what comes to be from the elements is their matter. That Aristotle would return to this point, that what comes to be from the elements is matter, appears to confirm that he retains the view that the elements change in one of two ways: either into each other, or into the matter. For it now appears that we ought to conceive of matter as a mixture of the elements.

There is reasonable support for the view that the matter—the matter of the elements, we might say, or the matter from which the elements come to be—is an intermediate mixture. At *De Gen. et Cor.* II.5, for instance, Aristotle appears to describe matter as an imperceptible, inseparable intermediate between the elements (332a35). There is some dispute as to how to

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[42] (1982), 177; see also Joachim (1922), 243.
[43] Cf. Charlton (1983), 203.

take this claim.[44] If we accept it, however, then for matter to result from fire and earth—or, to put it another way, for fire or earth to be 'destroyed' into matter—would be for fire and earth to lose their distinctive differentiae, but the differentiae would not simply disappear. Rather the hot and cold would meet at an intermediate point, and so what we would have is neither fire nor earth, but some stuff composed of both, in other words, some sort of intermediate mixture. Now this would be *destruction* of the elements, but not a destruction without remainder, as it were, i.e., into a bare substrate or nothing, as e.g., Williams thinks.[45]

It is worth noting, indeed, that Ancient Greek painters spoke of *phthora* when a colour was mixed with another, thus leading to the loss of the distinctive character or differentia of each colour.[46] In other words, destruction can be effected by *mixing*. And, as we know from *De Gen. et Cor.* I.10, ingredients in a mixture are not really *destroyed*; they are no longer present actually, but are preserved, somehow, in potentiality, in the resultant mixture (327b30-1). Hence the *phthora* or destruction of something does not necessarily entail the complete annihilation of that thing, i.e., the destruction into nothing, or nothing *actual*; nor does it necessarily entail a change such that the thing's opposite or contrary comes to be. It can *also* involve the process of mixing, whereby something is produced, a mixture, in which the distinctive characteristics of the things mixed are lost, or in some way reduced.

But that the *painters* thought this is one thing; is there any evidence, outside of the particular interpretation of *De Gen. et Cor.* II.7 that I am developing here, that Aristotle might think the change or destruction of the elements into their matter is analogous to the 'destruction', through mixing, of colours? As it happens, there is some evidence that he may have. At *De Caelo* IV.5, Aristotle writes that although there are four kinds of matter, they are four 'in such a way that there is one matter that is common to them all, especially if they come

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[44] Joachim (1922), 226, and Williams (1982), 165, 214 take the intermediate to be prime matter, a view criticised by Charlton (1982), 202, and Gill (1989), 249-50. It is, for Charlton, part of 'a fanciful hypothesis… we should not attach much importance to it'; Gill also dismisses it. Dancy (1978), 400-1, takes Aristotle to be committed to this understanding of matter.

[45] For Williams' identification of the bare substrate, i.e., prime matter, as 'nothing', see (1982), 219.

[46] Plutarch, *Moralia*, 346a, 393c, 725c. See also LSJ, s.v. *phthora*. Cf. Ierodiakonou (2005), 5, n. 5.

to be from each other' (312a30-3). By way of explanation, he continues: 'for nothing prevents there being an intermediate, either one or many, between the contraries, *as in the case of colour*, for the intermediate (*to metaxu*) and the mean (*to meson*) are said in many ways', (my italics, 312a33-b2). Now this reference to the common matter of the elements can presumably be taken as a restatement of a point made earlier, at *De Caelo* III.8.[47] There Aristotle explains that the elements change into each other when their qualitative differentiae (*kata ta pathê diaphorôn*) are removed (306b20-22), and this is connected to the claim that they must be thought of as the matter of the composite bodies (306b19-20). In other words, it seems that, just as with colours, the elements can pass into each other, whereby their distinctive differentiae are 'destroyed', i.e., by mixing, and forming an intermediate; and this intermediate between the contrary differentiae, in the case of the elements, is, he seems to say, the common matter.

The point at 334b16-20, then, may well be something like this. What comes to be from the elements is (if not another element) a mixture; but this will be *either* a particular homoeomer, such as flesh or bone; or else something shapeless or formless, i.e., matter. Now one might object that, if it is a mixture, it must have the elements mixed in some particular ratio—which in turn ought always to make the 'mixture' something determinate, some particular homoeomerous body, rather than something shapeless, and indeterminate. It is difficult, in other words, to see how one might have an *indeterminate* mixture, i.e., an indeterminate ratio. One way, perhaps, to avoid this objection is to insist that the intermediate stuff is not separable from particular homoeomerous bodies, [48] but we conceive of it without the ratio that defines it as flesh, or bone (I suggested this at the end of Chapter **3**). On the other hand, one might think it *is* possible to have mixtures that consist of particular ratios of the elements, *without* the mixture thereby being a determinate thing. In other words, some stuff may not have the ratio of some determinate homoeomer like flesh or bone; it may in that sense be shapeless and

[47] Thus Charlton (1983), 199, takes it.
[48] In the sense of not independent of particular homoeomerous bodies, i.e., not a particular thing.

formless; but to say this is not to deny that it has shape, or that it can be analysed and discovered to have the elements in *some* ratio in its constitution.

It might be most useful to think of the 'shapeless' or indeterminate mixture as that which is in process, and for this reason the ratio of the elements in the mixture is itself changing. It is not, then, that the mixture has an 'indeterminate ratio', but rather that the elements, in mixing, pass through an range of 'ratios' of hot to cold, or dry to wet, until becoming a determinate, identifiable homoeomer. This indeterminate, intermediate stuff is 'neither one thing nor another'—which indeed is how Aristotle appears to describe the intermediate 'range' wherein or where from flesh and bone and the other homoeomers come to be (*oudeteron*, 334b27; see 334b24-30). Elements interacting such that they, or their contraries, approach a mean or intermediate range are, as it were, not yet a determinate homoeomer, but form a stuff that is neither hot nor cold, dry nor wet, but intermediate. So, although, as a mixture, it is something homoeomerous (*GC* I.10, 328a10), it is yet something shapeless and formless, i.e., without a determinate ratio by which we can say it is this or that. But clearly it is not completely bereft of form, i.e., not a bare substrate. It is, as it were, the base homoeomerous stuff that, in the appropriate ratio of elements, will be flesh or bone or some other homoeomer. As Aristotle explains at *Physics* II.2, 'the thing that is potentially flesh or bone does not have its own nature, or is not by nature (*oute phusei estin*) before it acquires the form of the *logos* (*to eidos to kata ton logon*), and we say it is defined as flesh or bone' (193a36-b3). It is not 'by nature', or something natural, Aristotle explains, because something natural is a determinate compound of matter and form (193b5-6). It is, then, as Aristotle puts it, 'neither one thing nor another'.

It is in this sense, then, that what comes to be from the elements is matter, rather than (a determinate) mixture, i.e., a homoeomer. But the matter of what? The matter of the perceptible bodies—which is, of course, the matter of the elements too, in the sense of the matter from which the elements come to be, albeit not that of which they are composed, i.e.,

the non-constitutive use of 'from'. Note, indeed, Aristotle's apparent reticence about describing the things that comes to be from the elements as 'matter', or potentially the elements, at 334b18-19. I take it he means to say that we should not understand the homoeomeries, i.e., determinate mixtures of the elements, as, strictly speaking, the 'matter' of the elements. For although the elements are 'preserved' in the homoeomeries in potentiality, insofar as the latter are mixtures of the elements, and the elements are separable from them, the homoeomeries are not potentially the elements in the sense of being the matter that develops into the elements and remains as constituent in them. The point being made here may be partly illuminated by Aristotle's warning elsewhere not to think of the corpse as matter for the animal, or wine as matter for vinegar, even though the former comes to be from the latter in both cases (*Metaph* VIII.5, 1044b29-1045a6). For the passage from animal to corpse is a destruction of the animal, from wine to vinegar, a destruction of wine; likewise, the elements come to be from the homoeomeries, but this involves the destruction of the mixture into its constituent ingredients.

The process of the coming to be of the elements from the homoeomeries, presumably, goes something like this. The homoeomer, e.g., flesh, begins to lose its form as flesh, due to, e.g., external factors working on it (see *De Long*, 3, 465b27f., *Meteor*, IV.1, 379a12): destruction occurs, Aristotle says, 'when what is being determined gets the better of what is determining it' (*Meteor* IV.1, 379a11). For 'a thing's nature is maintained [only] as long as the ratio (*logos*) holds', (IV.2, 379b35). So once the ratio of the mixture starts to change, destruction is under way. And this, for things composed of the elements, is inevitable, because things composed of the elements are inseparable from contrariety, and contraries destroy each other (see *DC* II.3, 286a32ff, *De Long*, 3, 465b3, b29f.). The particular ratio of flesh that determines the way the elements are mixed thus departs; we still, however, have some mixture of elements. For the flesh has passed away into the indeterminate range where things are neither one thing nor another, the middle range of 'chance' mixtures (cf. *GC* II.6, 333b13-16).

As the hold of the ratio declines, the elements regain their natural tendencies that had been tempered or curtailed by the other contrary elements in the mixture.[49] And their natural tendencies are to go in different directions (cf. *DC* II.6, 288b16-18; and also *DA* II.4, 416a6-9). But it is not that the elements, the simple bodies fire, air, water, and earth, are seen to emerge as discrete entities (see Ch. **2**, s. **4.4**). What emerges rather are themselves mixtures, albeit of a much less complex structure than the original flesh. And these mixtures will be fiery or earthy, airy or watery, but not fire or earth, air or water, strictly speaking. Rather they are mixtures which exemplify the element that predominates. As Joachim puts it 'any part of flesh can indifferently be converted into flame, into liquid, into the dry dust of putrefaction, and into 'air' or gas".[50] But it is not quite 'flesh' from which the elements come to be, but rather from the matter of flesh, i.e., the mixture of elements that constituted flesh. Thus we can say that the matter of the perceptible bodies, of such bodies as flesh, is that from which the so-called elements come to be. Insofar, then, as we can, strictly speaking, call the intermediate mixture 'matter', it is the matter *of the perceptible bodies*—of flesh, bone, and other determinate composites.

Conclusion: The Inseparable Intermediate

3.1 Let's return, then, to the passage that I have been endeavouring to explain in this thesis. At *De Gen. et Cor.* II.1, Aristotle says that there is 'some matter (*tina hulên*) of the perceptible bodies, which is not separable from contrariety, from which the so-called elements come to be', (329a24-6). My argument has been that the matter of the perceptible bodies is something that comes to be from the so-called elements, i.e., it is a mixture of the elements, an intermediate stuff in which the elements, by mixing, are destroyed—for they have had their differentiae removed. But the so-called elements remain in the intermediate stuff in potentiality, and are able to separate out from the mixture. In that sense the so-called elements come to be from the

[49] See, e.g., *MA* 10, 703a25-8, with Freudenthal (1995), 16.
[50] (1922), 240.

matter of the perceptible bodies, as ingredients come to be from a mixture. I have tried to keep the thread of the argument as clear as possible but no doubt there remain obscurities in the account offered in this chapter of the rather dark and relatively uncharted territory of *De Gen. et Cor.* II.7.

Now this interpretation of Aristotle's notion of matter as an indeterminate, intermediate mixture places Aristotle's notion of the matter of the perceptible bodies surprisingly close to that of some of his predecessors, and it may be useful to consider the difference. As we noted earlier, Aristotle himself believes that Anaximander, Anaxagoras, and Empedocles also forward a claim that the matter of things is both one and many, i.e., an indeterminate mixture (s. **2.2**). In fact, Aristotle acknowledges at *Metaphysics* XII.2 that these thinkers anticipated his own notion of matter (1069b23-4); moreover, it is worth recalling that Aristotle reckons the intermediate to be one of the best candidates that any of his predecessors offered as the substratum of things (*Phys.* I.6, 189b1-10). But, on the other hand, Aristotle is heavily critical of that notion of an intermediate mixture. Why? What is the difference between Aristotle's intermediate 'matter', and that of his predecessors?

The difference is that they failed fully to grasp a coherent notion of the intermediate because they conceived it to be a body and yet separate from perceptible contrariety (328b35).[51] At *De Gen. et Cor.* II.1, Aristotle describes the intermediate as a single matter (*mian hulên*) apart from, or besides (*para*), the elements fire, air, water, and earth (329a9); and he calls it *apeiron*, i.e., infinite or indeterminate (329a12). It is not explicitly stated here, but this *apeiron* is conceived as that from which the elements, and then everything else (i.e., the perceptible bodies), come to be. Aristotle makes this explicit elsewhere; at *Physics* III.5, he refers to 'something besides the elements, from which they come to be' (*tines to para ta stoicheia, ex hou tauta gennôsin*, 204b23-24;

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[51] What Aristotle says about the intermediate is that it is 'a body and separate' (*sôma te on kai chôriston*). Following Dancy (1978), 400-1, and Williams (1982), 153, I take it that he means 'separate from perceptible contrariety', which entails that the body is separate from the elements. There are other uses of 'separate' (or 'separable'; on translating *chôristos* as 'separate', see Morrison (1985)), e.g., independent, or ontologically prior, as a composite substance is, as opposed to, e.g. affections or matter, (see *Phys.* I.2, 185a31); and separate in definition, as, e.g., form or *psuchê* is (see Gill (1989), 34-8); but in this context Aristotle means 'separate from contrariety', i.e., separate from the elements. That this is so is supported by his criticism of the intermediate (329a8-13; cf. II.5, 332a23-26).

cf. *Phys.* I.4, 187a12-26). That it is meant, by those who propose it, to be the matter from which the elements come to be is confirmed at *De Gen. et Cor.* II.5 (332a18-22). But Aristotle is quite clear that any such separable intermediate is impossible, because, if it is a body, then it must have some determining, or perceptible, and in particular tangible, characteristics (329a8-13, II.5, 332a20-26; cf. *Cat.* 8a1; *DA* III.12, 434b12; cf. also *Phys.* III.5, 204b32-35, with Ch. **1**, s. **4.1**). But the tangible characteristics that determine bodies are the differentiae of the elements (see *DA* II.11, 423b27-30). Hence a body cannot be 'separate' from the elements.[52]

Aristotle's 'intermediate', by contrast, is not separable from the elements precisely because it is composed of the elements. This is what I have argued for in this chapter. But let's consider another route to this conclusion—Aristotle's rejection of the *apeiron* or 'separate intermediate' at *De Gen. et Cor.* II.5. His aim in that chapter, as Williams puts it, is 'to refute Monism in each of [its] forms', i.e., to refute the claim that there is one thing that is the principle of the other elements (and everything else), which is either something determinate, as one of the so-called elements, or indeterminate, separable *apeiron*.[53] His argument against the latter is that there is no such thing as a matter besides the elements, separate from contrariety, because matter must share a contrariety with the elements that come to be from it, if indeed it is that from which the elements come to be. This is because change takes place between things that have a contrariety or opposition to each other (*GC* II.4, 331a14-16; see also *Phys.* III.5, 205a4-7). So, for instance, if it is to become fire, then it takes on heat, and fire comes to be. But if fire, which is hot, comes to be, then that from which it comes to be must be cold, the privation of hot.[54] And, if this is so, then it turns out that the matter is, after all, always already characterised by a contrariety. Likewise if air comes to be out of it; if air is, e.g., wet, then the matter must be dry. In short, the matter must be *inseparable*. It is impossible for there to be an

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[52] Williams (1982): 'Since, as a body, it must have one member of each 'perceptible contrariety,'... it will accordingly be, or be composed of, one of the four so-called 'elements', and so... cannot be over and above those mentioned.' 153.
[53] (1982), 164.
[54] Joachim (1922), 225.

indeterminate intermediate, separate from contrariety, such as the *apeiron* (332a23-25). Hence, Aristotle concludes, this *apeiron* is either 'one of them [the elements] indifferently, or nothing; so if there is indeed nothing perceptible prior to these, then these will be everything' (332a25-26).

What Aristotle might appear to be saying here is that, if we admit that the matter from which the elements come to be is inseparable, which we must if change is to take place, then it is one of the elements; and if we deny that, then it is nothing at all, for there cannot be a body without perceptible contrariety.[55] So he concludes that the intermediate, what some call the *apeiron*, must be one of the elements, or nothing (332a25). This might seem to be a total rejection of there being anything at all from which the elements come to be. But it would be a mistake so to think. For what Aristotle rejects is a matter that is besides or apart from (*para*) the elements. This matter is understood to be prior to, and so materially simpler than, the elements. For the use of *para* here entails not merely that the matter is not an element, but also that it is not *composed* of the elements. As such it is separable from contrariety, because the elements are the bearers of the primary contrarieties hot and cold, dry and wet. It is this sort of thing that falls foul of the dilemma in *De Gen. et Cor.* II.5.

If, however, the matter is something that is other than the elements, just in the sense that it is not one of the elements, then there is no major difficulty in claiming that this matter is inseparable. Inseparability from perceptible contrariety is by no means exclusive to the elements; rather, it is the distinctive mark of body in general. For whatever is a body is perceptible, i.e., inseparable from perceptible contrariety. And, since the matter is inseparable, it seems that the natural assumption is that Aristotle is talking about some kind of body. Now Aristotle holds a general and rather commonplace principle that a body is either an element or composed out of elements (*ê stoicheion ê ek stoicheiôn*; see *Metaph.* VII.17, 1041b19-20; *Phys.* IV.1, 209a14; *DC* III.7, 306b1). The matter of the perceptible bodies it appears, is inseparable from

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55 Alternatively, Aristotle's point might be that the intermediate must have, as privations, both pairs of contraries, e.g., hot and cold; which is impossible; thus King (1956), 385, n. 38, Gill (1989), 248. This would make it mirror the argument against there being one of the elements from which the others come to be (332a10-17). But I can't

contrariety, but it is not an element. Unless we are to propose that it is nothing, it would appear to follow that it is composed out of elements. As such, it is inseparable, and yet not one of the elements. For something that is composed out of the elements is other than the elements (cf. *Metaph.* VII.17, 1041b12f., *GC* I.10, 327b24-25), but not in the sense of being apart or separate from the elements.[56]

3.2 There is, of course, another option, and it would be amiss not to consider it. What Aristotle says in conclusion to his argument against the *apeiron* at *De Gen. et Cor.* II.5 is this: 'So if there is indeed (*ge*) nothing perceptible prior to these [elements], these will be all there is' (332a26). The apparent qualification 'nothing perceptible' has been taken as an indication that there is something imperceptible prior to the elements—prime matter.

According to the traditional interpretation, the matter of the elements is prime matter. Traditionalists insist that prime matter is something other than the elements, yet it is always found with a contrariety. But on the argument of *De Gen. et Cor.* II.5, any such matter is simply one or other of the elements. If one denies this conclusion, then prime matter must be *without* contrariety, and as such, nothing. It would seem that this argument severely damages the traditional interpretation of the matter of the elements.

The traditionalists, however, want to have their cake and eat it too. They happily ignore the existence of a dilemma here; or rather, they insist upon grasping both of its horns. In the words of one of its defenders: 'prime matter is nothing but a potentiality which can exist only as actualized in some determinate matter—i.e., in one of the elements—and which is what persists when one contrariety is replaced by another and the identity of the element changes'.[57] At once, it seems, prime matter is inseparable from contrariety, and as such, one of the elements, and yet, in itself, it is separable from contrariety, and as such, something prior to and

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see how that would allow Aristotle to conclude that the intermediate must then be *either* any one of the elements indifferently, *or* nothing at all. The reading I offer stays closer to Joachim (1922), 225-6.

[56] Cf. Williams (1982), 153, quoted in note 52 above.

[57] Robinson (1974), 168. Cf. Williams (1982), 211.

apart from the elements. But this really will not do. The dictum that prime matter is nothing in actuality, but hot or cold, dry or wet in potentiality, and that it is in this way that it is always with a contrariety, makes no sense because there is nothing that is potentially hot, or cold, while actually being neither cold nor hot (nor intermediate, i.e., somewhere in the range between being hot and being cold). Or, to put it another way, for x to become either member of a contrariety requires that x be the other member of that contrariety, or an (inseparable) intermediate between them (see *Phys.* I.5, 188b21-26). So what is potentially hot is something that is not-hot, i.e., cold; and in the case of the elements this would be, e.g. earth or water. Prime matter cannot be potentially hot, unless it is cold; but if it *is* cold, then it is earth or water, i.e., just one of the elements. If prime matter *in itself* is neither cold, nor hot, neither dry nor wet, nor characterised by a quality that is between these contraries, then clearly it is separable from contrariety; but if this is so, then it is nothing at all.

The appeal that is often made, namely that prime matter survives Aristotle's criticisms of the separable intermediate because the latter is conceived as a body, whereas the former is not, merely highlights the incoherency of the tradition's position.[58] If it is not a body, then it is nothing, and by 'nothing' one cannot assume something that is potentially a body, without actually being a body of some kind; for this would be to posit a vacuum or void (*kenon*; cf. *DC* III.2, 302a3-9, III.5, 305a14ff.)—and Aristotle undoubtedly rejects the possibility of a void (see *Phys.* IV, 6-9; cf. *GC* I.5, 320b2f.).

Nor is it the case that Aristotle is opening the door to prime matter when he remarks that there is nothing *perceptible* prior to the elements (332a26). This cannot be taken as a tacit admission that there is some *imperceptible* thing prior to the elements.[59] Regardless of its effect on the prime matter hypothesis, such an admission would undermine Aristotle's own preceding

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[58] For this appeal, see Joachim (1922), 194, 226; Solmsen (1958), 249f.; cf. Robinson (1974), 177, Dancy (1978), 389, Guthrie (1981), 230. For critiques of the coherency of prime matter (which they nevertheless understand to be a faithful interpretation of Aristotle's position), see Williams (1982), 218f., and Graham (1987), esp. 488-489, and (1987b), 224-232.

[59] For the view that it *is* such an admission, see Joachim (1922), 226, Williams (1982), 214. Traditionalists often claim that at *GC* I.4, 319b15-19 Aristotle distinguishes generation from alteration on the basis that the *hupokeimenon* of the former is imperceptible, that of the latter perceptible; see Joachim (1922), 107f., Robinson (1974), 171,

argument against the intermediate. For, if there were something imperceptible prior to the elements, then the reason why it is imperceptible is because it is separable from perceptible contrariety. Aristotle rejects completely this possibility (cf. *Phys.* III.5, 204b29-35, and Ch. **1**, s. **4.1**). Now the tradition would have it that prime matter is imperceptible, although not because it is separable from perceptible contrariety. Rather, prime matter is supposed to be imperceptible on account of its being incorporeal.[60] But the crucial point that is being neglected here is that an incorporeal entity is not something that could have perceptible contrariety (cf. *GC* I.3, 317b26-33). Hence if prime matter is incorporeal, then it is necessarily imperceptible, precisely because it is separate from perceptible contrariety. We simply cannot say that prime matter is inseparable from contrariety unless it were actually a body of some sort. It is incoherent to ascribe to an incorporeal entity the very characteristic—inseparability from perceptible contrariety—that renders an entity corporeal.

Clearly, then, Aristotle's argument in *De Gen. et Cor.* II.5 seems to rule out a matter prior to the elements from which the elements come to be, and it makes no difference whether this matter is conceived as separable (e.g., an intermediate apart from the elements) or inseparable (e.g., as prime matter is understood by its defenders). The former is impossible, the latter must really be one or other of the elements (cf. *DC* III.6, 305a14-32). And yet the elements do come to be. Another alternative, that some commentators hold, is that the elements themselves, all four together, as it were, provide the matter from which the elements themselves come to be.[61]

Certainly Aristotle does on occasion make statements that appear to support this interpretation. At *Physics* IV.5, 213a14, for instance, he says that water is the matter of air, if air comes to be from water; and in the *De Caelo* as well as the *De Gen. et Cor.*, he says that the generation of the elements is from or out of each other (*ex allêlôn ê genesis*, *GC* II.4, 331a7-8; *DC* III.6, 305a31-2). Nevertheless this interpretation must be rejected, at least in the form it is

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Williams (1982), 99f., 217. Cf. Gill (1989), 46-67, for criticism of this interpretation of alteration.
[60] Cf. Dancy (1978), 389, n. 41.
[61] See note 3 for references.

usually stated. For the way it is usually stated makes Aristotle come across as a straightforward pluralist.[62] It is also relevant to remark upon the clumsiness and confusion to which a re-reading of the passage where Aristotle presents his own view of the matter of the perceptible bodies gives rise (II.1, 329a24f.), were we to understand the matter from which the elements come to be to be the elements themselves.[63] A perhaps more pressing problem for this view is Aristotle's frequent insistence that there must be a common matter for the elements, if elemental change and indeed alteration is to be possible (see *DC* IV.5, 312a30-b1; *GC* I.1, 314b26f., I.6, 322b9-19; II.5, 332a17, II.7, 334a23-25; cf. *Meteor.* I.3, 339a36-b2).[64] Those who insist that the elements themselves are the matter for their own generation have some explaining to do to cater for Aristotle's references to a common matter. Typically it is suggested that the reference to a common matter is meant to capture the way in which the four elements are *collectively* the matter for each other.[65] But Aristotle as we have seen points out that the theses that there is a common matter for the elements, and that the elements change into each other, are mutually entailing (II.7, 334a16-18; cf. *GC* I.1, 314b28-315a2). The fact that these theses are mutually entailing is a real problem for those who think that the elements as a collective are to be considered as the common matter.[66] For, presumably, Aristotle's point is that, to explain elemental transformation, a common matter must be posited; while to explain natural phenomena according to the thesis that there is a common matter for everything, one must admit that the elements change into each other. But, on the view of those who think that the elements themselves are somehow to be regarded as the common matter, it seems that one explains *how* the elements change by simply repeating that the elements change—as if it were an explanation to say that together they act as a common matter. At once, it seems, they admit the

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[62] As Charles (2004), 167, writes, for those who favour this view, 'prime matter', i.e., the matter of the elements, 'specifies only the collection of basic elements (earth, air, fire, and water) or their distinctive types of matter'.
[63] See Robinson (1974), 179-181.
[64] See Charles (2004), 167-8.
[65] See, e.g., King (1956), 384, Charlton (1983), 199, Broadie (2004), 146.
[66] As is clear from Charlton's treatment of 334a16-18, (1983), 202-3. Remarkably, C. tries to deny that Aristotle thinks that the entailment of a common matter applies to his own account of elemental transformation; he also suggests, rather weakly, that Aristotle might mean simply that fire, air, water, and earth have something in common in the sense that they are all bodies.

need for a common matter to explain elemental transformation, and refuse to provide one.[67] It is doubtful, then, that they take the requirement of a common shared matter for the elements seriously enough.[68]

I think, then, that is tolerably clear that Aristotle intends to identify a matter of the perceptible bodies, from which the elements come to be, which is not one of the elements, nor all of them collectively, nor indeed something prior to the elements. The alternative that I have suggested is that the matter from which the elements come to be is something composed of the elements, an inseparable intermediate mixture.

3.3 But is the understanding of the matter of the perceptible bodies as an intermediate mixture, and as such inseparable from, because composed of, the elements, consistent with what Aristotle usually says about matter?

If anything it may help to explain some of the things that Aristotle says about matter. For instance, Aristotle says some of the following things about matter: it is not actually a particular thing, but it is potentially so (*DA* II.1, 412a7-8; *Metaph.* VIII.1, 1042a27-9); it is indeterminate (*Phys.* IV.2, 209b5-11, *Metaph.* VII.11, 1037a27), and unknowable in itself (*Metaph.* VII.10, 1036a8-9); and it is formless (*Phys.* III.6, 207a25-6). I think all of these things could be applied without too much difficulty to the inseparable intermediate. Moreover, it seems to me that only something like this, precisely by virtue of being a intermediate between the elements, can truly be described as potentially hot and cold, dry and wet; and hence potentially a perceptible body.

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[67] Thus Charlton writes: 'Someone who holds Aristotle's theory [of elemental transformation] does not really have to say they have a common matter. All he must say is that each element is 'receptive of opposites', capable of getting hotter and colder, wetter or drier', (1983), 203. But an *element* is not receptive of opposites, if by this we understand something that is in itself capable of taking on contrary qualities or affections. An element is destroyed if its differentiae pass into their contraries. Hence it must be something *other* than the elements that becomes hotter or colder, drier or wetter.

[68] Charles (2004), 167-8, speaking of Charlton and Furth, writes: 'their proposal does not capture Aristotle's insistence on the need for there to be one common matter shared by the basic contraries… which underlies earth, air, fire, and water'.

So while there is a matter that gives rise to the elements, or out of which they emerge, this is not something more fundamental than the elements, something that can be posited or inferred as the material constituent or cause of the elements to explain the behaviour of the elements. Rather the contrary is the case: the matter, and its capabilities, are to be explained in terms of the elements of which it is composed. Thus it is neither heavy, nor light, neither hot, nor cold, neither dry, nor wet. The best way to explain these characteristics of matter is not the thesis that the matter is completely characterless, because it is nothing actually, but has only potential existence, but rather the thesis that this matter is an intermediate mixture of the elements, in which the differentiae of the elements have been 'destroyed'. For it is the elements to which the properties heavy and light, hot and cold, dry and wet, belong, and hence their mixture produces something neither heavy nor light, but intermediate between heavy and light, and as such potentially either; neither hot nor cold, but intermediate between hot and cold, and as such potentially either. The difference, then, between prime matter and my account of matter may be expressed like so: whereas the latter has many of the features traditionally attributed to prime matter, such as indeterminacy, potentiality, and inseparability from contrariety, it is neither a mystery nor an offence to Aristotelian principles as to how it can possess them.

Having said that, perhaps I should once again draw attention to a limitation on the aims of this thesis, adverted to above (s. **1.3**), that might still give succour to the traditional view. And that is that, as I have stated repeatedly, what I have been concerned with in this chapter, and in the thesis as a whole, is the question of the interpretation of how the matter of the perceptible bodies is that from which the so-called elements come to be. While the account of matter that I have developed in response to that question has undoubtedly important ramifications for our understanding of Aristotle's account of elemental change, and much of what I have said naturally bears upon that account, I have not attempted to provide an explication of what happens when one element changes into another. And so the absence of a full discussion of the ramifications, of my account of how the elements come to be from the

matter of the perceptible bodies, upon our understanding of how the elements come to be from one another would appear to allow the prime matter hypothesis to survive for another day. For prime matter is typically proposed to explain the change of one element into another, as the substratum that underlies such change.

The problem is that there may seem to be an intuitive difficulty in understanding how the matter from which the elements come to be, if, as I have argued, this *is* a mixture of the elements, can be something that underlies the change of one element into another. For if we begin with a simple body, and end with another simple body, it seems odd that, underlying this change, we have not something simple, or indeed, simpler than the elements, but something composite. I intend to postpone this problem, not only because of its intrinsic difficulty but also because of considerations of space. But, in any case, in establishing the foregoing interpretation of the matter of the perceptible bodies, I believe that I have thrown light upon a number of passages in Aristotle's text that were obscure in either aim or motivation or even content (e.g., *GC* II.1, II.3, II.5, II.7). I have raised questions that any one who wishes to defend and maintain the traditional view ought to consider, in particular the question of the status of the contraries in relation to the elements (Ch. **2**), the question of the interpretation of the perceptible bodies at *De Gen. et Cor.* II.1 (Ch. **3**), and also the question of the manner in which the so-called elements come to be from the matter of the perceptible bodies (Ch. **4**). Moreover in the previous section I have raised problems for the tradition based on Aristotle's attack on the *apeiron* at *De Gen. et Cor.* II.5. So it is already difficult to see how something like a bare substratum could be an acceptable part of any such account.

It is worth noting, indeed, some recent accounts of Aristotle's theory of elemental change eschew prime matter. An ingenious account has been recently offered by Charles.[69] Discussing a notorious passage of *De Gen. et Cor.* I.3 (319a31-b4), where Aristotle seems to conclude that the matter, insofar as it underlies the elements, is the same, but its being is

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[69] (2004).

different, Charles takes the thing that underlies the elements to be a logical or abstract object, which is successively 'filled' by the matter of earth and then the matter of fire, much as the 'now' is successively filled by different points of time or moments. The idea seems to be that the *function* of being an underlying thing is the same, while what it is that will, in fact, be this underlying thing will differ. A worry about Charles's argument is that it seems to lead to the conclusion that the elemental transformation of earth to fire is in fact reduced to a process whereby fire simply succeeds earth. Nevertheless it does suggest one way to explain elemental change without appeal to the tradition's prime matter.

Another recent interpretation of the change from one element into another is provided by Rashed. On the face of it, it bears some interesting similarities to the account of matter I have offered here. In his attempt to explicate *De Gen. et Cor.* I.3, 319a31-b4, Rashed suggests that what allows us to say that the underlying thing remains the same is the presence of the *sumbolon*, i.e., the dry; but since that which it qualifies is changing continually, from being hot to being cold, from one moment to the next the *being* of the material mass will be different, e.g., we will have dry-hot, then dry-warm, dry-tepid, and so on.[70] The matter, then, Rashed concludes, far from being a logical abstraction, is an essentially variable being, produced by the association of the *sumbolon* and the 'flux', i.e., the process from one contrary to another. This very brief outline of Rashed's view is perhaps sufficient to indicate that his account of matter in *De Gen. et Cor.* I.3 to some extent complements my interpretation of the matter as an intermediate between the elements. For Rashed's 'matter/flux + *sumbolon*' is evidently a composite stuff. Indeed Rashed goes on to suggest that, rather than there being a matter prior to the contraries, the matter is always semi-qualified, adding that matter, or that which plays the material role, is under a certain point of view, the homoeomeries constituted by the four contraries.[71] What is particularly attractive here is the notion of the matter as being in flux, as this provides a continuity in the change between fire and earth conspicuously lacking in

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[70] (2005), xcii-xcvii, 119.
[71] (2005), xcvi.

Charles' account. Although I have differences with Rashed—he evidently takes the contraries to be more fundamental than the elements—the proximity of his general account to mine, in particular, the view that the homoeomerous are in a way the matter of the elements, is certainly noteworthy.

In general, however, as I have said, the question at issue in this thesis concerns not changes from one simple body to another, but of composite bodies to simple bodies. The question of consistency, or lack of it, between my account of the latter, and any account of the former, is a problem that calls for further research.

3.4 The overriding aim of this thesis has been to establish that Aristotle's commitment to fire, air, water, and earth as the most fundamental forms of matter is unwavering. In Part I of this thesis, I considered the popular view that the description of fire, air, water, and earth as the 'so-called elements' (*ta kaloumena stoicheia*) indicates Aristotle's belief that these are not the genuine elements, and I found this view to be groundless. I then attacked the view, also very popular in the secondary literature, that fire, air, water, and earth are constituted or composed out of the contraries hot and cold, dry and wet. In the second part of this thesis I have been concerned with Aristotle's claim at *De Gen. et Cor.* II.1, 329a24-6, that there is a matter of the perceptible bodies, from which the elements come to be; in particular, I have been concerned to establish that this claim need not entail that Aristotle admits a matter more primitive than the elements.

The key to my argument in the second part of the thesis is that the perceptible bodies, in the context of *De Gen. et Cor.* II.1, do not include the elements or simple bodies fire, air, water, and earth. For it follows from this that the matter of the perceptible bodies is not also the matter of the elements, i.e., it is not the matter of which the so-called elements are composed. But the matter of the perceptible bodies may be called 'the matter of the elements' in another sense. For the elements do come to be from or out of this matter, but this does not mean that the latter is the constitutive matter of the former. The matter of the perceptible

bodies is that from which the elements come to be in a non-constitutive, or originative, use of 'from'. And this is explained by identifying the matter of the perceptible bodies as a mixture of the elements.

Texts for Chapter 4

[a] *De Caelo* III.3, 302a19-25

Εἰ δὴ τὸ εἰρημένον ἐστὶ στοιχεῖον, ἀνάγκη εἶναι ἄττα τοιαῦτα τῶν σωμάτων. Ἐν μὲν γὰρ σαρκὶ καὶ ξύλῳ καὶ ἑκάστῳ τῶν τοιούτων ἔνεστι δυνάμει πῦρ καὶ γῆ· φανερὰ γὰρ ταῦτα ἐξ ἐκείνων ἐκκρινόμενα. Ἐν δὲ πυρὶ σὰρξ ἢ ξύλον οὐκ ἐνυπάρχουσιν, οὔτε κατὰ δύναμιν οὔτε κατ' ἐνέργειαν· ἐξεκρίνετο γὰρ ἄν.

[b] *De Gen. et Cor.* II.7, 334a31-35

Συμβαίνει δὴ μὴ ἐξ ὁτουοῦν μέρους σαρκὸς γίνεσθαι πῦρ καὶ ὕδωρ, ὥσπερ ἐκ κηροῦ γένοιτ' ἂν ἐκ μὲν τουδὶ τοῦ μέρους σφαῖρα, πυραμὶς δ' ἐξ ἄλλου τινός· ἀλλ' ἐνεδέχετό γεἐξ ἑκατέρου ἑκάτερον γενέσθαι. Τοῦτο μὲν δὴ τοῦτον γίνεται τὸν τρόπον ἐκ τῆς σαρκὸς ἐξ ὁτουοῦν ἄμφω·

[c] *De Gen. et Cor.* II.7, 334a21-26

ὁστᾶ καὶ τῶν ἄλλων ὁτιοῦν. Ἔχει δὲ τὸ λεγόμενον ἀπορίαν καὶ τοῖς ἐξ ἀλλήλων γεννῶσιν, τίνα τρόπον γίνεται ἐξ αὐτῶν ἕτερόν τι παρ' αὐτά. Λέγω δ' οἷον ἔστιν ἐκ πυρὸς ὕδωρ καὶ ἐκ τούτου γίνεσθαι πῦρ· ἔστι γάρ τι κοινὸν ὑποκείμενον. Ἀλλὰ δὴ καὶ σὰρξ ἐξ αὐτῶν γίνεται καὶ μυελός·ταῦτα δὴ γίνεται πῶς;

[d] *De Gen. et Cor.* II.7, 334b1-20

Ὁμοίως δὲ καὶ τοῖς ποιοῦσι μίαν αὐτῶν ὕλην ἔχει τινὰ ἀπορίαν, πῶς ἔσται τι ἐξ ἀμφοτέρων, οἷον ψυχροῦ καὶ θερμοῦ ἢ πυρὸς καὶ γῆς. Εἰ γάρ ἐστιν ἡ σὰρξ ἐξ ἀμφοῖν καὶ μηδέτερον ἐκείνων, μηδ' αὖ σύνθεσις σωζομένων, τί λείπεται πλὴν τὴν ὕλην εἶναι τὸ ἐξ ἐκείνων; ἡ γὰρ θατέρου φθορὰ ἢ θάτερον ποεῖ ἢ τὴν ὕλην. Ἆρ' οὖν ἐπειδή ἐστι καὶ μᾶλλον καὶ ἧττον θερμὸν καὶ ψυχρόν, ὅταν μὲν ἁπλῶς ᾖ θάτερον ἐντελεχείᾳ, δυνάμει θάτερον ἔσται· ὅταν δὲ μὴ παντελῶς, ἀλλ' ὡς μὲν θερμὸν ψυχρόν, ὡς δὲ ψυχρὸν θερμὸν διὰ τὸ μιγνύμενα φθείρειν τὰς ὑπεροχὰς ἀλλήλων, τότε οὔθ' ἡ ὕλη ἔσται οὔτε ἐκείνων τῶν ἐναντίων ἑκάτερον ἐντελεχείᾳ ἁπλῶς, ἀλλὰ μεταξύ· κατὰ δὲ τὸ δυνάμει μᾶλλον εἶναι θερμὸν ἢ ψυχρὸν ἢ τοὐναντίον, κατὰ τοῦτον τὸν λόγον διπλασίως θερμὸν δυνάμει ἢ ψυχρόν, ἢ τριπλασίως, ἢ κατ' ἄλλον τρόπον τοιοῦτον. Ἔσται δὴ μιχθέντων τἄλλ' ἐκ τῶν ἐναντίων ἢ τῶν στοιχείων, καὶ τὰ στοιχεῖα ἐξ ἐκείνων δυνάμει πως ὄντων, οὐχ οὕτω δὲ ὡς ἡ ὕλη, ἀλλὰ τὸν εἰρημένον τρόπον· καὶ ἔστιν οὕτω μὲν μίξις, ἐκείνως δὲ ὕλη τὸ γινόμενον.

Bibliography

Primary Texts:

Aristotle

Bywater, I. (1894), *Aristotelis Ethica Nicomachea* (Oxford, Clarendon Press).

Cook, Harold P. (1938), *Categories and On Interpretation* Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press).

Dalimier, Catherine et Pierre Pellegrin (2004) *Aristote Traité du ciel* Édition Bilingue, Traduction et notes par Dalimier et Pellegrin (Paris, GF Flammarion).

Drossaart Lulofs, H.J. (1965), *Aristotelis de generatione animalium* (Oxford, Clarendon Press).

Düring, I. (1961a), *Aristotle's Protrepticus* (Stockholm, Almqvist & Wiksell).

Fobes, F.H. (1919), *Aristotelis meteorologicorum libri quattuor* (Cambridge, Mass., Harvard University Press, repr. Hildesheim, Olms, 1967).

Forster, E.S. (1955), *Aristotle: On Coming-To-Be and Passing-Away*, Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press).

Frede, Michael and Günther Patzig (1988), *Aristoteles. 'Metaphysik Z'*, 2 vol., Text, translation and Commentary (Munich, Beck).

Guthrie, W.K.C. (1939), *Aristotle: On the Heavens*, Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press).

Hett, W.S. (1957), *Aristotle On the Soul, Parva Naturalia, On Breath*, Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press)

Hicks, R.D. (1907), *Aristotle De anima*, with translation, introduction and notes (Cambridge University Press, rep. Amsterdam, Hakkert, 1965)

Joachim, H.H (1922), *Aristotle On Coming-to-be and Passing-away* A Revised Text with Introduction and Commentary (Oxford, Clarendon Press).

Kassel, R. (1965), *Aristotelis de arte poetica liber* (Oxford, Clarendon Press).

Lee, H.D.P. (1962), *Meteorologica* Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press).

Louis, P. (1956), *Aristote. Les parties des animaux* texte établi et traduit (Paris, Société d'Édition 'Les Belles Lettres').

———(1964-1969), *Aristote. Histoire des animaux*, vols. 1-3 (Paris, Société d'Édition 'Les Belles Lettres').

Minio-Paluello, L. (1949), *Aristotelis categoriae et liber de interpretatione* (Oxford, Clarendon Press).

Moraux, P. (1965), *Aristote. Du ciel* texte établi et traduit (Paris, Société d'Édition 'Les Belles Lettres').

Mugler, Charles (1966), *Aristote. De la Génération et la Corruption* texte établi et traduit (Paris, Les Belles Lettres).

Rashed, M. (2005) *Aristote De la Génération at la Corruption: Texte et Traduction* Paris, Les Belles Lettres).

Ross, W. D. (1923) *Aristotle* (London, Methuen).

———(1924), *Aristotle's Metaphysics: A Revised Text with Introduction and Commentary*, 2 Vols. (Oxford, Clarendon Press).

———(1936), *Aristotle's Physics: A Revised Text with Introduction and Commentary* (Oxford, Clarendon Press).

———(1949), *Aristotle's Prior and Posterior Analytics* (Oxford, Clarendon Press).

———(1955), *Aristotle.: Parva naturalia: A Revised Text with Introduction and Commentary* (Oxford, Clarendon Press).

———(1957), *Aristotelis politica* (Oxford, Clarendon Press).

———(1958), *Aristotelis topica et sophistici elenchi* (Oxford, Clarendon Press).

———(1959), *Aristotelis ars rhetorica* (Oxford, Clarendon Press).

———(1961), *Aristotle's De Anima: Edited, with Introduction and Commentary* (Oxford, Clarendon Press)

Peck, A.L. (1937), *De Partibus Animalium* Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press).

Pepe, Lucio (2003) *Aristotele Meteorologia* Introduzione, traduzione, note e apparati (Milano, Bompiani Testi a Fronte).

Tredennick, Hugh (1933 and 1935), *Metaphysics*, Loeb Classical Library (London, Heinemann/ Cambridge, MA, Harvard University Press).

Other Greek authors

Archer-Hind, R. D. (1888), *The Timaeus of Plato* edited with an Introduction and Notes (London, Macmillan).

Babbitt, F.C. (1927), *Plutarch's moralia*, vol. I, Loeb Classical Library (London, Heinemann/ Cambridge, Mass., Harvard University Press). (repr. 1969).

Burnet, J. (1900-02), *Platonis opera*, vols. 1, 2, and 4 (Oxford, Clarendon Press).

Bury, R. G. (1929), *Plato VII Timaeus* Loeb Classical Library (London, Heinemann/Cambridge, Mass., Harvard University Press).

———(1953), *Sextus Empiricus III Against the Physicists*, Loeb Classical Library (London, Heinemann/Cambridge, Mass., Harvard University Press).

Campbell, Lewis (1867), *The Sophistes and Politicus of Plato* (Oxford, Clarendon Press).

———(1883), *The Theaetetus of Plato* A Revised Text with English Notes (Oxford, Clarendon Press, 2nd edition).

Diels, H. (1882 & 1895), *Simplicii in Aristotelis physicorum libros octo commentaria*, 2 vols. (*Commentaria in Aristotelem Graeca* 9 & 10, Berlin, Reimer).

De Lacy, Phillip H. and Benedict Einarson (1959), *Plutarch: Moralia* vol. VII, Loeb Classical Library (Cambridge, Mass., Harvard University Press/London, Heinemann).

Fowler, H.N. (1921), *Plato: Theaetetus and Sophist* Loeb Classical Library (London, Heinemann/Cambridge, MA, Harvard University Press, revised 1952).

Hayduck, M (1882) *Simplicii In libros Aristotelis De Anima Commnetaria* (Berlin, Reimer).

Heiberg, J.L. (1894), *Simplicii in Aristotelis de caelo commentaria* (*Commentaria in Aristotelem Graeca* 7 (Berlin, Reimer).

Jones, W.H.S. (1923) *Hippocrates, Vol. I* Loeb Classical Library (Cambridge, Mass., Harvard University Press/ London, Heinemann).

———(1931) *Hippocrates Vol. IV* Loeb Classical Library (Cambridge, Mass., Harvard University Press/ London, Heinemann).

Kühn, K.-G. (1821-33), *Galeni Opera Omnia.* (ed.), 20 vols. (Leipzig, repr. Hildesheim, 1964- 65).

Mau, J. and H. Mutschmann (1914 & 1961), *Sexti Empirici opera*, vols. 2 & 3, 2nd edn. (Leipzig, Teubner).

Mutschmann, H. (1912), *Sexti Empirici opera*, vol. 1 (Leipzig: Teubner).

Shorey, Paul (1969), *Plato The Republic* Loeb Classical Library (London, Heinemann/Cambridge, MA, Harvard University Press).

Sieveking, W. (1929), *Plutarchi moralia*, vol. 3. (Leipzig, Teubner).

Vitelli, H. (1887-1888), *Ioannis Philoponi in Aristotelis physicorum libros octo commentaria*, 2 vols. (*Commentaria in Aristotelem Graeca* 16 & 17, Berlin, Reimer).

———(1897), *Ioannis Philoponi in Aristotelis libros de generatione et corruptione commentaria* (*Commentaria in Aristotelem Graeca* 14.2, Berlin, Reimer).

Wehrli, F. (1969), *Eudemos von Rhodos:: Die Schule des Aristoteles,* vol. 8, 2nd edn. (Basel: Schwabe).

Wellman, M. (1901) *Die Fragmente der Sikelischen Arzte*, (Berlin, Weidmannsche Buchhandlung).

Wright, M. R. (1981), *Empedocles: The Extant Fragments* (New Haven, Yale University Press).

Secondary Literature

Ackrill, J. L., (1963), *Aristotle's* Categories *and* De Interpretatione, translation with notes (Clarendon Aristotle Series; Oxford).

———(2001), 'Aristotle's Definitions of *Psuchê*', in *Essays on Plato and Aristotle* (Oxford University Press); originally published in *Proceedings of the Aristotelian Society* (1972-3), 73, and reprinted in Barnes, Schofield, Sorabji (1979).

Apostle, Hippocrates G. (1979), *Aristotle's Metaphysics* translated with Commentaries and Glossary (Iowa Peripatetic Press).

Aquinas, St. Thomas (1912-36), *Summa Theologiae,* trans. by English Dominicans (London: Burns, Oates, and Washbourne; repr. New York: Benziger 1947-48; repr. New York: Christian Classics, 1981).

———(1934), *Summa Contra Gentiles,* trans. by English Dominicans (London: Burns, Oates, and Washbourne).

———(1948), *De principiis naturae ad fratrem Sylvestrum,* trans. by R. Kocourek (St. Paul: North Central).

———(1963), *Commentary on Aristotle's Physics,* trans. by R. J. Blackwell et. al. (New Haven: Yale).

———(1963-1964), *Commentary on Aristotle's On the Heavens,* trans. by Father Pierre Conway and F. R. Larcher, unpublished but circulated in photocopied form.

———(1964), *Commentary on the Metaphysics of Aristotle,* trans. by J. P. Rowan (Chicago: Regnery).

———(1964), *Commentary on Aristotle's On Generation and Corruption,* trans. by Father Pierre Conway and F. R. Larcher, unpublished but circulated in photocopied form.

———(1968), *Aquinas on Being and Essence,* trans. by A. A. Maurer (Toronto: PIMS, 2nd ed.).

Ball, Philip (2004), *The Elements* (Oxford University Press).

Balme, D. M. (1972), *Aristotle De Partibus Animalium I and De Generatione Animalium I* translated with Notes (Oxford, Clarendon Press, rep. 1992).

———(1987) 'Teleology and Necessity', in Gotthelf and Lennox (1987).

Barnes, J. (1976a) 'Introduction' in *The Ethics of Aristotle: The Nicomaxhean Ethics* translated by J.A.K. Thomson, revised with notes and appendices by Hugh Tredennick, Introduction and Bibliography by Jonathan Barnes (London, 1976).

———(1976b) 'Aristotle, Menaechmus, and Circular Proof', *Classical Quarterly*, vol. 26, no. 2, pp. 278-292

———(1979) *The Presocratic Philosophers* (London, Routledge; 1 vol. edn, 1982).

———(1982), *Aristotle* (Oxford University Press).

———(1984), (ed.), *The Complete Works of Aristotle*, the revised Oxford translation in 2 vols. (Princeton University Press).

———(1994), *Aristotle's Posterior Analytics*. 2nd Edition. Translation with commentary. (Oxford, Clarendon Press).

———(1995) (ed.), *The Cambridge Companion to Aristotle* (Cambridge University Press).

———(1995a) 'Life and Work', in Barnes (1995).

———(1995b) 'Metaphysics', in Barnes (1995).

Barnes, J., M. Schofield, and R. Sorabji, (1975), (eds.), *Articles on Aristotle: Vol. 1, Science* (London, Duckworth).

———(1979), *Articles on Aristotle: Vol. IV, Psychology and Aesthetics* (London, Duckworth).

Bolton, Robert (1987) 'Definition and Scientific Method in Aristotle's *Posterior Analytics* and *Generation of Animals*', in Gotthelf and Lennox (1987).

———(1991), 'Aristotle's Method in Natural Science: *Physics* I' in Judson (1991).

Bonitz, Hermann (1870), *Index Aristotelicus* (Berlin, G. Reimer).

Bostock, David (1982), 'Aristotle on the Principles of Change in *Physics* I', in Schofield and Nussbaum (1982).

———(1988), *Plato's Theaetetus* (Oxford, Clarendon Press).

———(1994), *Aristotle Metaphysics Books Z and H* Translated with a Commentary (Oxford, Clarendon Press).

———(1995), 'Aristotle on the Transmutation of the Elements', in *Oxford Studies in Ancient Philosophy*, vol. XIII.

———(1996), *Physics*, translated by Robin Waterfield, Introduction and Notes by D. Bostock (Oxford University Press).

———(2000), 'Aristotle's Theory of Matter', in Sfendoni-Mentzou, Hattiangadi, and Johnson (2000).

———(2006) 'Aristotle on Teleology in Nature' in *Space, Time, Matter, and Form: Essays on Aristotle's Physics* (Oxford University Press).

Brague, R. (1982), 'Sur la formule aristotéicienne *ho pote on*', in *Du temps chez Platon et Aristote* (Paris).

Brandwood, Leonard (1992), 'Stylometry and chronology', in Richard Kraut (Ed.), *The Cambridge Companion to Plato* (Cambridge University Press).

Broadie, Sarah (2004), '*GC* I 4: Distinguishing Alteration', in de Haas and Mansfeld (2004).

Brown, Malcolm (1976), 'A Pre-Aristotelian Mathematician on Deductive Order', in Edward P. Mahoney (ed.) *Philosophy and Humanism: Renaissance Essays in Honour of Paul Oskar Kristeller* (Leiden, Brill).

Brunschwig (2004), '*GC* I 1: A False Start?', in de Haas and Mansfeld (2004).

Buchanan, Emerson (1962), *Aristotle's Theory of Being* (Cambridge University Press).

Burkert, W. (1959), '*Stoicheion*', in *Philologus*, 103.

Burnet, John (1892), *Early Greek Philosophy* (London, Adam and Charles Black; 4th Edition, 1930, reprint of the 3rd edition, 1920).

Burnyeat, Myles (1981), 'Aristotle on Understanding Knowledge', in E. Berti (ed.), *Aristotle on Science* (Padua, 1981).

———(1990), *The Theaetetus of Plato* (Indianapolis, Hackett).

———(1992) 'Is an Aristotelian Philosophy of Mind still Credible? A Draft', in Nussbaum and Rorty (1992).

———(2004), 'Introduction', in de Haas and Mansfeld (2004).

Burnyeat, Myles and others (1979), (eds.), *Notes on Zeta, Aristotle's Metaphysics* (Sub-Faculty of Philosophy, Oxford University).

———(1984) (eds.) *Notes on Eta and Theta* (Sub-Faculty of Philosophy, Oxford University).

Chappell, V. (1973), 'Matter', *Journal of Philosophy* 70.

Charles, David (2001), 'Some Notes on Simple Genesis and Prime Matter in G.C. 1', unpublished paper.

———(2004), '*GC* I 5: Simple Genesis and Prime Matter', in de Haas and Mansfeld (2004).

Charlton, William (1970), *Aristotle's Physics Books I and II*, translated with an Introduction and Notes (Oxford, Clarendon Press).

———(1983), 'Prime Matter: A Rejoinder', *Phronesis* 28.

Cherniss Harold (1977) Review of H. D. Saffrey *Le Peri Philosophias d'Aristote et la théorie platonicienne des idées nombres*, originally published in Gnomon, 31 (1959), 36-51, in *Selected Papers* ed. Leonardo Tarán (Leiden, Brill).

———(1944), *Aristotle's Criticism of Plato and the Academy* (Baltimore, Johns Hopkins Press).

———(1935), *Aristotle's Criticism of Presocratic Philosophy* (Baltimore, Johns Hopkins Press).

Cleary, John (1995), *Aristotle and Mathematics: Aporetic Method in Cosmology and Metaphysics* (Leiden, Brill).

Code, Alan (1976), 'The Persistence of Aristotelian Matter', *Philosophical Studies* , 29.

Cohen, Sheldon (1984), 'Aristotle's Doctrine of the Material Substrate' in *The Philosophical Review* XCIII, No. 2.

———(1997) *Aristotle on Nature and Incomplete Substance* (Cambridge University Press).

Cook, Kathleen C. (1989), 'The Underlying Thing, the Underlying Nature, and Matter: Aristotle's Analogy in *Physics* I 7', *Apeiron* 22.

Cooper, John M. (1982) 'Aristotle on Natural Teleology', in Schofield and Nussbaum (1982).

———(1985) 'Hypothetical Necessity', in Gotthelf (1985).

Cornford, F. M. (1935), *Plato's Theory of Knowledge* (London, Routledge and Kegan Paul).

——(1937), *Plato's Cosmology* (London, Routledge and Kegan Paul).

Clarke, Emma C., John M. Dillon and Jackson P. Hershbell (2004), *Iamblichus, De mysteriis*, translated with an introduction and notes (Leiden, Brill).

Crowley, Timothy J. (2005), 'On the Use of *Stoicheion* in the Sense of 'Element'', in *Oxford Studies in Ancient Philosophy* 29.

Crubellier, Michel (2000), '*Metaphysics* Λ 4', in Frede and Charles (2000).

Curd, Patricia (1998), *The Legacy of Parmenides: Eleatic Monism and Later Presocratic Thought* (Princeton, NJ, Princeton University Press).

Dancy, R.M. (1978), 'Aristotle's Second Thoughts on Substance', *Philosophical Review*, 87.

Dean-Jones, L. (1994), *Women's Bodies in Classical Greek Science* (Oxford University Press).

Debus, Allen George (2002), *The French Paracelsians : The Chemical Challenge to Medical and Scientific Tradition in Early Modern France* (Cambridge University Press).

De Haas, Frans and Jaap Mansfeld (2004), (eds), *Aristotle's* On Generation and Corruption I *Symposium Aristotelicum* (Oxford, Clarendon Press).

De Haas, Frans (1997) *John Philoponus' New Definition of Prime Matter* (Leiden, Brill).

Diels, H., (1899), *Elementum* (Leipzig, Teubner).

Dillon, J.M. (1977), *The Middle Platonists* (London and Cornell; 2nd edn. 1996).

———(2003), *The Heirs of Plato: A Study of the Old Academy (347-274BC),* (Oxford, Clarendon Press).

Düring, Ingmar (1943), *Aristotle's* De Partibus Animalium: *Critical and literary Commentaries* (Göteberg, Elanders Boktyckeri aktiebolag).

——— (1961), *Aristotle's Protrepticus, An Attempt at Reconstruction* Studia Graeca et Latina Gothoborgensia XII (Göteberg).

———(1966), (ed), *NaturPhilosophie bei Aristoteles und Theophrast* Symposium Aristotelicum 4 (Heidelberg).

Everson, Stephen (1997), *Aristotle on Perception* (Oxford, Clarendon Press).

Fine, Gail (1993), *On Ideas: Aristotle's Criticism of Plato's Theory of Forms* incl. Text and Translation (Oxford, Clarendon Press).

———(1999), (ed.), *Plato 1: Metaphysics and Epistemology* Oxford Readings in Philosophy (Oxford University Press).

Fine, Kit (1992), 'Aristotle on Matter', *Mind* 101.

———(1994), 'A Puzzle Concerning Matter and Form', in Scaltsas, Charles, and Gill (1994).

Fisk, Milton (1963), 'Prime Matter and Unqualified Change', in McMullin (1963).

Fitzgerald, John J. (1963), '"Matter" in Nature and the Knowledge of Nature: Aristotle and the Aristotelian Tradition', in McMullin (1963).

Frank E. (1923), *Plato und die sogenannten Pythagoreer: Ein Kapitel aus der Geschichte des griechischen Geistes* (Halle).

Frede, Dorothea '*On Generation and Corruptio*n I 10: On Mixture and Mixables', in de Haas and Mansfield (2004).

Frede, Michael (1987), *Essays in Ancient Philosophy* (Oxford, Clarendon Press).

———(1992), 'Introduction' to *Plato Protagoras*, translated by Stanley Lombardo and Karen Bell (Indianapolis, Hackett).

———(1994), 'Aristotle's Notion of Potentiality in *Metaphysics* Θ' in Scaltsas, Charles and Gill (1994).

———(1996), 'Aristotle's Rationalism' in M. Frede and G. Striker, (eds), *Rationality in Greek Thought* (Oxford, Clarendon Press).

———(2000), '*Metaphysics* Λ 1', in Frede and David Charles (2000).

Frede, Michael and David Charles (2000), (eds), *Aristotle's* Metaphysics *Lambda* (Oxford, Clarendon Press).

Freeland, Cynthia A. (1987), 'Aristotle on bodies, matter, and potentiality', in Gotthelf and Lennox (1987).

Frege, Gottlob (1892) 'Über Sinn und Bedeutung', *Zeitschrift für Philosophie und philosophische Kritik*, NF 100, 1892, S. 25-50.

Freudenthal, Gad (1995), *Aristotle's Theory of Material Substance: Heat and Pneuma, Form and Soul* (Oxford, Clarendon Press).

Furley, David (1987), *The Greek Cosmologists, Volume I: The formation of the atomic theory and its earliest critics* (Cambridge University Press).

Furth, Montgomery (1988), *Substance, Form and Psyche: An Aristotelean Metaphysics* (Cambridge University Press).

Gallop, David (1963), 'Plato and the Alphabet', *The Philosophical Review*, 72:3.

———(1975), *Plato Phaedo* translation what Notes (Oxford, Clarendon Press).

Gannagé, Emma (2005) *Alexander of Aphrodisias On Aristotle On Coming-to-Be and Perishing 2.2-5* (London, Duckworth).

Gill, Mary Louise (1989), *Aristotle on Substance* (Princeton, University Press).

Gotthelf, Allan (1985) *Aristotle on Nature and Living Things*, (ed), (Pittsburgh, Mathesis).

———and James G. Lennox (1987), (eds.), *Philosophical Issues in Aristotle's Biology* (Cambridge University Press).

———(1987) 'Aristotle's Conception of Final Causality', in Gotthelf anf Lennox (1987).

Graham, Daniel W. (2006) *Explaining the Cosmos: The Ionian Tradition of Scientific Philosophy* (Princeton University Press).

——— (1987), 'The Paradox of Prime Matter' *Journal for the History of Philosophy* 25.

———(1987b), *Aristotle's Two Systems* (Oxford, Clarendon Press).

———(1984), 'Aristotle's Discovery of Matter' *Archiv fuer Geschichte der Philosophie* (66).

Granger, Herbert (2000) 'Z.11, 1036b28: *aisthêton* OR *aisthêtikon*?', *Classical Quarterly* 50, No.2, 415-427.

Grice, Paul (1989) *Studies in the Way of Words* (Harvard University Press).

Guthrie, W. K. C. (1935) *Orpheus and Greek Religion* (London, Methuen).

———(1978), *A History of Greek Philosophy, Volume V: The Later Plato and the Academy* (Cambridge University Press).

———(1981), *A History of Greek Philosophy, Volume VI: Aristotle* (Cambridge University Press).

Hackforth, R. (1945), *Plato's Examination of Pleasure* (Cambridge University Press).

Hamlyn, D. W. (1968), *Aristotle's* De Anima *Books II and III*, translated with an Introduction and Notes (Oxford, Clarendon Press).

Hankinson, R.J. (1995) 'Science', in Barnes (1995).

———(1998), *Cause and Explanation in Ancient Greek Thought* (Oxford University Press).

Heath, T.L. (1949), *Mathematics in Aristotle* (Oxford, Clarendon Press).

———(1956), *The Thirteen Books of Euclid's Elements*, Vol. 1, translated with Introduction and Commentary, 2nd Edition (New York, Dover).

Hesse, Mary (1965), 'Aristotle's Logic of Analogy', *Philosophical Quarterly* 15.

Huffman, C. (1993) *Philolaus of Croton: Pythagorean and Presocratic* (Cambridge University Press).

Hussey, Edward (1983), *Aristotle's Physics III and IV* translated with an Introduction and Notes (Oxford, Clarendon Press).

Ierodiakonou, Katerina (2005) 'Empedocles on Colour and Colour Perception', in *Oxford Studies in Ancient Philosophy*, 29.

Inwood, Brad (2001) *The Poem of Empedocles* Text and Translation with Introduction (Toronto, University of Toronto Press).

Inwood, Brad and L.P. Gerson (1997) *Hellenistic Philosophy: Introductory Readings*, 2nd edition, Translated with an Introduction and Notes (Indianopolis/Cambridge, Hackett).

Irwin, Terence (1988), *Aristotle's First Principles* (Oxford, Clarendon Press).

Jaeger, Werner (1923), *Aristotle* translated by R. Robinson (Oxford, Clarendon, 1967, 2nd edition; first published in English, 1948; 1st German edition, 1923).

Jones, Barrington (1974), 'Aristotle's Introduction of Matter', *Philosophical Review*, 83.

Judson, Lindsay (1981), (ed.), *Aristotle's Physics: A Collection of Critical Essays*, (Oxford, Clarendon Press).

Kahn, Charles H. (1960), *Anaximander and the Origins of Greek Cosmology* (New York, Columbia University Press).

King, Hugh R. (1956), 'Aristotle without *Prima Materia*', *Journal for the History of Ideas* XVII., 370-87.

Kirk, G.S., and J.E. Raven (1957), *The Presocratic Philosophers: A Critical History with a Selection of Texts* (Cambridge University Press, 1971 reprint with corrections).

Kirk, G.S., and J.E. Raven and M. Schofield (1983), *The Presocratic Philosophers: A Critical History with a Selection of Texts* (Cambridge University Press, 2nd edition).

Kirwan, Christopher (1971), *Aristotle: Metaphysics Books* Γ, Δ, *and* E, Translated with an Introduction and Notes, 2nd edition 1993 (Oxford, Clarendon Press).

Koller, H. (1955), 'Stoicheion', *Glotta* 34.

Lacey, A.R. (1965), 'The Eleatics and Aristotle on Some Problems of Change' in *Journal of the History of Ideas*, 26.

Lagercrantz O. (1911), *Elementum* (Uppsala, Akademiska Bokhandlen).

Lawson-Tancred, Hugh (1986) *Aristotle De Anima (On the Soul)*, translated with an Introduction and Notes (London, Penguin).

Lear, Jonathan (1988) *Aristotle : The Desire to Understand* (Cambridge University Press).

Lee, H.D.P. (1965), *Plato Timaeus* (Harmondsworth, Penguin).

Lennox, James (2001), *Aristotle: On the Parts of Animals,* translation with introduction and commentary (Clarendon Aristotle Series, Oxford University Press).

Lesher, J.H. (1973), 'The Meaning of *nous* in the *Posterior Analytics*' *Phronesis*, vol. 18.

Lewis, Eric (1996), *Alexander of Aphrodisias On Aristotle's Meteorology 4*, (Ithaca, Cornell University Press).

Lewis, Frank A. (1991), *Substance and Predication in Aristotle* (New York, Cambridge, Cambridge University Press).

———(1994), 'Aristotle on the Relation between a Thing and its Matter', in Scaltsas, Charles, and Gill (1994).

———and Robert Bolton (1996), (eds.), *Form, Matter, and Mixture in Aristotle* (Oxford, Blackwell).

Lloyd, G.E.R. (1996), *Aristotelian Explorations* (Cambridge University Press).

———(1968), *Aristotle: The Growth and Structure of his Thought* (Cambridge University Press).

Lohmann, J. (1970), *Musikê und Logos: Aufsaetze zur griechischen Philosophie und Musiktheorie* (Stuttgart, Musikwissenschaftliche Verlags-Gesellschaft).

Longrigg, James (1967), 'Roots', *The Classical Review*, New Series Vol. XVII, No. 1, 1-4.

———(1975), 'Elementary Physics in the Lyceum and Stoa', *Isis* 66:2.

———(1976), 'The 'Roots of All Things'", *Isis* 67:3.

———(1993) *Greek Rational Medicine: Philosophy and Medicine from Alcmaeon to the Alexandrians* (London, Routledge).

Loux, Michael J. (1991) *Primary Ousia: An Essay on Aristotle's* Metaphysics *Z and H* (Ithaca: Cornell University Press).

Lumpe, A. (1962), "Der Begriff 'Element' in Altertum', in *Archiv fuer Begrriffsgeshcichte*, 7.

Luyten, Norbert (1963), 'Matter as Potency' in McMullin (1963).

McCabe, Mary Margaret (1994), *Plato's Individuals* (Princeton, NJ, Princeton University Press).

McDowell, John (1973), *Plato's Theaetetus* (Oxford, Clarendon Press).

McMullin, Ernan (1963), (ed.), *The Concept of Matter in Greek and Medieval Philosophy* (Indiana, University of Notre Dame Press, paperback edition, 1965).

———(1963a), 'Matter as Principle', in McMullin (1963).

McKirihan, Richard D. (1994) *Philosophy Before Socrates: An Introduction with Texts and Commentary* (Indianapolis, Hackett.).

Madigan, Arthur (1999) *Aristotle Metaphysics Book B and Book K 1-2* Translation with a Commentary (Oxford, Clarendon Press).

Mansion, Auguste (1913), *Introduction à la physique aristotelicienne* (Louvain, Paris; Vrin).

Miller, Fred D. (1978), 'Aristotle's Use of Matter' in *Paideia: Special Aristotle Issue* Second Special Issue, ed. George C. Simmons.

Mansion, A. (1946), *Introduction à la Physique aristotélicienne*, 2nd ed. (Paris/Louvain, l'Institut supérieur de Philosophie/Vrin).

Moore, A.W. (1993), (ed.), *Meaning and Reference* (Oxford University Press).

Morison, Benjamin (2002), *On Location: Aristotle's Concept of Place* (Oxford, Clarendon Press).

Morrisson, Donald (1985) '*Chôristos* in Aristotle', *Harvard Studies in Classical Philology*, 89.

Morrow, G. R. (1970) *Proclus: A Commentary on the First Book of Euclid's Elements* (Princeton University Press, N.J.)

Natali, Carlo (2004) 'On Generation and Corruption I.6', in de Haas and Mansfiled (eds) (2004).

Nussbaum, Martha C. (1982), 'Saving Aristotle's Appearances', in Schofield and Nussbaum (1982).

——— and Rorty, A.O. (1992) (eds) *Essays on Aristotle's* De Anima (Oxford, Clarendon Press).

Osborne, Catherine (1987), 'Empedocles Recycled', Classical Quarterly, 37.

Owen, G.E.L. (1953), 'The Place of the *Timaeus* in Plato's Dialogues,' *Classical Quarterly*, no. 3, 79-95; reprinted in R.E. Allen (ed.), *Studies in Plato's Metaphysics* (London, 1965).

———(1961), '*Tithenai ta Phainomena*', first published in S. Mansion, (ed.), *Aristote et les Problèmes de la Méthode* (Louvain 1961); also in Barnes, Schofield, and Sorabji (1975).

Owens, Joseph (1951), *The Doctrine of Being in the Aristotelian Metaphysics* 3rd edition, 1963 (Toronto).

———(1963), 'Matter and Predication in Aristotle' in McMullin (1963).

———(1966), 'The Aristotelian Argument for the Material Principle of Bodies', in I. Düring (1966).

Pakaluk, Michael (2005) *Aristotle's Nicomachean Ethics: An Introduction.* (Cambridge University Press).

Partridge, Eric (1942), *Usage and Abusage: A Guide to Good English*, New edition ed. Janet Whitcut 1999 (London, Penguin).

Platnauer, M (1921), 'Greek Colour-Perception', in *Classical Quarterly*, 15.

Politis, Vasilis (2004) *Aristotle and the* Metaphysics (London, Routledge).

Preus, Anthony (1975) *Science and Philosophy in Aristotle's Biological Works* (Hildesheim, New York, Georg Olms Verlag).

Puig-Montada, J. (1996) 'Aristotle and Averroes on *Coming-to- be and Passing-Away*', *Oriens*, 35.

Rahill, T. E. (1999), *Greek Science: New Surveys in Classics* No. 29, *Greece and Rome:* (Oxford University Press).

Reeve, C.D.C. (1998), *Plato's Cratylus* translated, with an Introduction and Notes (Indianapolis/ Cambridge, Hackett).

Robin, Léon (1930), *La Théorie Platonicienne des Idées et des Nombres d'après Aristote* (Paris, Presses Universitaire de Paris, rep. Hildesheim, Olms, 1963).

Robinson, H.M. (1974), 'Prime Matter in Aristotle', *Phronesis*, 19.

Ross, W. D. (1949), *Aristotle* (London, Methuen, 5th edition, revised, first published (1923).

Ryle, Gilbert (1960), 'Letters and Syllables in Plato', in *Philosophical Review*, LXIX.

Scaltsas, Theodore (1985), 'Substratum, Subject, and Substance', *Ancient Philosophy* 5.

———(1989), Review of Furth (1988), *Philosophical Books* 30.

———(1994), *Substances and Universals in Aristotle's Metaphysics* (Ithaca, Cornell University Press).

———(1998), *Argument Analysis of Aristotle's On Generation and Corruption* (Project Archelogos, http://www.archelogos.com/xml/toc/toc-gci.htm).

Scaltsas, Theodore, David Charles, and Mary Louise Gill (1994), (eds.), *Unity, Identity, and Explanation in Aristotle's Metaphysics* (Oxford, Clarendon Press).

Schmaltz, Tad M. (2002), *Radical Cartesianism: the French Reception of Descartes* (Cambridge University Press).

Schmidt, M.C.P. (1884) 'Die Fragmente der Mathematikers Menaeachmus', *Philologus*, 42, pp. 72-81.

Schofield, M. and M. Nussbaum (1982), (eds), *Language and Logos: Studies in Ancient Greek Philosophy* (Cambridge University Press).

Schwabe, Wilhelm (1980), '"Mischung" und "Element" im Griechischen bis Platon', in *Archiv fuer Begriffsgeschichte* Suppl. 3.

Sedley, David (2003), *Plato's Cratylus* (Cambridge University Press).

Seeck, G.A. (1965) *Über die Elemente in der Kosmologie des Aristoteles: Untersuchnungen zu 'De Generatione et Corruptione' und 'De Caelo'*, *Zetemata* 34 (Munich, Beck).

Sfendoni-Mentzou, Demetra (2000), (ed.), *Aristotle and Contemporary Science*, vol. I (New York, Peter Lang).

Sfendoni-Mentzou, Demetra, J. Hattiangadi, and David M. Johnson (2000), (eds.), *Aristotle and Contemporary Science*, vol. II (New York, Peter Lang).

Shields, Christopher (1999), *Order in Multiplicity: Homonymy in the Philosophy of Aristotle* (Oxford University Press).

Shorey, Paul (1903), *The Unity of Plato's Thought* (Chicago, University of Chicago Press)

Skemp, J. B. (1952), *Plato's Statesman* A Translation of the Politicus of Plato with Introductory Essays and Footnotes (London, Routledge and Kegan Paul).

Sokolowski, Robert (1970), 'Matter, Elements, and Substance in Aristotle' *Journal of the History of Philosophy*, Vol. VIII.

Solmsen, Friedrich (1958), 'Aristotle and Prime Matter: A Reply to Hugh R. King', *Journal for the History of Ideas*, XIX. XIX (1958).

———(1960), *Aristotle's System of the Physical World* (Ithaca, Cornell University Press).

———(1961), 'Aristotle's Word for "Matter"', in Sesto Prete (ed.), *Didascaliae: Studies in honor of Anselm M. Albareda* (New York, Rosenthal). Reprinted in *Kleine Schriften I* (Hildesheim, Olms, 1968).

Sorabji, Richard (1988), *Matter Space and Motion* (London, Duckworth).

———(1992) 'Intentionality and Physiological Processes: Aristotle's Theory of Sense-Perception', in Nussbaum and Rorty (1992).

———(2004) *The Philosophy Of The Commentators, 200-600 AD, Vol. 2. Physics* (London, Duckworth).

Tarán, Leonardo (2001) 'Concerning a New Interpretation of Parmenides', in *Collected Papers: 1962-1999* (Leiden, Brill).

Taylor, A. E., (1928), *A Commentary on Plato's* Timaeus (Oxford).

Verdenius, W.J. and Waszink, J.H. (1966) *Aristotle on Coming-to-be and Passing-away*, 2nd end. (Leiden, Brill).

Vlastos, Gregory (1957) 'Equality and Justice in Early Greek Cosmologies', *Classical Philology* 42.

———(1975), *Plato's Universe* (Oxford, Clarendon Press).

Vollgraff, W. (1949), 'Elementum', *Mnemosyne* IV, S. 2.

Waterfield, Robin A. H. (1982), *Plato Philebus* (Harmondsworth, Penguin).

Waterlow, Sarah (1982), *Nature, Change, and Agency in Aristotle's Physics* (Oxford, Clarendon Press).

Wians, W. (1992), 'Saving Aristotle from Nussbaum's *Phainomena*', in J. Anton and A. Preus, eds., *Essays in Ancient Greek Philosophy* v. 5 (SUNY Press, 1992).

Wieland, W. (1962), *Der aristotelische Physik* (Gottingen, Vanderhoek und Ruprecht).

———(1975), 'Inquiry into Principles' in Barnes, Schofield and Sorabji (1975).

Williams, C.J.F. (1982), *Aristotle's De Generatione et Corruptione*, translated with notes (Oxford, Clarendon Press).

———(1999a), *Philoponus On Aristotle On Coming-to-Be and Perishing 1.1-5* translation, with Introduction by Sylvia Berryman (London, Duckworth).

———(1999b), *Philoponus On Aristotle On Coming-to-Be and Perishing 1.6-2-4* translation, with Introduction by Sylvia Berryman (London, Duckworth).

Zeller, E. (1897), *Aristotle and the Earlier Peripatetics*, 2 vols., trans. Costelloe and Muirhead (London, Longmans).