

4 Aristotle on the Matter for Birth, Life, and the Elements

David Ebrey

INTRODUCTION

One of Aristotle's major contributions to natural science was his development of an idea that he called *'hulê'*, which we translate into English as 'matter'. The notion of matter seems quite ordinary to us today, but Aristotle's idea was new at the time. The word *hulê'* originally meant forest, brushwood, or cut wood and, aside from a single occurrence in Plato's *Philebus* (54c), Aristotle is the first (extant) author to use the term in a general account of things in the natural world. Our notion of matter is a descendant of his, but we should be careful not to assume that he thought of it the way we do today. One way to understand how Aristotle thinks about matter is to look closely at his *Physics* (*On Nature*) 1 and 2, where he describes matter at a high level of generality. This can help us understand his reasons for identifying matter as one of the principles and causes needed to do natural science. However, it does not provide much insight into what concrete role matter is supposed to play in our understanding of the natural world. Moreover, his account in the *Physics* leaves several important questions open, which can be answered by looking closely at how he uses matter in his scientific explanations. Aristotle's scientific corpus is large and in places melds seamlessly with what we would consider philosophical works. While we typically distinguish science from philosophy, Aristotle himself considered his scientific works to be part of natural philosophy.¹ Natural philosophy comprises slightly over nine hundred pages in the *Complete Works of Aristotle: the Revised Oxford Translation*. Of this, more than four hundred pages are detailed biology. Aristotle was the first systematic biologist and his biology contains his most impressive scientific work.² But, for Aristotle, it is important to understand the entirety of the natural world, from the elements to the cosmos as a whole. His scientific concepts are meant to apply generally to all natural things. For this reason, among others, it is illuminating to consider different places where Aristotle discusses matter. In

what follows I first consider menstrual fluid as the matter of animal reproduction in the *Generation of Animals*, then the more puzzling case of the body of a living thing as its matter in the *De anima* (On the Soul), and finally the notoriously obscure matter for the transformation of the elements in *Generation and Corruption*.³ I focus on two thorny questions about matter that arise in these works.

One question is how to reconcile two apparently incompatible ways that Aristotle discusses matter. Sometimes he treats matter as relative to some particular type of change. Thus, in the *Parts of Animals* he says that blood is matter of the body since it nourishes it (651a12–15, 668a1–4) and in *Generation and Corruption* he refers to the ‘matter of size’, which is the matter involved in growth (320b22–25, 321a6–7).⁴ Menstrual fluid as the matter for animal generation is an example of this sort of matter that is relative to a change. According to this way of treating matter, there are different types of matter for different types of change. However, at other times Aristotle says that substances (paradigmatically, living things like trees, dogs, and spiders) are composed of form and matter, not a bundle of forms and a bundle of matters. This latter way of thinking about matter does not seem relative to a particular change in the way that the former is. Does Aristotle have a coherent notion of matter that fits with these two ways he identifies it?

The other question is how to understand the matter involved in the transmutation of the elements. Aristotle thinks that fire, earth, air, and water are the simplest bodies and that they can transform into one another. He is clear that there is a matter for the transformation of these elements, but his discussion of this is obscure. There is a medieval tradition that takes this matter to be actually nothing, but a pure potentiality to become anything. This matter is typically taken to remain through every change, not only the transformation of the elements. This traditional view, often referred to as ‘prime matter’, came under attack in the middle of the twentieth century, and was the subject of an intense debate.⁵ Part of what gave the debate its particular fervor is that it was connected with the question of whether or not Aristotle thinks that matter must remain through every change.

In what follows, I argue that we can reconcile the two apparently incompatible ways that Aristotle describes matter, and in doing so develop a new account of the matter of the elements. There is a single, coherent notion of matter found in all three treatises, and at the same time, important differences that result from (1) the different

sorts of changes under consideration, and (2) whether Aristotle is considering the matter for a specific change, or the matter for all of a substance's characteristic changes.⁶ Aristotle's single coherent notion is this: matter changes insofar as it is matter.⁷ It changes not in the active sense of changing something else, but in the passive sense of being itself changed. In saying that matter does this 'insofar as it is matter', Aristotle is saying that it does this because it is matter, not because of some other feature that it happens to have. Thus, the matter in a change is the thing that is properly suited to undergo that change. Just as an efficient cause, insofar as it is an efficient cause, changes something else, so matter, insofar as it is matter, is changed.

If we want to understand why something is matter in a given change, we cannot answer this generically; we need to look at the change in question. In the case of making a statue, the sculptor needs something that can retain fine levels of detail and hold its shape. Water would not work, but bronze does. Note that there are no generic efficient causes; instead, there are sculptors, doctors, and – in Aristotle's view – male *sperma* in the case of animal reproduction. Similarly, there is no generic matter; instead, there are bronze, bodies, and in Aristotle's view, menstrual fluid. Menstrual fluid, according to Aristotle, is what is properly suited to become a newborn animal. When acted on by the *sperma*, it becomes the appropriate type of animal insofar as it is menstrual fluid, not because of some other feature it happens to have. In the *De anima*, the body is what is properly suited to undergo the various changes characteristic of a given living creature. So, for example, a robin's wings allow it to engage in a characteristic activity, flying. Many of the features that Aristotle ascribes to the matter of the elements in *Generation and Corruption* do not result from general commitments he has about all matter, as is generally assumed, but rather from the specific type of change that he is considering. Aristotle's views of the elements and how they change into one another entail that the sort of thing suited to become air is the same as the sort suited to become earth, water, or fire; this is why it turns out that there is the same matter for all four elements.

GENERATION OF ANIMALS

The *Generation of Animals* is one of Aristotle's explanatory scientific treatises, that is, it seeks to determine the answers to 'why?' questions on a given subject matter. Broadly speaking, Aristotle's *History of*

Animals sets out empirical facts about animals in such a way as to make salient what explanatory relations could obtain between these facts.⁸ By contrast, treatises such as the *Generation of Animals*, *Parts of Animals*, and *Movement of Animals* seek to determine the explanations for empirical facts. In particular, the *Generation of Animals* seeks to explain such things as why animals and some plants reproduce sexually and why animals resemble their parents.

Aristotle argues in the *Generation of Animals* that menstrual fluid is the matter in animal reproduction. In reproduction the menstrual fluid is the patient (in the sense of what is passive) and the male's *sperma* is the agent (what is active). On a traditional understanding of matter in Aristotle, it is crucial that it remain through a change. This causes a *prima facie* problem, since the menstrual fluid does not remain through the generation of an animal.⁹ There is no menstrual fluid in the newborn animal. The solution, I suggest, is that while Aristotle sometimes describes matter as remaining, that is not essential to his notion of matter. Just as the agent of a change may remain through the change, but this is not what makes something the agent, so the matter may remain through the change, but this is not what makes it the matter. Although this is controversial, I would argue that it fits naturally with Aristotle's account of matter in *Physics* I and II and *Generation and Corruption* I.¹⁰ Aristotle says in *Physics* 1.7 and 1.9 that things come to be from matter not by virtue of concurrence (*mê kata sumbebêkos*) (190b23–30, 192a31–32). Just as a doctor heals because she is a doctor, not because she happens to be a lyre player, so things come to be from matter because it is matter, not because it concurs with something else. Aristotle says in *Generation and Corruption* 1.7 that matter insofar as it is matter is passive (324b18). Matter should be understood in terms of this role in change, being the patient that undergoes the change. Thus, the menstrual fluid, as matter, is the sort of thing that is properly suited to become an animal. Not just anything can become an animal. Just as you cannot build a house out of just anything, or make an axe out of just anything, so also – in fact, to a much greater degree – you cannot make an animal out of just anything. An animal of a given species comes from the appropriate kind of menstrual fluid acted on by the appropriate kind of *sperma*. Since it is the patient of the change, the change happens within the menstrual fluid.¹¹ As long as we take matter to be what is suitable for undergoing a change, it does not pose a problem that the menstrual fluid does not remain. There is nothing suitable for

becoming an animal at the end of the change, and so the matter does not remain.

If an interpreter is strongly committed to matter remaining through change, he or she might suppose that Aristotle must not really think that the matter is the menstrual fluid, precisely because it does not remain. But that comes at a large cost. What is powerful about Aristotle's account is that it identifies precisely the thing that is suitable for undergoing the change, and that is the menstrual fluid. That is what has the potentiality to become a fully formed organism (if properly acted upon by the *sperma*), not something else. The search for something that remains draws us away from the thing with the potential to undergo the change. Aristotle thinks that matter is a principle and a cause because it is needed to explain why changes happen; thus, it is important that we identify it as the thing with the relevant explanatory role: the menstrual fluid. Of course, merely identifying it as the menstrual fluid is not enough. If one left it there, Aristotle's view might seem open to the early modern criticism of Aristotelianism that it identifies the cause of sleep as 'dormative virtue' without explaining how wine, for example, accomplishes this effect. But Aristotle does discuss in detail in the *Generation of Animals* how menstrual fluid and *sperma*, together, bring about the formation of an animal (see esp. *Gen. an.* 1.18–23, 4.1–3). Identifying menstrual fluid as matter does not end the explanation; it identifies what plays a certain explanatory role, which then should be investigated in further detail. On Aristotle's account, menstrual fluid and *sperma* are concocted in the parents' bodies in such a way that, among other things, they have changes in their heat and coolness. These are used as tools in the production of the offspring.¹²

Matter's passivity does not mean that it is dormant or featureless. Aristotle thinks the patient in a change plays a crucial role in explaining how and why a given change happens in the way that it does. This is why Aristotle thinks we must identify the matter in a change if we want to understand the change. Sometimes interpreters talk of menstrual fluid and similar highly developed matter as 'informed' matter, suggesting that the matter's development is to be understood in terms of the contribution of form rather than that of matter.¹³ But it is a mistake to think that form and matter are opposed to each other in this way. It is precisely because the menstrual fluid has these highly developed features that it is qualified to be matter: only it is suitable for becoming

an animal, and in fact only the right sort of menstrual fluid for a given kind of animal. Since the menstrual fluid has a definition, it has a form, but this form is not something distinct and added to matter. On the contrary, without its form the menstrual fluid would not be suitable to undergo the relevant change, and so would not be matter. The menstrual fluid is in no way dormant or featureless, and if it became so, it could no longer be the matter for this change. Aristotelian matter is never a generic or featureless stuff; it is always something suitable to undergo some specific change or changes.

The menstrual fluid is matter for a substantial change, whereas blood, according to Aristotle in the *Parts of Animals*, is the matter for nourishment and growth.¹⁴ Nonetheless, it works in fundamentally the same way, which is to be expected since nourishment and growth are, on Aristotle's account, types of coming-to-be (*Gen. corr.* 1.5) and menstrual fluid is a concocted form of blood (*Gen. an.* 1.19). When blood nourishes bone, there is no reason to think that the blood remains. Nonetheless, blood is, precisely speaking, the matter because it is the thing suitable to become the parts of the body. The parts of the body are sustained by blood insofar as it is blood, just as the animal comes to be from the menstrual fluid insofar as it is menstrual fluid.

THE BODY OF AN ORGANISM AS MATTER IN THE *DE ANIMA*

Next, let us consider the body as the matter of a living organism, which is introduced in *De anima* (On the Soul) 2.1. The soul, for Aristotle, is the principle of life, and so it plays an important role not only in his work devoted to the soul, but also in works that we would consider biological: the *Generation of Animals* and the works known as the *Parva Naturalia*, which discuss phenomena that are 'common to body and soul'. Aristotle thinks that living things are composed of body and soul. The body does not have some single change that it is clearly suited to undergo, unlike the menstrual fluid. Given this, many scholars have suggested that the body is identified as matter because it is what the living thing is composed of.¹⁵ This relies on a very different criterion for something to count as matter, one not directly connected to change. I'll argue here, instead, that the body is matter because it is suitable for undergoing the various changes (*kinêseis*) that are characteristic of the living thing. An organism's body is what undergoes its natural changes, and so it is its matter.

Near the beginning of *De anima* 2.1, Aristotle declares his view, that the soul is substance as form and the body substance as matter, and the thing composed of each is also a substance (412a15–21). He then says that the soul is ‘the first actuality of a natural body that has life potentially’ (412a27–28).¹⁶ Thus, the matter, namely the body, is something that has life potentially. In the next chapter, 2.2, Aristotle says that life is ‘said in many ways’; reason, perception, locomotion and rest, and change (*kinesis*) related to nourishment, growth, and decay are all forms of life (413a22–25). Thus, we would expect the body to be matter that has the potential for these activities. And this turns out to be basically correct.¹⁷

The body and soul together compose the living thing; they are, respectively, what has the potentiality for life and its first actuality. We will examine this notion of potentiality and actuality shortly. First, we need to consider the division of labour, according to which some features of the organism are due to the soul and others to the body. What features of an organism is each responsible for? Aristotle’s view is that a soul, insofar as it is a soul, does not change.¹⁸ Instead, the changes happen in the body, insofar as it is a body. After distinguishing the soul’s coincidental changes from the body’s non-coincidental changes (406a16–20), Aristotle says that ‘it is evident that it [the soul] changes the body’ (406a30), and that the soul is thereby coincidentally changed (406a30–b3). This does not merely apply to locomotion. Living things could not digest without the soul, but the soul does not change when we digest something; the body does, in virtue of the soul. The body is what is receptive of health; health and such things reside in the body, which is disposed to receive health (414a4–14). An animal’s body changes incidentally when it is blown over by a wind, but it changes insofar as it is a body when it is changed by the soul. Of course, the organism undergoes change when the body does, but it does so insofar as the body changes. There is a complicated question of whether the very same types of activities that are attributed to the whole organism should also be attributed to the body.¹⁹ But, regardless of how we decide this, a living thing is changed in virtue of its body changing; its body is the thing suitable for changing. Whenever a living thing undergoes a change, it does so insofar as it is a body, i.e. matter. This overall picture fits with Aristotle’s claim in 2.1 that the type of body that has a soul is ‘organic’ (412a28–b1). As Stephen Menn has argued, to call the body organic (*organikon*) is to say that it is a tool (*organon*) of the soul, the instrument by which the soul produces its characteristic activities.²⁰ Tools change when a

craftsperson is active. Aristotle's view is that, in fact, the craft itself does not change. In a parallel way, the soul does not change insofar as it is a soul, whereas the body does.

The next step in understanding Aristotle's account of the body is to understand his claim that the body is a potential being (*dunameion*, 413a2) and the soul an actuality (*entelecheia*, *energeia*).²¹ Aristotle distinguishes between two types of potentiality in the *De anima* 2.1 and 2.5. His standard example is that a person who does not know something, say mathematics, has a first potentiality for mathematics. A rock, by contrast, does not have this potentiality. Once someone learns mathematics, she removes a privation, her ignorance, and now possesses a first actuality. This first actuality can at the same time be described as a second potentiality. This person has this first actuality/second potentiality even if she is asleep; if she actively thinks about some mathematics, e.g. the Pythagorean theorem, this exercise of the second potentiality is the second actuality. Aristotle says that the soul is a first actuality, which would make the body's potentiality a first potentiality.²² The activity of living is the second actuality, the exercise of the soul.

How do we fit together these two ideas about the soul's relation to the body: (1) the soul is what produces changes and the body is what is changed, and (2) the soul is first actuality and the body has the corresponding first potentiality? While we can reconcile the two descriptions of the soul by saying that it does not change (*kinein*) but rather simply becomes active (*energeia*), that does not explain why the very same thing, the body, has these two roles, being what is changed and what has the potentiality that corresponds to the soul's actuality. Aristotle thinks that in other cases these roles do not go together: when a carpenter exercises her ability, a change happens in the wood, not in the carpenter herself, even though she is what has the first potentiality for being a carpenter. To explain why these two roles come together in the body, consider, as a parallel case, the ability to dance. This ability is a first actuality. In order to develop this ability, one needs a first potentiality that includes the capacity to move one's limbs. The ability to dance uses this capacity, thereby producing changes in one's own body – not in someone else's. The soul, for Aristotle, is like the ability to dance. An organism's soul is able to use the organism's own capacities in specific ways.²³ The body is the part of the organism that has these capacities and so it is changed when they are exercised. The

body's capacities can only be exercised by the organism that has them. Thus, the body has these two roles, both what is changed and what has the first potentiality, because its potentiality is for this sort of self-reflexive change where an organism changes itself. When my potential for being a carpenter is fully realised, I can produce changes in wood, whereas when my arm's potential for moving is fully realised, I can produce changes in my arm. That is the sort of potential my arm, and in general, my body has. The body is the matter of this specific sort of self-motion.²⁴

It is important not to overextend the analogy between the soul, on the one hand, and crafts and abilities, on the other. In particular, many people have the first potentiality to dance without having the ability to do so. But, according to Aristotle, the body is a potential being that cannot exist without the actuality, i.e. the soul. The body comes to be with the soul, and when we die or a limb is cut off, this is a body or limb in name only, not actually one.²⁵ If you think of matter primarily in terms of what remains through a substantial change, this raises a puzzle, which J. L. Ackrill develops in a classic article: the body does not exist before or after the soul, and so it seems that the matter does not remain longer than the form.²⁶ But again, if we think of matter as what is suitable to undergo change, rather than as what remains through a change, no puzzle arises. When a hand is cut off, what is left is not suitable for grasping; it cannot change in the ways characteristic of a hand. And when an animal dies, its body is not suitable for living in the way characteristic of an animal. It is because of the soul that the body is able to change in the way that it does, and so without the soul it no longer has the potentiality to change, and hence is a body in name only.

On Aristotle's account, the body can only be understood in terms of the activities it engages in, as determined by the soul; the soul needs the body to perform these activities. Aristotle brings out this close interrelation between body and soul at the end of *De anima* 2.2, when he argues against views that allow any soul to be in any body. This would include Plato's account of reincarnation in the *Phaedo*, *Phaedrus*, *Republic*, and *Timaeus*, where humans can reincarnate into animals. Here is how Aristotle puts his view:

For it [the soul] is not a body, but is something belonging to a body; and because of this it is present in a body, and in a body of this

sort – not as our predecessors supposed when they fitted the soul into the body without additionally specifying in which body or in which sort, even though it appears that whatever happens to show up does not receive whatever it happens upon. It happens rather in this way, in conformity with reason: the actuality of each thing comes about naturally in what has it in potentiality, that is, in its appropriate matter.

(Arist. *De an.* 2.2.414a20–27)

There is an appropriate type of matter for each type of soul, and this is the body for that soul. What makes it appropriate is that it has the potentiality that corresponds to a given type of soul. Thus, the body has the potentiality of sight, or of hunting down rabbits, or whatever is appropriate for the type of living being it is. A wolf's soul could not be in a sheep's body. What makes a wolf's body appropriate is precisely that it can undergo the changes characteristic of wolves. If it sounds like the body and soul are almost two sides of the same coin, that is a welcome conclusion for Aristotle. He thinks that once we see that soul relates to body as form to matter, we do not need to enquire into the unity of body and soul (412b6–9). Together they form a tightly unified substance.²⁷

When Aristotle says that the body is matter, he is saying that it is the right sort of thing to undergo a whole range of changes, those characteristic of the organism in question.²⁸ When an animal goes from hungry to full, or from here to there, or from tired to awake, it is the body, insofar as it is a body, that undergoes this change. This case is unlike menstrual fluid, which is properly suited to just one change. Nonetheless, the basic account of matter is the same in the *De anima* and in the *Generation of Animals*. Matter, in general, is what is properly suited to undergo change. Matter changes insofar as it is matter. Different sorts of things undergo different sorts of changes, so there are different kinds of matter. The body is matter because the soul produces in it a wide range of changes, which together constitute the life of the organism. The body can be identified as *the* matter of an organism because an organism is defined in terms of its way of life, and the body is the matter for this activity.

THE MATTER FOR ELEMENTAL TRANSFORMATION

Last, let us consider the matter involved in the transformation of the elements into one another. Aristotle agrees with Empedocles that there

are four elements (at least within the sublunary sphere): earth, air, fire, and water. He discusses them in a number of places in the corpus, in most detail in *De caelo* (On the Heavens) 3 and 4, *Meteorology* 4, and *Generation and Corruption* 2. *Generation and Corruption* 2 is his most extensive discussion of their transformation, so we will focus on it here. Aristotle clearly is committed to there being matter in this transformation, but it is controversial how to understand it. The traditional view is that he is committed to something called 'prime matter', which is pure potentiality, not actually anything, and which remains through the transformation of the elements.²⁹ This is generally treated as something that remains through all changes, not simply elemental transformation, and which has the potentiality to become anything. It is thought of as 'pure' matter, as opposed to informed matter, which is thought of as matter combined with some form. It is easy to see how this notion of matter could naturally lead one to think of matter as featureless stuff.

Let me briefly lay out my alternative before providing evidence for it. Aristotle thinks that there are several broad types of change; one type, substantial change, involves a substance coming-to-be, and another type, alteration, involves a change between affections that are strict contraries (not mere contradictories). In Aristotle's natural works, he considers the elements substances (e.g. *Physics* 2.1.192b8–13 and *De caelo* 3.1298a29–b1), and so, as we would expect, he says that the transformation of one element into another is a type of substantial change (*Gen. corr.* 1.4.319b14–21).³⁰ I argue that, nonetheless, elemental transformation works the way that alterations work. Although the elements do not themselves have contraries (as would be needed for an alteration), they are each essentially characterised by two strict contraries from among the pairs: hot/cold and wet/dry. Because of this, a change between the elements works the same way as an alteration, and so the sort of matter involved in the transformation of the elements is the sort needed for an alteration. Aristotle argues that in an alteration there is a single matter that is able to take on both the contraries, the one at the beginning and the one at the end of the change. When changing from hot to cold or from wet to dry, there is the same sort of matter at the end as there is at the beginning, because the sort of thing suitable for becoming hot is exactly the same as the sort suitable for becoming cold. Since elemental transformations simply involve changing whether an element is hot or cold or whether it is wet or dry, all of the elements will have the same matter for their elemental transformations. But we

should not think that this matter is a pure potentiality to become anything; instead, it is simply a potential to become hot or cold, wet or dry. And we should not think that this sort of matter is involved in every change; instead, this matter is precisely suited to elemental transformation and so only involved in it and related changes.

Let us turn to the evidence for this interpretation, filling it out in the process. Aristotle's fullest description of this matter is in a very difficult passage in *Generation and Corruption* 2.1:

Our own theory is that whereas there is a sort of matter of the perceptible things, this is not separable but is always with a contrariety, from which the things called 'elements' come to be. A more precise account of them has been given elsewhere.³¹ However, since according to the present approach too [in addition to that of the *Timaeus*, which he has just been discussing] the primary bodies are from the matter, we must give an account of these too, regarding as a principle and first the matter that on the one hand is inseparable but on the other hand underlies the contraries (for neither is the hot matter for the cold nor the latter for the hot, but the underlying thing is matter for both); so first that which is potentially perceptible body is principle, and secondly the contrarieties [I mean, for example, heat and cold], and then thirdly fire and water and the like. For these change into one another, and it is not as Empedocles and others say (for there would be no alteration); but the contrarieties do not change.

(Arist. *Gen. corr.* 2.1.329a24–b3)³²

Aristotle is clear at the beginning that there is a matter from which the elements come-to-be. (He calls them 'the things called "elements"' in order not to endorse that they really are elements. Calling them 'elements' suggests they are the simplest things, but it turns out that they are composed of matter and contrarieties.)³³ What is this matter for the generation of the elements? Aristotle says that it 'underlies the contraries' and that it is 'perceptible body in potentiality'. In the next chapter he identifies the contraries as the essential features that differentiate each element from the others, making each the element that it is. An element is differentiated by possessing contraries from among the pairs hot/cold and wet/dry: fire is hot and dry, air is hot and wet, water is cold and wet, earth is cold and dry. Aristotle is saying that the matter for the elements underlies the contraries, which turn out to be hot/cold and wet/dry.

In the passage, Aristotle prioritises and contrasts the matter with the contraries: 'so first that which is potentially perceptible body [i.e. matter] is principle, and secondly the contraries' (329a32–34). This is connected to the previous clause, where he says that the matter underlies the contraries and that it is a principle and first. This speaks against the suggestion that Montgomery Furth and Mary Louise Gill have developed that a contrary from one pair (e.g. hot or cold) can serve as the matter for a transformation between the other contraries (e.g. from wet to dry).³⁴ Aristotle here contrasts matter with the contraries and prioritises it over them; thus, matter cannot be the same as one of them.³⁵ Moreover, the Furth–Gill interpretation runs into a problem with something Aristotle reminds us of at the end of the passage: that the contraries do not change. This recalls Aristotle's first argument in *Physics* 1.6 for needing an underlying thing (189a20–27). Contraries are not the sort of thing to undergo change; we need a third thing to change, which he identifies in *Physics* 1.7 as the matter, with a reference back to this 1.6 argument (190b23–33).³⁶ Just as the soul, insofar as it is a soul, does not undergo change, so too contraries, insofar as they are contraries, do not change. To put it somewhat differently, the contraries themselves do not have a potential to undergo change, and that is precisely what is required of matter. Furth and Gill's suggestion is driven by the thought that matter must remain through the change. But even if we accept this, Aristotle requires matter to do something else: it must be suitable for undergoing a given change. And neither hot nor cold is suitable for becoming wet or dry. Again, the focus on finding something that remains has drawn interpreters away from identifying matter as something with the appropriate potentiality. Furth and Gill are explicitly motivated by trying to avoid positing prime matter. My account offers another way to do that.

One of Aristotle's central claims is that this matter that underlies the contraries is the same in different elements. In the passage quoted above, he says that the underlying thing is the matter for *both* of the contraries. We see a similar thought in *Gen. corr.* 2.7:³⁷

The sort of thing I mean is that water can come to be from fire, and fire from this, since there is something in common, the underlying thing.

(Arist. *Gen. corr.* 2.7.334a23–25)

Aristotle says that there is an underlying thing in common between fire and water. It might seem that this is supposed to follow from the fact that water can come from fire. This sort of reading might lead you to think that matter always remains through every change, which, in turn, would mean that some matter must remain in the case of animal generation. But note that in the above passage Aristotle is explaining not merely why water can come from fire, but also why fire can come from water. His explanation for this reciprocal relationship is that they have an underlying thing in common. By contrast, while menstrual fluid can transform into an animal, an animal cannot transform into menstrual fluid.³⁸ The fact that elements have common matter is what explains their ability to reciprocally transform, which cannot happen in animal generation. Hence, this passage gives us no reason to expect a common matter in other types of generation.³⁹

Fire and water have a matter in common because of the specifics of how the elements transform into one another. The elements are transformed by changing which contraries they have from among the pairs hot/cold and wet/dry. The matter for the elements is the thing that underlies these primary contraries. Normally, for Aristotle a change between (strict) contraries is a form of alteration. So it is worth considering Aristotle's account of what underlies in cases of alteration, which he discusses in *On Generation and Corruption* 1.6:

What is more, it is impossible for there to be alteration, or segregation and aggregation, unless there is something which acts and something which is affected. For, those who posit several elements make them come to be by their acting upon and being affected by one another, and equally those who make them come to be from a single element cannot avoid speaking of action. And Diogenes is right to say that if it were not the case that everything is from a single thing, there would not be any acting upon or being affected by one another, e.g. what is hot being cooled, and vice versa – for heat and cold do not change into each other. What changes is clearly the underlying thing; so objects between which there is action and passion necessarily have a single underlying nature. But it is not true to say that everything is of this kind, but only those things which affect one another.

(Arist. *Gen. corr.* 1.6.322b9–21)

Alteration requires acting and being affected. And when one thing acts on another, the other acts back on it. Aristotle thinks that whenever a

thing is affected it becomes like the thing acting on it. He uses as his example heat and cold, which, as we have seen, turn out to be differentiae of the elements. A cold thing becomes hotter when a hot thing acts on it, and the hot thing in turn becomes colder. Aristotle says that there must be the same underlying nature shared between hot and cold things in order for them to be able to affect one another. Intuitively, this makes sense. The sort of thing that is hot is the same as the sort of thing that is cold, and this is why hot and cold things can be affected by one another. In general, changes between strict contraries are changes between things that share an underlying nature.⁴⁰ Normally, such a change is simply a case of alteration. But in the special case of the elements, it is a substantial change between things with the same underlying nature, since the elements are substances differentiated by strict contraries.⁴¹

We can now return and provide a fuller answer to why there is not a common nature in the case of the generation of animals. The basic reason is that animals are not differentiated by contraries; thus, the matter for the creation of an animal is not the matter for a contrary. But why not think there is a common nature in all cases, rather than only in those between contraries? This is because the right sort of thing to become hot is something that has the same nature as the things that *are* hot. But the right sort of thing to become a rabbit is not something that has the same nature as the things that are rabbits. Rabbits only come from something suitable for becoming a rabbit, and making this is a complicated biological process. You cannot just take a rabbit, turn it into something else, and then directly make another rabbit out of that. By contrast, you can take something that is hot, chill it, and then make it hot again. This is why Aristotle says in the first passage quoted in this section, from *Gen. corr.* 2.1, that the matter 'underlies the contraries', without in any way restricting it to being a matter for *becoming* something new.⁴²

Why should we think of the elements as having a single matter, rather than two matters, given that the ability to become hot or cold seems independent of the ability to become wet or dry? By the same token, one might worry that we should not think of the elements themselves as having a unified nature, given that they are defined in terms of being hot or cold as well as wet or dry.⁴³ The answer, I suggest, is that Aristotle thinks of these pairs of contraries as two aspects that together form a whole. Aristotle argues in *Gen. corr.* 2.2 that these two pairs are the fundamental features that make something tangible.

Something cannot be wet or dry on its own; it must be paired with hot or cold. Once we see hot/cold and wet/dry as the two basic dimensions of being tangible, we can see why Aristotle would think the nature of each element is unified – each is tangible in a fundamentally different way. The matter of the elements is unified, in turn, as the potentiality for being tangible. This is why Aristotle refers to the matter of the elements, in the *Gen. corr.* 2.1 passage quoted above, as ‘the matter of perceptible bodies’. This is not an accidental formulation – it is the matter of perceptible bodies *qua* perceptible bodies. The most fundamental form of being perceptible is being tangible (*Gen. corr.* 2.2, *De an.* 2.2), so the matter of perceptible bodies is the matter that is able to take on any of the basic ways in which something can be tangible.

We have seen why Aristotle thinks that all four elements have the same matter. This means, at a minimum, that there is the same type of matter at the beginning of an elemental transformation as there is at the end. Does it also mean that the same token matter remains through the change? In other words, is the matter at the beginning numerically identical with that at the end? Aristotle does not seem to say anything one way or another that would directly commit him to its being the same token matter.⁴⁴ In general, he does not seem very concerned with such individuation questions in *Generation and Corruption*, although commentators are often extremely interested in this. To the extent that Aristotle thinks that only actual substances can be described as ‘a this’ (*tode ti*) and to the extent that what we individuate are this’s, he should not think that the matter is the sort of thing that would remain. More importantly, even if he does think that it remains, this would not be because it is essential to matter that it remain, but rather because of some specific feature of the change in question.⁴⁵ There is nothing about his basic notion of matter that requires the matter for the elements to remain.

There is one important way in which the matter for the elements is different from other types of matter. Whereas the menstrual fluid and the body have independent, actual features insofar as they are matter, the matter of the elements does not seem to have any independent, actual features of its own. The menstrual fluid has certain actual features that partially ground its potential for reproduction (e.g. a certain temperature) and the eagle’s body has certain actual features that partially ground its potential to fly (e.g. large wings). By contrast, Aristotle does not suggest that the matter of the elements has any actual features, and there are good reasons for him not to attribute any

to it. Aristotle thinks that each element has actual features and from this we can tell that it has potential features. Anything that is hot and wet is able to be hot and wet and so also able to be cold and dry. Hot/cold and wet/dry are the most basic features of being a body, and so no other actual features could be metaphysically prior to them. If the potential to be hot/cold and wet/dry were explained by some prior, actual feature, this feature would, in turn, be prior to hot, cold, wet, and dry. But that contradicts them being the most basic features, so the potential to be hot/cold or wet/dry must not be grounded in some prior, actual feature. It is a brute potential that the elements have. We can refer to each element insofar as it has this potential to be tangible body. When we do so, we refer to it as matter.⁴⁶ This is parallel to the way that a living thing undergoes changes insofar as it is a body, i.e. matter. But, unlike a body, the matter of the elements has a pure potentiality and so to this extent there is something right about the traditional notion of prime matter. Unlike other types of matter, the matter of the elements has a potentiality that is not grounded in any actuality. But, unlike prime matter, the matter of the elements cannot become anything whatsoever, only tangible body. And unlike prime matter, it is not crucial that it remain through change.

While interpreters do not typically explain why they actively try to avoid the prime matter interpretation, we can see why they would. It seems to involve a sort of metaphysically extravagant, magical thinking: the idea that there is something that is actually nothing, but potentially everything, which remains through every change. The interpretation I've offered is not metaphysically extravagant in this way. One might think that every ability is grounded – at least in part – in some metaphysically prior, actual feature, the way that glass's ability to break is grounded in the actual molecular structure of glass. But it is not clear that every ability is grounded in this way. My suggestion is that Aristotle thinks that the elements' potential to be a perceptible body is not due to some prior, actual feature of the elements. Contemporary physics suggests that the ability to be hot/cold and wet/dry is at least partially due to more basic molecular features. But it is not clear that in contemporary physics every potentiality must be grounded in prior actual features. For example, is there some actual feature of electrons that gives them the potential to move from one atom to another? Or is this a brute potentiality that electrons have, not grounded in some prior actual feature? If we supposed that this is a brute fact about them, that would not make this ability spooky or metaphysically extravagant.

Similarly, the matter of the elements, according to Aristotle, has a brute potentiality, an ability to be any of the four basic types of tangible body, and this is not grounded in some more basic feature that they have. There is nothing spooky about this.⁴⁷

CONCLUSION

Aristotle thinks that a fundamental feature of the natural world is that the things in it change. Thus, if we want to understand things in the natural world, we need to understand their changes. In order to understand a change, we need to grasp what is suitable to undergo this change. To grasp something in this way is to consider it as matter. Given that different things are suitable for different types of changes, there will be different types of matter, and the features of these types of matter will differ depending on the change in question. An animal's menstrual fluid is very different from its body, which is very different from fire and water insofar as they can become cold or dry. Nonetheless, Aristotle's notion of matter is fundamentally the same across a variety of scientific contexts: it is a thing insofar as it is able to undergo a given change. Examining Aristotle's scientific works helps us understand how he thinks of different sorts of matter, that is, how he thinks about the things suitable for undergoing different natural changes.

NOTES

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- 1 Only the *De anima* (On the Soul) is controversial. Shields 2016, for example, has recently argued that some parts of the work should be considered first philosophy (i.e. metaphysics) rather than natural philosophy. The parts I discuss here are uncontroversially natural philosophy.
- 2 For an introduction to interesting issues in Aristotle's biology, I suggest Gotthelf 2012a.
- 3 This chapter focuses on Aristotle's natural philosophy, occasionally referring to his *Metaphysics* but without relying on this work. It is often difficult to determine the dialectical structure of the *Metaphysics*, and there are questions about how to understand it as a science distinct from natural philosophy. My approach here is to provide an account of matter in the natural works, taken on their own; we can then ask how this relates to Aristotle's account of matter in the *Metaphysics*.

- I think we should keep open the possibility that Aristotle operates with a broader notion of matter in parts of the *Metaphysics* than he does in his natural works.
- 4 In *Generation and Corruption*, Aristotle says that ‘what is most strictly matter is the substratum receptive of generation and corruption; but, in a way, so is that of other changes, since all substrata are receptive of contrarieties of one sort or another’ (320a2–5, Williams trans.). Cf., *Metaph.* 7.1.1042a32–1042b3, and 11.2.1069b9–20. Just as Aristotle is frequently interested in power (*dunamis*) not merely in the ‘most strict’ (*malista kuriôs*) sense (cf. *Metaph.* 8.1), so also he is frequently interested in matter not merely in the most strict sense. Aristotle discusses the matter of place (which is what allows the stars to move) in *Metaph.* 7.1.1042a32–1042b6, 7.4.1044b6–8; 8.8.1050b20–24, 11.2.1069b24–26.
 - 5 The first article was King 1956. The debate was at its most intense in the 1970s. For recent discussions, see Krizan 2013 (with useful bibliography) and Henry 2015, 2019.
 - 6 Ultimately, I think this notion is deployed throughout Aristotle’s natural philosophical works, but here I limit my claims to these three treatises. It would be interesting if there are exceptions, given the broad coherence of his notion across his natural philosophy.
 - 7 I argue that this is the notion of matter in *Physics* 1 in Ebrey 2007 and Ebrey unpublished.
 - 8 The classic defence of this view is Lennox 1987.
 - 9 For a classic statement of this problem, see Charlton 1970, 76–7.
 - 10 I argue for this at length in Ebrey 2007 and Ebrey unpublished. Henry (2015, 2019) also closely considers *Physics* 1 and *Generation and Corruption* 1 and argues that matter need not remain through change.
 - 11 This is argued for in Gelber 2010. See *Physics* 3.3 for the general view that changes happen within the patient.
 - 12 For a complementary account, which discusses the role of these motions at much more length, see Gelber 2010, especially section 6.
 - 13 For a classic statement, see Peck 1942, xii–xiii.
 - 14 For a discussion of blood as matter in the *Parts of Animals*, see Ebrey 2015.
 - 15 E.g. Charlton 1970 (esp. 73); Ackrill 1972/3; Shields 2016 (esp. xvii–xxviii).
 - 16 All *De anima* translations from Shields 2016.
 - 17 The exception is reason (*nous*). See note 28.
 - 18 This is emphasised in *De anima* 1.3–I.5; see especially 406a2, 408b30–31, 411a24–26. For a general discussion of the importance of this for Aristotle’s conception of the soul, see Menn 2002.
 - 19 Those who think that strictly the organism engages in its characteristic activities, but not the body, include Barnes 1971/2, 103 and Menn 2002, 100–1. Before discussing the textual support for this, suppose it is correct. If so, then (as Menn says) these activities would happen in virtue of changes within the body (except in cases of pure contemplation). The parallel with the craftsman is instructive. When a builder builds a house her hammer changes, and not coincidentally. At the same time, the builder builds the house, not her tools. This is because the builder is the unchanging efficient cause of the change (cf., 416a34–b3). The builder’s body changes because of her soul; thereby, the whole builder changes. When we attribute a change to an entire organism, we are crediting its soul, as

- form and efficient cause, as well as its body, as matter. The main passage cited for thinking the whole organism engages in its activities, not the body, is in *De an.* 1.4 (408b11–16). Note that Aristotle does not mention the body here at all; he simply says that it is better to say that the human pities or learns or thinks than that the soul does. For a thoughtful discussion of what we can conclude from this passage, see Lorenz 2007, 215–19.
- 20 Menn 2002, 108–12.
- 21 It is very tricky to translate these terms. *Dunamis* is sometimes translated ‘capacity’, sometimes ‘ability’, sometimes ‘potentiality’. I have chosen the traditional ‘potentiality’ here because it seems to bridge cases that we would call a capacity, those we would call an ability, and those that seem broader than a single ability. The downside is that this term seems more abstract and theoretical, whereas the word itself is ordinary Greek. I take Aristotle to use *entelecheia* and *energeia* interchangeably in the *De anima* 2.1 and 2.5 (e.g. 412a26–27), although they may have slightly different emphases. Sometimes they refer to activities or changes, at other times to things that are not changing. I have translated them as ‘actuality’, although this downplays their connection to change. See Beere 2009, 3–5, 169–219 for a clear discussion of these issues and a proposal for how Aristotle understands the single notion of being *energeia* in *Metaphysics* Theta.
- 22 Pace Whiting 1992, 88–9, who takes the body to be a potentiality for the second actuality, which would make the body a first actuality.
- 23 In my view, the soul relates to the body in this self-reflexive way because organisms are natural things, and these have their principle of movement and rest inside of themselves (*Physics* 2.1.192b20–23), whereas artificial things, such as the products of carpentry, do not.
- 24 For a related idea, very briefly expressed, see Frede 1992, 104. Lorenz 2007, esp. 211–19, develops the idea that in sense perception the soul undergoes the change from first to second actuality while the sense organ undergoes an ordinary change, altering the organ.
- 25 E.g. *Gen. corr.* 1.5.321b29–32; *Mete.* 4.12.390a10–12; *De an.* 2.1.412b19–26; *Part. an.* 1.1.640b34–641a34; *Gen. an.* 2.1.734b24–27. For a general discussion of this ‘homonymy principle’ and its relevance to Aristotle’s notion of a body, see Frey 2007, especially section 2.
- 26 Ackrill 1972/3.
- 27 Frey 2015a, esp. 19, argues for a stronger form of unity, which is compatible with the one suggested here.
- 28 There is one exceptions to this, or perhaps two. First, Aristotle thinks that there is no bodily organ for the exercise of reason, although he seems to think that every exercise of reason involves an exercise of imagination, which does have a bodily organ. Second, it is controversial whether the body changes when we perceive. Burnyeat 1992 provocatively claims that there is no physiological change when we perceive. For a recent survey and proposed resolution, see Caston 2005, and for another account, Lorenz 2007. The current scholarly consensus, which I share, is that there is some sort of physiological change in the sense organ, although the exact nature of this is disputed.
- 29 The classic statement is Zeller 1897, 347–8.

- 30 Famously, in *Metaphysics* 6.16 (1040b5–10), Aristotle denies that the elements are genuine substances. But elsewhere in the *Metaphysics*, he says that they are substances (*Metaph.* 4.8.1017b10–14, 6.2.1028b8–13, 7.1.1042a6–12). More importantly, I see no evidence for such doubt in Aristotle's natural philosophy (pace Gill 2009). He routinely puts them in his lists of substances, and treats them as such. Moreover, change between elements is one of his two examples of substantial change in a chapter on this topic, *Gen. corr.* 1.4 (319b14–21). In my view, Aristotle uses a higher standard for being a substance in *Metaphysics* 6.16 than he requires in his natural philosophy. This said, my account can be accepted even if (like Gill 2009) one does not accept that the elements are genuine substances in Aristotle's natural works.
- 31 It is controversial what 'from which' refers back to in the first sentence, and what 'them' and 'elsewhere' refer to in the second sentence. For my purposes this does not matter. For a discussion of the issues, and alternative accounts, see Williams 1982, 154–6; Gill 1989, 244–5; Broadie 2004, 140–2.
- 32 My translation of this passage draws primarily from Broadie 2004, 140, as well as Williams 1982 *ad loc.* and Gill 1989, 244. Other translations of the *Gen. corr.* are from Williams 1982, lightly modified.
- 33 Crowley 2008 argues that we should not translate the phrase 'so-called elements'. I agree as a matter of translation, but think that nonetheless Aristotle's considered view is that strictly they are not elements. Cf., *Timaeus* 48b–c, where Timaeus similarly denies that the things called elements really are such. I take Aristotle in this passage to use 'contrary' and 'contrariety' interchangeably.
- 34 Furth 1988, 221–7; Gill 1989, ch. 2 and appendix. Krizan 2013 distinguishes between a matter that the element is composed of, and a distinct matter that remains through the change. The latter, which she calls the 'material constituent', functions the way that matter does for Furth and Gill. She offers no direct evidence that Aristotle thinks that there are these two sorts of matter. The account I offer here resolves Krizan's puzzles without positing these two different types of matter.
- 35 Gill 1989, 245, suggests that Aristotle means that in a given change, one contrary (e.g. hot) will be matter, which is the prior principle, and contraries from the other spectrum (e.g. wet and dry) will be the 'contraries' that are the second principles. Certainly, the natural reading of the passage is that the matter is distinct from any contraries, and that it underlies them. Aristotle never says that he is restricting his claims to only one pair of contraries. Moreover, he identifies matter simply as 'perceptible body in potentiality'. What counts as 'perceptible body in potentiality' should not change depending on whether a change happens in the hot–cold spectrum or the wet–dry spectrum; thus, the matter should be the same in both cases. Below I discuss why Aristotle calls this matter 'perceptible body in potentiality'.
- 36 Gill 1989 says, 'If for Aristotle the hot and the cold were not the sorts of entity that could serve as the matter for something, his statement is bizarre' (245). To the contrary, his point in *Physics* 1.6 (repeated in 1.7) is precisely that contraries, in general, cannot undergo change, which is why we need matter.
- 37 See also *Gen. corr.* 2.5.332a17–18, where the term 'matter' is used. Aristotle moves back and forth between claims about matter and claims about the underlying

- thing in *Generation and Corruption*, just as he does in *Physics* 1. Sometimes he uses ‘underlying thing’ as a broader term that encompasses more than just matter.
- 38 Of course, adult female animals sometimes produce menstrual fluid, but such animals are not transformed as a whole in this process.
- 39 Williams 1982’s appendix on prime matter defends the traditional prime matter view by arguing against its opponents. His best evidence is the passages I have cited above where Aristotle notes that we have the same matter, or underlying thing, for contraries. But that does not give us evidence for thinking that this matter is all things potentially, or that it is involved in non-elemental changes. Moreover, I argue below that there is no reason to think that this matter for elemental transformations remains through this change, as opposed to there being a new matter of the same type at the end of the change.
- 40 This also fits very naturally with Aristotle’s account in *Gen. corr.* 1.7, according to which all agents and patients share a genus; this gives them a common nature that allows them to affect one another.
- 41 Note also that this account allows for a natural reading of Aristotle’s claim in *Gen. corr.* 2.4 (331b4) that it is possible to transform from one element to the diametrically opposed element – the one that it shares no contraries with. Aristotle says that this transformation takes longer because it simultaneously changes both contraries. Furth, Gill, Krizan, and those with similar views are forced to argue that the process happens by first changing one of the contraries and then the other. But that is not what Aristotle says, and such interpreters have to try to explain why we should think of this as one difficult change, rather than two ordinary changes. On my account, each element has matter that allows it to become hot–cold and wet–dry. Given this, something could change both of these simultaneously, turning into the diametrically opposed element, but (Aristotle is claiming) that would be harder, because it is harder to change two things at once, rather than one.
- 42 While Broadie 2004 does not identify the matter for the elements in the way that I do, in several ways her account is similar to the one presented here. One important difference is that she argues that each element only has a matter for becoming the other elements, which she thinks in no way underlies the form of the element (see esp. 146–50).
- 43 Krizan 2013 usefully pushes the question of how the elements are unified in the way needed for them to be substances. She addresses the problem by arguing that one of the pair hot/cold or wet/dry serves the form of an element, and the other as the matter. While this solves the problem of not having two forms (e.g. both cold and wet), it does not seem to be sufficient to unify matter and form. In general, Aristotle’s solution to this is to view matter as potentially what form is actually (cf. *De an.* 2.1, *Metaph.* 7.6), and it is not clear how Krizan’s account accomplishes this.
- 44 There is a tricky question of whether *Gen. corr.* 1.4.319b8–18 requires that matter not remain through a substantial change. Broadie 2004 argues that this passage requires that it not remain. If she were right, then there would have to be a new matter at the end of the change of the same kind as the one there beforehand. However, I do not think that the passage requires this. In it Aristotle distinguishes between a change in the underlying thing and one in the affections. Broadie claims

that since the change is in the underlying thing, not an affection, we must think that the entire underlying thing is 'exchanged' (Broadie 2004, 124). But why not think that it is possible that part of the underlying thing stays the same while another part changes? Why must it be exchanged as a whole? In particular, how should we understand it if a substance's differentia changes? That is what happens in the case of the transformation of the elements, e.g. hot is replaced with cold. Given that changing a differentia leads to a substantial change, it seems that such a change should count as the underlying thing changing, not an affection. Thus, this passage is compatible with thinking that part of the underlying thing remains, namely the matter, while another part is 'exchanged', namely the differentia.

- 45 In *Generation and Corruption* 1.4, Aristotle seems to allow that numerically the same affection could remain through a generation, so that when water comes to be from air, the very same transparency could remain from the water to the air (319b21–24). If this is his view, perhaps he would also be happy to think that the very same matter could remain through the change, but then this would not be a special feature of matter.
- 46 In general, I have argued in this chapter that matter undergoes change insofar as it is matter. Here I am making a slightly different claim: that something (in this case the elements) is matter insofar as it undergoes a change. The point is that matter is what (properly speaking) undergoes any given change, just as the efficient cause is what (properly speaking) produces any given change. The elements can undergo a transformation into one another and Aristotle thinks there must be something in virtue of which they are able to do so. Given this, the elements must be able to be considered as matter, since they can undergo change and it is precisely in virtue of being matter that something can do this.
- 47 Vetter 2015 defends a stronger claim in contemporary metaphysics, that potentiality is a 'primitive or basic notion' that is not reduced to anything else (see, e.g., the introduction, 2–3). I am only claiming that it is reasonable to think of the most basic potentialities as not reducible to anything else.