

CHAPTER 2

The 'matter' of sleep

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Matter, metaphysics and the causes of natural things

Metaphysics H4 starts with a discussion of material substance (οὐσία ὑλική), and the matter that is appropriate for each kind of thing (οἰκεία ἐκάστου), and ends with a discussion of things that do not even have matter, but have something else instead. Sleep belongs to the latter group, and is brought in at the end of a section of text in which Aristotle talks about the correct way to inquire into the causes of natural things. Before looking specifically into the matter, or matter-analogue, for sleep, we should first consider the context within which that topic comes up.

For Aristotle, sleep is something that exists by nature, but is not a substance. When he discusses the right way to state causes for items of this sort in *Metaphysics* H4 he says that they do not have matter. They do, however, have a cause that plays an analogous role, and he goes on to say what this is and how it is connected with two other types of cause. There are a number of reasons that this is important. One is that there are scholarly controversies about Aristotle's views on the material cause of sleep in the *de Somno*, and anger in *de Anima* 1.1, and more generally about the material cause for the attributes he classifies as common to body and soul.¹ I will touch on this briefly below, since the passage in *Metaphysics* H4 that expresses a view about the causes of such things, including the cause that corresponds to the matter of a generable substance, puts constraints on possible candidates for that role. However, it is by no means obvious how a hylomorphic natural science should analyze or explain natural entities that are not themselves composite substances, but rather are the attributes of these substances. Fortunately, this passage in the *Metaphysics* provides a principled perspective as to how this is to be done.

¹ For Aristotle's use of this phrase in connection with sleep see Morel 2006.

The general methodological remarks about the proper statement of causes are introduced immediately after he has given some examples of various kinds of matter, and examples that relate something's matter to an efficient cause. These examples illustrate ways in which the appropriate matter for X is located within a larger network of causes. First, he uses some examples to show how the appropriate matter for X is the proximate matter for X (what he will go on to describe as a '*nearest*' cause for the thing.)² He does this by giving examples of cases in which there is different proximate matter for different things, as well as by giving examples that illustrate a hierarchical conception of matter that involves both upwards composition and downwards decomposition, followed by upwards composition. Next he brings in a different type of cause, the efficient cause, together with some new examples that illustrate additional constraints on the matter for X.³ This move brings in a further dimension to his discussion of the way in which something is the appropriate matter for X. The matter's suitability for its role is not independent of the efficient cause that brings it about. Considerations concerning what that efficient cause is, or is not, able to produce from various kinds of matter make it evident, among other things, that nothing could be the appropriate matter for X unless an efficient cause could make an X from it.

Although these two factors have different causal roles, these are roles that they do not play independently of each other. The point is not simply that the matter needs something else, an efficient cause, to produce X; nor is the point simply that the efficient cause requires something else, the matter, if it is going to bring about an X. The language of *agency* is used here to talk about the efficient cause being able, or not able, to make something out of something.⁴ For instance, the efficient cause of a saw *produces*, or is *not able to produce*, a saw *from* certain types of matter. A saw could not be produced from matter such as wood or wool. The appropriate matter for a saw is something that is capable of being acted upon by the efficient cause in such a way that a saw is produced out of that matter. These causes are related as agent and patient, and for something to be the matter of X it must be capable of being affected in such a way that an X is made from it, and the efficient cause needs to be capable of acting on that matter in such a way as to bring about that result.⁵

² *Metaph.* H4, 1044a18–25.

³ *Metaph.* H4, 1044a25–32.

⁴ *Metaph.* H4, 1044a29; a30.

⁵ At the end of the chapter, in discussing the causes of sleep, he uses *πρόσχειν* in connection with the item affected by the efficient cause; see *Metaph.* H4, 1044b11, 16, 19.

This is true not of the *remote* efficient or material causes, but rather is a requirement for the '*nearest*,' or proximate causes. The proximate efficient cause cannot be understood in its role *as* the efficient cause to X independently of the proximate matter being understood in its role *as* the material cause of X. The former is a cause by being the *agent* that acts on the matter in such a way as to produce X from it; and the latter is a cause by being the *patient* that is affected by the efficient cause in such a way that X is produced from it. In general, one way of being a cause is to be what acts in that way; the other way of being a cause is to be what is affected in that way. Each of these two items is a proximate cause for X, and each is a cause in a different way, but neither makes its causal contribution independently of the other.

It is at this point, after discussing material substance in connection with the efficient cause, that Aristotle generalizes in a way that brings in whatever other types of causes something might have:

In fact, whenever one inquires into the cause, it is necessary to state all of the possible causes, since causes are spoken of in many ways.⁶

Not only are the material and efficient causes mutually interdependent, but since there are many (i.e., four) ways in which something can be said to be a cause, it is necessary to state *all* of the possible causes. Aristotle proceeds to illustrate this with the example of the causes of a human. In doing so he also goes on to make it clear that the procedure he describes is not simply one for *saying* what the causes of something are, but is also being put forward as the right way to *pursue* causes:

concerning the natural and generable substances, one must go after them in this way if one is to go after them rightly, since the causes are indeed these and this many, and it is necessary to know the causes.⁷

For Aristotle's example of a generable substance, a human, he poses a series of four questions corresponding to each of his four causes: What is the cause as matter (ὥς ὕλη)? What is the cause as what effects change (ὥς κινούν)? What is the cause as the form (ὥς τὸ εἶδος)? And what is the cause as that for the sake of which (ὥς οὗ ἕνεκα)? The first question is itself answered with the question 'is it the menstrual fluid [τὰ καταμήνια]?' The

⁶ *Metaph.* H4, 1044a32–34.

⁷ *Metaph.* H4, 1044b3–5.

second is answered with the question ‘is it the seed [τὸ σπέρμα]?’⁸ The third and fourth questions are answered with the replies ‘essence [τὸ τί ἦν εἶναι],’ and ‘end [τὸ τέλος],’ respectively, followed by the suggestion that perhaps both are the same.

As in the discussion of material substance in the earlier parts of *Metaphysics* H4, here too Aristotle is identifying matter with *that from which something comes to be*. It falls outside of the scope of the present chapter to attempt a full discussion of how this is connected with the general definition(s) of soul in *de Anima* II.1, and how it bears on issues concerning the soul as the form of the body. These passages in *Metaphysics* H4 treat the matter *as that from which something comes to be*, and do not bring in some other conception of the matter of a generable substance according to which the matter exists at all and only those times at which it possesses the form, or soul, of the animal. Furthermore, like his treatment in *Metaphysics* H4, the way Aristotle discusses the matter of an animal in the following chapter continues to treat it as that from which something comes to be. There the matter of an animal is the matter of the corpse that comes into being when the animal perishes.⁹ The purpose of this chapter is not to resolve issues about how to relate the matter of a mature specimen of a kind to the matter for its generation, but simply to explicate the way in which *Metaphysics* H4 discusses the material cause, and to do so with an eye to what it has to say about the way in which sleep has an analogous cause.

When the H4 passage turns to the case of *eternal* natural substances, there is no discussion at all of the efficient, formal or final causes, and the only remarks made concern the material cause:

But in the case of substances that, though natural, are eternal, another treatment [is appropriate]; for perhaps [ἴσως] some do not have matter, or not such [matter], but only [matter] that changes with respect to place.¹⁰

⁸ It is worth pointing out that he does not go on to affirm that the matter is the menstrual fluid. When looking into the question ‘what is the matter?’, an answer such as ‘fire’ or ‘earth’ fails to cite what is ‘nearest,’ and instead one should look for what is distinctive (ἴδιον) (*Metaph.* H4, 1044a33–b3). The menstrual fluid, a concoction of the female’s blood, is distinctive to each type of animal. However, this does not show that menstrual fluid is compatible with the view that what becomes the animal is the matter for both the menstrual fluid (which perishes) and the animal (which comes to be). In the *Generation of Animals* the matter of a blooded animal is said to be in the composition (σύνστασις) of the menses (*GA* 1.19, 727b31–33); alternatively, the nature of the menstrual fluid (*GA* 1.20, 729a32–33). It is what contains all of the parts of the animal in capacity (δυνάμει), though not in actuality (ἐνεργείᾳ) (*GA* II.3, 737a23–24).

⁹ *Metaph.* H5, 1045a1–2. ¹⁰ *Metaph.* H4, 1044b6–8.

The account that one gives of such substances should also cite all of the possible causes, and the most proximate ones at that, but all that we are told here is how the causal account one gives for them will differ from the account of a generable substance in one respect – in whether, and if so how, to cite matter. Perhaps there are *some* natural substances that do not even have matter. This may be leaving open, at least for now, the question as to whether there are *natural* substances that are not only ungenerable, but also not even subject to change at all. For instance, although Aristotle himself would not accept such a view, perhaps there are certain mathematical objects, such as the shapes of heavenly bodies, that exist by nature and also have the ontological status of substances.¹¹ However, for no eternal substance could there be the matter *from which it comes to be*, and so eternal, natural substances do not have the kind of matter that generable substances have. Hence they could not be composites of matter from which they were generated and a form acquired as the completion of their generation. However, heavenly bodies do engage in eternal circular motion, and hence there is at least some way in which such things have matter. They have matter for change of place,¹² but for all that they are not hylomorphic composites in the way that is distinctive of generated substances.

Additionally, Aristotle does not analyze eternal, celestial substances into different functional parts, or parts composed of different materials or mixtures of materials. Regardless of whether this is due to their nature (as he thinks it is), or to limitations in our knowledge of them, or even to both, for heavenly bodies we do not inquire into such causes. This in turn has consequences for the way in which we can seek causes for their motion and other attributes. In particular, although an eternal substance is itself a subject for attributes, we are not able to investigate these attributes in the same way that we ought to investigate the attributes of perishable substances. For perishable substances, often we are able to proceed by identifying the part in virtue of which it has the attribute, as well as a condition that part is in when the substance has the attribute, and additionally an efficient cause for that part's being in that condition. However, this is not the procedure he specifies for the search for the efficient cause of an explicable attribute of an eternal natural substance. Even though, for instance, the matter of a heavenly body is such as to make that body a subject of circular motion, he does not propose that one explains that circular motion by

¹¹ Or perhaps this leaves open (for now) the possibility that the source of change for the outermost heavenly sphere is a natural, though incorporeal and unchangeable, substance.

¹² For which see *Metaph.* H1, 1042b6.

identifying some part or parts out of which the subject is constituted, and some attributes or motions of such parts.

After his remarks about matter, or the lack of it, for eternal natural substances, he then turns to consider the causes of natural non-substances. Here he does assign to both eclipses and sleep a cause that somehow corresponds to the cause ‘as matter’ [ὡς ὕλη]. However, there can be no doubt that he also says that it is *not* matter:

Nor indeed is there matter for those things that exist by nature but are not substances, instead ‘that which underlies’ [τὸ ὑποκείμενον] is substance.¹³

Let us call the cause of sleep that is ‘not matter,’ but is what sleep has instead, its ‘matter-analogue.’ It is in the final section of *Metaphysics* H4 that he discusses the causes of sleep in particular.¹⁴

In the next two sections I consider two questions about this cause, the ‘matter-analogue.’ The first has to do with *why* he says that natural attributes like sleep lack matter; the second has to do with *what a natural attribute like sleep has instead of matter*. Both questions are concerned with the way in which Aristotle’s hylomorphism, as well as his doctrine of ‘four causes,’ handles items that are not material objects. In his ontology there are natural substances of various kinds, as well as attributes of natural substances, and both get explanations within the general hylomorphic framework of natural science.

Why does Aristotle deny that there is matter for natural phenomena such as eclipses and sleep?

We are familiar with many of the attributes that in various ways depend upon generable, natural substances. This includes such things as colors and psychological properties. Just as natural substances themselves have causes of various types, so too their natural attributes have causes. Although metaphysics is not the science that searches for the causes that natural things have insofar as they are natural, it is the discipline that explores more general questions about their causes insofar as they are beings, as well as questions about the mode of being they enjoy. An attribute such as sleep is an integral part of the cognitive and perceptual life of animals. As we are about to see, there is some controversy as to whether at the time Aristotle wrote *Metaphysics* H4 he accepted the view that sleep has

¹³ *Metaph.* H4, 1044b8–9.

¹⁴ *Metaph.* H4, 1044b15–20.

a final cause, and is both necessary and beneficial for the preservation of the animal's life, where its life is both an end and a good. However, unless there is strong evidence that he had rejected such teleological explanations of sleep, which is *prima facie* unlikely given the centrality of teleology in his biological works, this unified structure of purposeful, goal-directed activity could itself be studied by a science of being. Nonetheless, the teleology is not brought up or discussed in *Metaphysics* H4 in connection with natural attributes.

For Aristotle natural science has its own principles, and is the appropriate locus for scientific inquiry into the sensible world. That said, it is also possible to look into the positive results of the causal investigation of nature from the more comprehensive and synoptic perspective of a metaphysical consideration of their mode of being. It is from this more general standpoint that he considers metaphysical questions about the unity of matter and form in *Metaphysics* H, and it is in this text that he also makes the claim that natural attributes do not have matter. As we have already seen, in the case of the eternal natural substances, although he denies that they have matter of the sort that generable substances possess, he nonetheless allows that they have matter in some other way – matter for change of place. Additionally, in the case of natural attributes, his denial that they have matter may not be intended to deny that there is *any* way in which they could be said to have matter.

Attributes, however, unlike celestial bodies, are not the kinds of things that change, so they could not have matter for change of place, or for any other kind of change. By way of contrast with their attributes, material objects themselves are the kinds of things that change in various ways, and with the exception of those that are eternal, they also are the kind of things that both come to be and perish. On the other hand, unlike these material composites that are generated out of some underlying matter, their forms and attributes do not come to be, but rather come to be in something else.¹⁵

This is, in fact, very closely related to the kind of claims he makes about opposites and forms in general in the beginning of *Metaphysics* H5, directly after his discussion of the causes of sleep:

And since some things are and are not without coming to be and passing away, for instance points, if indeed they are, and in general the forms (for what is white does not come to be, but rather the wood [comes to be] white if everything that comes to be comes to be out of something X and [comes to be] something Y) . . .¹⁶

¹⁵ *Metaph.* Z8, 1033b5–16.

¹⁶ *Metaph.* H5, 1044b21–24.

Sleep and wakefulness are also opposites, just as white and dark, and things such as these neither come into being nor pass away. Rather, they either are or are not because of a change in something else. When some wood changes in such a way that it comes to be white, the white color that it comes to possess does not also come into being. It exists when the wood comes to be white, but does so without itself coming to be, but rather because of the way the wood changes.

Speaking quite generally, everything that comes to be comes to be something Y and comes to be out of something X, regardless of whether this is the generation of a substance, or instead some non-substantial change in some substance that already exists. Even in those cases of non-substantial change, there is some item from which something comes to be:

not all opposites [τάναντία] would come to be out of each other, but in different ways a white man [comes to be] from a dark man and white [comes about] from dark. Nor does everything have matter, but [rather] those things of which there is coming to be and that change into one another [have matter]. But those things that are or are not without change, these do not have matter.¹⁷

For the change in question, the something ‘from which’ a white man comes to be is a dark man. He does not identify the matter of a white man with the dark man that perishes when the white man comes to be. However, the man that is first dark, and later white, is a subject for opposites, and plays a role comparable to matter in this change. Even so, the attribute whiteness is not produced out of its matter, nor is a substantial form, nor is any other item that is or is not without itself coming to be or passing away.

There is a way in which the white man and the dark man are opposites,¹⁸ and these items do come to be from and change into each other. However, the attributes whiteness and darkness do not change into each other, and these are items that are or are not without coming to be or passing away. Likewise, sleep and wakefulness are opposites, and they too either are or are not without coming to be or passing away. Since nothing that is or is not without generation and perishing has matter, he takes it that it follows that there is no matter for sleep.

This explains the grounds for his denial that natural attributes have matter. If we were to confine our attention to *Metaphysics* H4–5 there would be no reason to think that there is another way in which such attributes could be said to have matter. Nonetheless, what he is concerned

¹⁷ *Metaph.* H5, 1044b24–29.

¹⁸ See Ross 1924 on 1044b25.

here to deny, both in the case of eternal natural substances and in the case of natural attributes, is mainly that they have matter of the sort found for generable substances. These texts are silent on whether or not the term 'matter' could be applied in some other way to the cause for an attribute that I am calling the 'matter-analogue.'

However, according to *Metaphysics* Λ4 there is a way in which generable items (both natural substances and artifacts) have matter, and their attributes do not, and there is yet another way in which even their attributes have matter:

In one way the causes and principles are different for different things, but in another way, should one speak comprehensively and analogically, they are the same for all.¹⁹

This text goes on to specify what the principles are that are the same for all things. There are three principles that are elements (στοιχεῖα), and a fourth principle that is external and is not an element, and these four are the same by analogy for everything. The elements are form, privation and matter (τὸ εἶδος καὶ ἡ στέρησις καὶ ἡ ὕλη), and the principle that is not an element is the moving, or 'efficient,' cause (τὸ κινεῖν).²⁰ These four principles are the same for each kind, and as we move out of a kind and make cross-kind comparisons, they are still the same, but now the same only by analogy.

All of the items within a kind have the same three elements, but the elements in one kind are different from the elements in a different kind. Not only are the elements of sensible bodies (natural substances) different from the elements of non-substance kinds, but non-substantial kinds themselves also have different elements. To give examples of non-substances in different kinds that have as their elements different trios of matter, form and privation he lists:

- (1) in [the kind] *color*:
pale, dark, surface;
- (2) and light, darkness and air,
the things from which *day* and *night* are.²¹

Colors are attributes, and do not have matter in the way in which sensible bodies do. However, there is a way in which they do have matter, namely by analogy. For a color, *surface* is said to be its matter in this second,

¹⁹ *Metaph.* Λ4, 1070a31–33; cf. 1070b16 ff.

²⁰ *Metaph.* Λ4, 1070b17–19, 22–23.

²¹ *Metaph.* Λ4, 1079b20–21.

analogical way. The matter of a sensible substance stands to a substance as surface stands to a color, and this is what counts as the matter of a substance and the matter of a color being the same by analogy.

In fact, in a way the matter-analogue is matter, as Aristotle explains in *Generation and Corruption* 1.4:

And while matter is most of all and strictly speaking that underlying thing which is receptive of generation and perishing, in a certain way the things underlying the other changes are matter too, because all of them are receptive of oppositions of some sort.²²

This passage characterizes the role that is the same for matter and the various matter-analogues in terms of two factors: (i) it is what underlies (τὸ ὑποκείμενον), and (ii) what it underlies is an opposition (ἐναντίωσις). Speaking quite generally, the role of matter is to be what *underlies* an *opposition*. An opposition is a pair of opposites (ἐναντία). Although it is not possible for an underlier to possess both opposites at the same time, the underlier is the kind of subject that is *receptive* of both. This does not mean that it can have either one in any and all conditions. Rather, it is a subject that is of such a nature as to have either one of the pair, and is so even when with respect to one of them there are factors, either internal or external, that prevent the underlier from having it. For instance, Socrates is the kind of subject that is receptive of standing, and is so even when he is prevented from standing up because he is tied to a chair.

The passage in Λ_4 also mentions change (μεταβολή). For any change, there is something that underlies a pair of opposites. Matter is what is receptive of generation and perishing, or else is the underlier for some other kind of change. However, although there is a difference between having an opposite and changing in such a way as to have it, what underlies a change from one opposite to another is always what underlies the opposition that includes both. At the start, the underlier must be receptive of both opposites, but have just one. It is impossible for a subject to possess both members of an opposition at exactly the same time. However, the subject that has just one of the pair, but is receptive of both, must be of such a nature as to receive the other member of the opposition. As a result of such a change it will have that opposite, and when that happens it no longer has the other member of the pair, the one that it had at the start.

²² *GC* 1.4, 320a2–5.

The role of a 'matter-analogue' for attributes

What more can be said about this general and analogical way in which both substances and their attributes have matter? The specific role played by matter in substantial generation does not have a counterpart in these other cases. For such a generable substance, the matter is what becomes the substance. It comes to be out of opposites (τὰ ἐναντία), where the opposites do not change.²³ This specific role is not general enough to include matter for attributes. After all, colors are opposites that do not change, and so they could not have matter for change as a substance does. No cause of color could play exactly that role, since a color is not the kind of thing that comes to be because some underlying matter becomes that color.

However, embedded in the causal role for each and every type of case, both for various substances and their various attributes, there is a triadic causal structure of matter, privation and form. The 'matter' of a color occupies a position in that structure that corresponds to the position occupied by the matter of a substance. That is, in the triadic causal structure of *surface*, *white*, and *dark*, surface occupies a position that corresponds to that occupied by matter in the triadic structure for generable substance. For matter to be what changes into a *substance*, the matter must (i) be what underlies opposites. Additionally, for it to be what underlies opposites it must (ii) be what is capable of receiving them both.²⁴ Described in this way, this is a role that is common to substances and their natural attributes. At the most general level, in each case one opposite is a form, and the other opposite is a privation of that form, and there is an item that occupies the remaining position in this type of structure:

ELEMENT STRUCTURE:²⁵

<(1) what underlies: {(2) form, (3) privation}>

To enter into position (1) something must be the kind of subject that is capable of receiving a range of properties belonging to a kind, where the range is determined by the occupants of positions (2) and (3), the extremes that serve as the limits of the range. In the case of <surface: {pale, dark}>, the range determined by the opposites will include all and only the members of the kind color, and the intermediates are defined in terms

²³ *Metaph.* Λ2, 1069b3–7. Although the substance that comes to be is not an opposite, that substantial form into which it changes is opposite to the corresponding privation.

²⁴ *Metaph.* Λ2, 1069b6, b14–15.

²⁵ This label is chosen to indicate that these three items are the principles that *Metaph.* Λ4 refers to as 'elements [στοιχεῖα]'; this terminology of 'elements' is used in a similar way in *Phys.* 1.6, 189b16–29.

of ratios of pale and dark. The properties from this range are modifications of *surface*, and this is of course the item in position (1). Hence although strictly speaking colors do not have *matter*, for a color there is a cause that is analogous to the matter of a generable substance. Colors are the various modifications of this kind of subject, surface.²⁶ Accordingly, properties in the range marked out for that genus will be certain conditions that a surface of a physical object can be in. Such properties cannot be what they are independently of *surface*, the position (1) item. A privation is a condition that something naturally suited for a form is in when the form is absent in some way or respect. Like form, it too is something that either is or is not, but does not come to be or pass away.²⁷

Hence, even though a surface is not a subject of *change*, and a surface could not be something that turns into light, dark and the rest, it too must be a subject that is receptive of the opposites. It is in this way that surface is by analogy the matter for color. That is, surface is an underlying subject that is receptive of the opposites light and dark, where light is the form and dark the privation.²⁸

When *Metaphysics* H₄ assigns eclipses and sleep to the class of things that do not even have matter, and presents instead what I will call its 'matter-analogue,' this latter item is what plays this analogous role.

The matter for sleep does not have its causal role all on its own, independently of the role played by the other causes of sleep. Rather it has the role as part of a triadic causal structure:

TRIAD-1:

<an affection of the underlier due to the agent>

To emphasize these three causal factors, one could represent the structure as:

TRIAD-2:

<AFFECTION, UNDERLIER, AGENT>

For eclipses and for sleep, the first item, the AFFECTION, is a privation of some sort; and the second item, the UNDERLIER, is the subject so affected; and the AGENT is the nearest cause responsible for that subject

²⁶ Additionally, for Aristotle surface is mentioned in the definition of the kind to which they belong.

²⁷ There are various ways in which a subject may be deprived of form, and not simply the condition that is maximally opposed to possession of form.

²⁸ When *Metaphysics* H₅ uses the example of the coming to be of a pale man to illustrate the thesis that forms are or are not without coming to be or passing away he does not bring in the distinction between a physical substance and its surface. The example could easily be expanded to accommodate the distinction, but this kind of elaboration is not needed for the purposes of that chapter.

being affected in just that way. However, in each case the privation is only temporary, and is itself preceded by, and eventually will be succeeded by, a form or positive condition of that subject. When viewed more generally, the AFFECTION will be one of the properties from the range determined by an opposition of form and privation, and the UNDERLIER will be a subject of such a nature as to be capable of receiving the relevant positive and privative conditions. The third item, the AGENT, is what is also referred to as the *efficient cause* that acts on the UNDERLIER in such a way that it comes to possess the relevant AFFECTION. According to *Metaphysics* Λ4, this agent, or efficient cause, is a principle that is not an element, and hence:

while analogically there are three elements, there are four causes and principles; but the elements are different in different things, and the primary cause as that which effects change is different for different things.²⁹

To sum up, the underlier may be called 'matter,' and it is in an analogical way that attributes and properties are said to have matter. For each such underlier, there is also a cause that is analogous to the efficient cause of a generated substance. This agent-analogue is what is capable of affecting the underlier in such a way that it acquires an affection that plays a role analogous to the form, or the privation, involved in a substantial change.

The matter-analogue for eclipses

Let us now look at the two cases discussed at the end of *Metaphysics* Η4, eclipses and sleep, in a bit more detail. The way in which Aristotle discusses the matter-analogue in each relates the 'matter' to the other two items listed in TRIAD-2. The relevant discussion starts with the sentence that denies that they have matter: "Nor indeed is there matter for those things that exist by nature but are not substances, instead 'that which underlies' [τὸ ὑποκείμενον] is substance."³⁰ In both the case of a natural substance *and* the case of a natural attribute there is something that underlies, but whereas in the former case what underlies is *matter*, he tells us now that in the latter it is a *substance*. One of the key texts that draws the relevant distinction between two ways of underlying is a passage from the introductory remarks of *Metaphysics* Ζ13. This passage informs us that we have already discussed (in *Metaphysics* Ζ):

²⁹ *Metaph.* Λ4, 1070b25–27.

³⁰ *Metaph.* Η4, 1044b8–9.

‘what is underlying’ [saying] that it underlies in two ways, either (i) being ‘some this’, just as the animal [underlies] its modifications, or (ii) as the matter [underlies] its actuality.³¹

The subject that underlies in the *first* way is described as τόδε τι ὄν, being ‘some this.’ This is a substance, such as the moon, or a human. For instance, the subject that underlies musicality is a human, which is a primary substance, and is characterized by Aristotle as ‘some this.’ Likewise, the substance that underlies a privation of light (στέρησις φωτός) is the moon, and this is also a particular, primary substance.

However, what underlies in the *second* way specified in Z13 is not some substance (nor is it ‘some this’), but rather is called in this text the ‘*matter*.’ Indeed, what is a subject in this second way is the matter for the various items that are the subjects in the first way – those subjects that underlie attributes, and are described as ‘some this.’ These subjects, at least those that are *generable* substances, are themselves composites of matter and form.³² However, neither an eclipse nor sleep is a composite of matter and form, where the matter underlies the form in this second way of underlying.

In causal inquiry about an eclipse, instead of looking for its matter, one should look for a *substance* that underlies something. Accordingly:

For instance, what is the cause of an eclipse, what is the matter? For there is not [matter], rather³³ the moon is what undergoes [it] [τὸ πάσχον].³⁴

This is meant to contrast with the case of generable substances, such as a human. In one of four ways in which something is a cause, a generable substance *does* have matter as one of its causes. However, eclipses do not have matter, but one of the causes of an eclipse is a substance, the moon. That is, for an eclipse, what underlies is not its matter, but rather the moon. Nonetheless, in both cases, that of an eclipse and that of a human, one of the causes *is something that underlies*. The difference that he stresses is that for an eclipse this is a substance (and not matter), whereas for a human this is matter (and not a substance).

There are analogues to at least two of the other causes for a generable substance. In the eclipse case, the form-analogue (the cause ὡς εἶδος) is what he calls the ‘account’ (ὁ λόγος), and this is identified as a privation

³¹ *Metaph.* Z13, 1038b4–6.

³² See, for instance, *Metaph.* Θ7, 1049a29–30, which singles out a man as what underlies modifications, and explicates this as “body and soul.”

³³ Reading ἦ with E, instead of ἡ (J, Ab). ³⁴ *Metaph.* H4, 1044b9–11.

of light.³⁵ Such an account, however, is said to be *unclear* (ἄδηλος) unless it is accompanied by the efficient cause:

And [the cause] 'as form' is the account, but the account is unclear unless the [efficient] cause is added. For instance: what is an eclipse? Privation of light. And if one were to add 'by the earth coming in the middle,' this would be the account with the [efficient] cause.³⁶

This passage first tells us that the earth is the efficient cause that destroys the light,³⁷ and subsequently says that the account *with* the efficient cause is 'deprivation of light *by the earth coming in the middle*.'³⁸ Given his injunction to state all of the possible causes, the full statement of causes should in that case be something like 'the moon's deprivation of light by the earth coming in the middle (of the moon and the sun).'³⁹

Why is the account unclear without the efficient cause? At least part of the reason is simply that without the efficient cause such an account is *too general* to be something distinctive of just lunar eclipses. There are various ways in which something – even the moon – could be deprived of light. To be sure, an eclipse is some sort of deprivation of light (στέρησις τις φωτός),⁴⁰ but saying this alone does not specify the sort of deprivation that it is, at least not in a way that would distinguish it from other ways of being deprived of light. Aristotle's proposal is not that this is clarified by adding some more determinate specification of observable features of the moon's light deprivation, or a fuller phenomenological description of what eclipses look like to observers. The proposal is rather that this (allegedly unclear) *logos* is made clear by accompanying it with a statement of the efficient cause that is responsible for the subject, the moon, having that property, or form-analogue.

³⁵ Note that in *Metaph.* Λ4, 1070b16–21, light is a form, darkness its privation, and air the matter. In H4, for an eclipse the form-analogue is a privation. In the case of a substance, he uses the word '*logos*' for the account or definition that expresses its form, and sometimes uses it for the form it expresses rather than the linguistic item itself. His use of the term '*logos*' has a similar duality of use in connection with definitions of natural phenomena, although in the two examples of eclipse and sleep the causal factor corresponding to a substantial form is not a form, but rather a privation. This general characterization of στέρησις needs to be worked out in different ways for different circumstances. For instance, *Metaph.* Θ1, 1046a31–35 distinguishes various ways in which something is called στέρησις. Nonetheless, in H4 he is speaking at a high level of generality about causes of natural phenomena, and drawing finer distinctions that do not generalize is not needed for this purpose.

³⁶ *Metaph.* H4, 1044b12–15.

³⁷ 1044b10–11. The light has as its subject the moon, and when its light is destroyed that subject is characterized by a privation of light.

³⁸ 1044b14–15. ³⁹ There is likely no final cause for an eclipse; see n. 43 below.

⁴⁰ One should compare this with *Post. An.* 11.8, 93a23.

The mention of the efficient cause of an eclipse at 1044b14 is in fact the *second* mention of such a cause in the relatively brief and condensed passage at H4, b9–15. The *first* mention of the efficient cause occurs earlier in the passage:

What is the cause in the sense of what effects change, i.e. extinguishes the light? The earth.⁴¹

This identifies the earth's causal role solely in terms of its causal *effect* on the item he has already listed as the subject for an eclipse, the moon. An eclipse occurs when the earth destroys the moon's light. Although this way of putting things brings in the subject (moon), and an attribute of the moon (its light having been destroyed), and an efficient cause for the subject having that attribute, it is not yet what he takes to be the 'clear' statement of either the form-analogue or the efficient cause. It tells us that a particular substance, the earth, is the efficient cause of the eclipse, but does not indicate what it is about the earth that is responsible for the effect. The earth is not the efficient cause simply in virtue of being the earth, or even simply in virtue of it being whatever it is that extinguishes the light. It is because the earth comes to be 'in the middle,' and thus blocks the light of the sun, that the moon is affected in such a way as to be deprived of light. To state the nearest efficient cause it is not sufficient simply to cite the earth itself as what brings about the relevant effect, since the earth does not cause this at just any time or in just any condition, but rather only when it comes to be in the middle.

With this fuller statement of the efficient cause, a statement involving the condition it is in when it produces the relevant effect, Aristotle takes it that one is now in a position to give a clear statement of the form-analogue as well. The form-analogue is not made clear simply by mentioning the earth as what destroys the light, but rather by mentioning what condition the earth is in such that by being in just that condition, something else (the moon) is deprived of its light. Both the efficient cause and the form-analogue are unclear if the efficient cause is identified simply as the earth, or as the earth destroying light. However, both the efficient cause and the form-analogue are clear once one knows what condition the earth is in when it brings about the light deprivation.

If this is the case, then the form-analogue stated *together with* the efficient cause is clear. The sort of privation of light that the moon undergoes in an eclipse is that sort of light deprivation that comes about by the earth being

⁴¹ *Metaph.* H4, 1044b11–12.

in that condition (being in the middle). This efficient cause (the earth's coming in the middle) is the cause of the privation of light,⁴² and although the form-analogue and the subject for the form-analogue, the moon, are also causes, this efficient cause is here singled out as 'the cause.' Citing this cause is what explains why the former item (the *pathos*) belongs to the latter item (subject, the moon).

Of course, even though the earth is cited as the efficient cause that brings about the eclipse, the earth itself does not actually *do* anything to put itself in the middle. After all, for Aristotle, the earth is itself stationary, and the moon and the sun are the objects that move around it. On occasion, as a result of what they are doing, they move into a configuration with the earth directly between them, specifically in just the way it is positioned when it blocks the moon's source of light. The motions of these other things themselves have efficient causes, and these are remote causes of the eclipse. Although they are not the 'nearest' causes, they are certainly part of the larger causal story of eclipses. A scientist who knows these causes as well has a fuller scientific understanding of the causal account of how and why eclipses occur. They are not, though, the causes with which the H4 passage is directly concerned, and they do not turn up in its statement of the causes of an eclipse. For this purpose he enjoins one to state only those causes that are nearest.⁴³

By stating nearest causes one invokes both the matter-analogue (what is acted upon, or affected) and the efficient cause-analogue (what so acts, or the agent). Citing the causes in this way makes the *logos* clear not only by making it more specific, but also by making it evident that the relevant modification (the *pathos*) just is the condition the subject is in as a result of what the agent, the efficient cause, does. Whereas the moon is something that is affected, it is the earth, the efficient cause, that affects it in such a way that it is deprived of its light. *What the latter is doing* insofar as it acts (and does so in the way in which it is an efficient cause for X), and *what the former is undergoing* insofar as it is being affected (and is affected in the way in which it is in this other way a material cause for X), are the same. They are the same in whatever way the action of an agent is quite generally the same

⁴² 1044b13, 15.

⁴³ Also, it might turn out that there is no single efficient cause for the earth's coming to be in the middle, but rather a cause for the moon being where it is and another cause for the sun being where it is. If there is an efficient cause for them simultaneously being in those positions then there is such a unified cause for the earth's coming to be in the center. Probably there is no final cause for an eclipse (1044b12). But there are final and efficient causes specifically for the motions of the moon and the sun, and as parts of a more comprehensive teleological system *perhaps* also a final/efficient cause for the way the motions are coordinated.

as whatever it is that the patient undergoes. Of course, Aristotle also holds that there is a way in which what it is for X to be acting on something Y is not the same as what it is for Y to be affected by something X. These are not the same 'in being.' However, he holds that the *account* of the passive capacity of the patient to be changed by another must contain the account of the corresponding active capacity of the agent.⁴⁴

In the case of the eclipse, the earth need not be seen as an agent in just the way in which, for instance, a father is an efficient cause of a child. Rather, it is the analogue of the efficient cause of the generation of a substance, and its agency is somewhat attenuated. (As already noted, it does not do anything at all to get in the middle.) However, by being in just the right position to block the moon's source of light it is what is directly responsible for there being an actually transparent medium for ordinary visual perception continuous⁴⁵ with the surface of the moon and any observers on earth. In fact, both the surface of the earth that faces the surface of the moon, as well as the part of the moon's surface that it faces, are equally deprived of light due to the position of the earth. The moon's loss of light during an eclipse is simply the condition of the transparent medium surrounding it that results from the earth's blocking its source of light.

The matter-analogue for sleep in recent scholarship

According to the H4 text, sleep is also in a class of natural things that lack matter. It too exists by nature, but is not a substance. Since sleep is not a substance, it does not have matter for generation and perishing. Nonetheless, when natural things and their causes are treated at the level of generality commensurate with that class, the cause 'as matter' (ὡς ὕλη) is one of their causes in each and every case. Accordingly, to inquire into, or to state, the causes of sleep correctly one must identify the cause that is related to sleep as matter is related to the generable substance of which it is the matter. Sleep does not have matter in the established sense of the term, but does have a subject that plays a role corresponding to the role of matter for generable substances. Furthermore, just as in the case of an eclipse, the matter-analogue does not play its role as the kind of cause it is except in concert with analogues to the cause 'as form' and the cause 'as that which effects change.' Hence in the case of sleep its 'matter,' or matter-analogue, has its role as part of the unified, tripartite causal structure in which it figures as the cause 'as matter.'

⁴⁴ See *Metaph.* Θ1, 1046a9–16.

⁴⁵ Or at least contiguous.

Accordingly, one might expect it should not be too difficult to determine what the matter, or matter-analogue, for sleep is supposed to be. After all, his *de Somno* proposes to investigate, among other things, the cause due to which both sleep and wakefulness belong to animals,⁴⁶ and in the course of this investigation explicitly brings up his doctrine of the four ways in which there are causes.⁴⁷ Additionally, the concluding remarks of that work claim that it has been stated what the cause of sleep is.⁴⁸

Aristotle's doctrine of four different ways in which things are said to be causes provides a crucial part of the overall framework for the investigation of the causes of things that exist by nature. The *de Somno* invokes this doctrine halfway through *Somn.* 2 in the following way:

We must state through which cause sleeping occurs, and what kind of affection it is. And since there are several types of cause (for we say that (i) that which is for the sake of something, and (ii) that from which the origin of the change is, and (iii) the matter, and (iv) the account [λόγος], are [each] a cause), first we say that since nature acts for the sake of something, and this is some good . . .⁴⁹

Just as in the *Metaphysics* H4 passage, though with slightly different vocabulary, he here lists the 'final' cause, the 'efficient' cause, the 'material' cause and the 'formal' cause, respectively. The quoted sentence goes on to argue that sleep is for the sake of the preservation (σωτηρία) of animals, and that waking is an end (τέλος). Their perceiving and their being sensible are, for an animal to which either belongs, not simply *an* end or a good, but rather *the good* and the best. We are here told that sleep has a final cause, and that this is a certain kind of preservation of an animal's nature.

If it is accepted that there is such a final cause, what more can be said about whatever other types of cause there are for sleep, and how they relate to the final cause? Among other things, there should be an efficient cause that originates a change, the result of which is that something has the 'form' of sleep (or whatever it is that plays the role of the item traditionally spoken of as the 'formal cause'). When that subject has been changed by the efficient cause in that way, with the result that the animal itself is asleep, this is itself in aid of some good for the animal. The result is a condition of rest that *preserves* the natural perceptual capacity, the natural capacity that the animal actively uses during its periods of wakefulness. Arguably, the connection with a final cause is not simply that what the efficient cause

⁴⁶ *Somn.* 1, 453b14; see also 2, 455b13. ⁴⁷ *Somn.* 2, 455b14–16.

⁴⁸ *Somn.* 3, 458a25–26. ⁴⁹ *Somn.* 2, 455b13–18.

brings about is this good (preservation), but more precisely that it acts *for the sake of* living. The 'formal cause' that is brought about is, when brought about in the relevant part of the animal and at the times at which rest is both needed and beneficial, not simply for the sake of preservation, but ultimately for the sake of the active life for which the animal's nature is the principle.

Nonetheless, the subsequent causal inquiry in the remainder of the *de Somno* does not, at least not explicitly, discuss the efficient cause in these terms. What about the material cause? Since the way an efficient cause is responsible for sleep is that it is an agent, there must also be a patient. This would be whatever it is that is able to be affected in such a way as to have the 'form' (or analogue of form) specified in the *logos* of sleep. This would be the cause for sleep that corresponds to the material cause of a substance. However, not only is this not what scholars have looked for in the *de Somno* when considering the material cause of sleep, but there is not even consensus as to which of these four types of cause that work takes to pertain to the explanation of sleep.

Some scholars maintain that Aristotle employs all four causes in that work, but others argue that sleep lacks at least one of them. To further complicate matters, there is also disagreement as to whether the treatise handed down to us combines texts from *different* stages of his philosophical development. Although there is some kind of scholarly consensus that at least some part of the treatise does assign sleep a material cause of some sort, there is disagreement as to whether those passages in fact represent only an earlier view, and are in conflict with the theory developed in other parts of that work. Finally, there is not simply disagreement as to which causal roles are invoked in his explanation of sleep, but still further disagreement as to which factors play which causal roles. Even among those who treat the *de Somno* as a single work expressing a single theory, there is considerable disagreement as to how matter fits into the theory.

These disputes are in part connected with worries about final causality. If we return to *Metaphysics* H₄ we can see that although it does ask about the 'cause as that for the sake of which' (ὡς οὗ ἕνεκα), or final cause, for two of the cases discussed earlier in the passage, before the topic of sleep is addressed, it says nothing at all about finality in connection with sleep. This silence has been taken as evidence that at the time he wrote this passage he had abandoned the view that there is a final cause of sleep.

In a moment I will consider a view according to which this provides confirmation for interpreting the *de Somno* theory along these lines. First, however, it should be stressed that this feature of the H₄ passage does not

by itself show that at the time Aristotle wrote it he thought that sleep lacked a final cause. After all, the discussion in H4 of eternal natural substances did not even bring up the topic of final causality, but that is not a reason to think that they altogether lack such a cause. If it were, it would also be a reason to think that they did not have efficient causes or formal causes, since those are not mentioned either. Additionally, the discussion of principles in *Metaphysics* Λ4 omits final causality (as does Λ1–5 as a whole), but once again, that is no reason to think that when he wrote it he rejected, or perhaps had not yet formulated, the view that natural substances have final causes.

That said, Malcolm Lowe has taken H4's omission of a final cause of sleep as evidence that at the time it was written Aristotle had abandoned teleological explanation for such natural attributes. He has argued that this text in the *Metaphysics* represents a late stage in the development of Aristotle's thought about causality, and says of this text: "it is implied, sleep is not something having four causes: there is no material cause; the final cause may not exist; the formal cause is given by the definition, but this is incomplete without the efficient cause . . ." ⁵⁰ Lowe holds that the passage not only shows that sleep lacks a material cause, given that 'the formal cause' is not a form, but instead a 'privation of sensation,' but also that the final cause cannot be identified with the formal cause. He takes this to go against what he describes as Aristotle's "well-known tendency" to see the formal and final cause as somehow identical.⁵¹ Furthermore, since the formal cause (i.e., the privation) "is unclear if it is without the [efficient] cause,"⁵² Lowe proposes that Aristotle's view is that, in light of this, sleep cannot be defined without a specification of the efficient cause.⁵³ Hence:

the formal cause amounts to the efficient cause plus something else. Thus, instead of the well-known four causes, the reader is offered (so to speak) merely one-and-a-half.⁵⁴

⁵⁰ Lowe 1978, p. 287. Lowe's conclusions on this matter are accepted by Gallop 1991; on p. 130, speaking of *Somn.* 3, he says "there is no indication in the text that a 'material cause' for sleep is being identified." Their joint view is effectively criticized by Everson 2007.

⁵¹ Lowe 1978, p. 286. Lowe does not indicate why, given that sleep is a privation, the final cause could not be the correlative form. For further criticism of this see Everson 2007, pp. 504–7.

⁵² Lowe 1978, p. 287.

⁵³ Against this, it should be pointed out that Aristotle does not suggest that the *logos* for the form-analogue is incomplete, or requires revision. His point is rather that the *logos* is unclear unless accompanied by the efficient cause, not that the *logos* needs to be expanded so as to include a reference to the efficient cause.

⁵⁴ Lowe 1978, p. 286.

On the interpretation that Lowe puts forward, this is not only the view of the H4 passage, but is also the view held when Aristotle wrote the bulk of the *de Somno*. Lowe argues that that work contains material from two different treatises on sleep, each of which represents a different stage in Aristotle's philosophical development, and that the later and better view that informs the majority of that work is the one that drops the four-cause model in favor of the 'one-and-a-half' model.

Lowe argues that a fragment from an earlier view was inserted in [Chapter 2](#), at 455b13–34, and that a comparison of this fragment with the main treatise “reveals a significant development . . . in Aristotle's well-known theory of the four causes.”⁵⁵ The fragment “boldly starts upon an investigation of four causes of sleep.”⁵⁶ However, on his view, the main, and later, treatise says *nothing whatsoever* about the material and the final cause, and furthermore it too adopts the view that the formal cause cannot be defined without specifying the efficient cause. For Lowe, the H4 passage we have been considering provides independent confirmation that the theory of four causes was later replaced with the view that sleep has no material cause, and may not have a final cause.

My aim in the present chapter is not to resolve all of the many issues concerning the unity of the *de Somno*, nor to present a full argument for a new interpretation of that work. Instead I will address the more limited, and preliminary, task of exploring more fully how that work could be interpreted were it in fact following the methodology presented in the *Metaphysics* H4 passage. In particular, I will sketch out a way to interpret the *de Somno* theory such that it employs the causal structure, TRIAD-2, presented in the *Metaphysics*, and does so in a way that is perfectly consistent with a more expansive causal perspective that embeds this structure within a teleological framework. This is sufficient to show that the H4 passage does not itself provide independent support for Lowe's interpretation of the *de Somno*. However, more work would need to be done to assess fully the merits of my proposal as an interpretation of the *de Somno*, and its consequences for issues about the unity of the treatise and questions about philosophical development. The pattern for stating causes advocated in the *Metaphysics* H4 passages gives to the matter-analogue a specifiable causal role, that of something affected by an efficient cause in such a way as to be

⁵⁵ Lowe 1978, p. 279. His argument for this is developed in opposition to the earlier interpretation in Lulofs 1947. According to Lulofs, the treatise combines an unfinished *de Somno* A, which is later and only partially preserved at 453b11–455b13, and a *de Somno* B that is preserved in its entirety at 455b13–458a32.

⁵⁶ Lowe 1978, p. 286.

characterized by the relevant *logos*. This puts constraints on what entities we could assign as the causes of sleep were we using this pattern in the *de Somno*, and does so in a way that gives us a basis for opening up discussion as to what its theory should be like if it does conform to that model.

Additionally, Aristotle's treatment of other psychological affections that are suitably similar can be approached in this way as well. Not only is there a comprehensive and detailed treatment of the causes of sleep in the *de Somno*,⁵⁷ but there is also an important methodological passage about attributes of this sort in *de Anima* I.1 that has been the locus of a great deal of scholarly debate.⁵⁸ Among other things, this passage discusses how affections common to body and soul ought to be defined, as well as considerations about stating both their matter and their form. This too is directly relevant to sleep, since Aristotle clearly considers sleep to be one of those affections.⁵⁹ The *de Anima* I.1 passage characterizes a fairly wide range of such psychological affections as "enmattered accounts" (λόγοι ἐνυλοί),⁶⁰ and tells us that the natural scientist defines them in a way that involves both their matter and their form. Among other things, the passage first motivates his claim that they are 'enmattered accounts,' and subsequently gives some guidance as to the general way in which the definitions of these affections of soul ought to be structured. To illustrate these points it briefly discusses the way in which a dialectician differs from a (non-Aristotelian) natural scientist when defining anger. The former defines only the form (e.g., 'desire for revenge,' or something like that) whereas the latter's definition gives just the matter (e.g., 'the boiling of the blood, or the hot, around the heart'). By way of contrast with both of these, the appropriate procedure for a natural scientist is to define anger in a way that combines both the matter and the form.⁶¹

Unfortunately, that text does not give this type of combined definition for anger, and scholars have not agreed on exactly which definitional methods or procedures he thinks a natural scientist ought to use for this purpose. Even though his remarks suggest candidates for the matter and form of anger, they do not say just what it is for something to be the matter, or the form, of an affection common to body and soul. Since he recommends applying hylomorphic analysis not just for substances and artifacts, but

⁵⁷ In *PA* II.7 there is a brief discussion of the role of the brain in the production of sleep (653a10–20).

⁵⁸ *De An.* I.1, 403a3–b19. The literature on this is enormous, and covers a wide range of topics. The reader can find an accessible discussion and interpretation of many of the central issues in Johansen 2012, Chapter 8, pp. 146–69. For an illuminating discussion of interpretive difficulties, and opposing views, concerning the way matter figures in definitions of these psychological affections see Charles 2009 and Caston 2009.

⁵⁹ *Somn.* I, 453b24–454a11.

⁶⁰ *De An.* I.1, 403a24–25.

⁶¹ *De An.* I.1, 403a29–b9.

also for their attributes, additional guidance as to how such analysis is to be extended to these cases would be useful. The methodology given in the *Metaphysics* H4 passage gives such guidance, and invites comparison with the *de Anima* discussion. This is not the place, though, to attempt an interpretation of the *de Anima* passage. However, if one is armed with H4's account of the role assigned to a matter-analogue for sleep, this can then be used to put restrictions on the candidates for matter and form in the interpretation of other attributes common to body and soul. This can serve as a basis to explore the interpretations on offer of the *de Anima* passage from the vantage point of the methodology presented in the *Metaphysics*.

One cannot simply assume that the pattern specified in H4 is in fact what he employs, or intends to employ in other works. Nonetheless, this kind of comparison is useful in part because there is no scholarly consensus as to what, if anything, Aristotle takes the material cause of sleep to be, or how he thinks matter and form are related to each other in the causal inquiry into such attributes in general. There are, as we shall see, interpretations of his views on matter that do not treat the matter as the subject that is affected by the efficient cause. Exploring how they contrast with the methodology taken from H4 is a way to see how the conception of matter they employ differs from the one developed in this chapter, and how such alternatives relate to his hylomorphic approach to natural science.

As we shall see, the matter-analogue for sleep in the H4 passage is a bodily part that is affected by an efficient cause. In blooded creatures, he takes this to be the heart. The current interpretations of Aristotle's views on how sleep, or related attributes, have a material cause do not consider candidates such as the heart for just this role. Accordingly, before considering the passage in any more detail I will first give a brief, and somewhat selective, overview of a few of the views about the material cause of sleep in the *de Somno*. There are quite a few textual issues that a full treatment would require, but for this kind of overview they have to be set aside.

The most well-known interpretation is that of W. D. Ross. He writes that Aristotle: "offers no separate account of the material cause, but it has become plain that this is the hot matter contained in food."⁶² By way of sharp contrast, Robert Bolton argues that the material cause is the "seizing up of the primary sense organ, the heart," and that this material cause is itself caused by the efficient cause, which he identifies as "the necessary

⁶² Ross 1955, p. 44. He further states that "[chapter 3] makes it plain that the material cause is the hot matter contained in food" (457a33–b1) (Ross 1955, p. 260).

massive return of cooled material to the region of the heart.”⁶³ Both of these views in turn contrast with the claim by Stephen Everson that the material cause is the inward concentration of the hot matter,⁶⁴ and that for Aristotle “explanation of sleep in terms of its final and material causes is entirely sufficient.”⁶⁵ For him, the material causes are material changes, and sleep neither has nor requires efficient or formal causes.

As different as the views of these three authors are, one thing they have in common is that they do not identify the material cause with the subject that is affected in such a way as to possess the privative modification, or form-analogue. Indeed this is what one finds quite generally throughout the literature on the topic. On any interpretation of the *de Somno* theory a blooded animal is asleep when its heart is affected in such a way that it is (temporarily) incapable of the kind of perceptual activity characteristic of its waking life. However, this has not led scholars to identify the heart with the material cause. But, if something other than the heart is playing the role of the material cause, then it is not part of the material cause's role that it is what is perceptually incapacitated due to the activity of the efficient cause. If that is correct, then one needs not just an alternative *candidate* for the material cause, but also an alternative account of the role itself that differs from what is assigned to it in *Metaphysics* H4. It is now time to consider a few more details of that text, and how they relate to the explanation of sleep.

The matter-analogue in *Metaphysics* H4

When *Metaphysics* H4 turns to a consideration of the causes of sleep, Aristotle notes a respect in which there is a difference between the case of sleep and the earlier case of an eclipse:

But for sleep it is unclear what the primary thing affected [τὸ πρῶτον πάσχον] is. But is it not the animal? Yes, but [it is] this in respect of what, i.e. what primary thing [κατὰ τί, καὶ τί πρῶτον]? The heart or something else.⁶⁶

To be sure, it is the animal as a whole that sleeps, and when it does so it has sleep as one of its attributes. However, the substance (the animal as whole) is affected in such a way that it is asleep *in respect of some primary thing*. This

⁶³ Bolton 1997, pp. 104–5. This brings an interpretation of the material cause of sleep into line with an interpretation of the material cause of anger in *de An.* 1.1 as the boiling of blood, or warm substance, around the heart.

⁶⁴ Everson 2007, p. 513, n. 35.

⁶⁵ Everson 2007, p. 519.

⁶⁶ *Metaph.* H4, 1044b15–17.

primary thing is not the whole animal, but rather a non-uniform, material part of the animal, such as the heart, or something else of that sort. When one asks *in respect of what* (κατὰ τί) the animal sleeps, this could be asking either for the *form* of sleep or for the primary, *proximate subject* for that form,⁶⁷ where the former is predicated of the latter. What he has in mind here is the proximate subject for the attribute, and this is not the animal itself, but rather a functional part of the animal, such as the heart, or some other such part.

In this passage, what is predicated of this primary subject is called the modification (τὸ πάθος). This is a modification, or affection, of the heart, and the animal as a whole is asleep in virtue of its heart being affected in just that way. The relevant way is an immobility of some sort (ἀκίνησις τοιαυτή).⁶⁸ That is, sleep occurs just in case an animal as a whole is asleep, and this takes place when, and because, the animal's heart (or some other such organ, if it is not the heart) is *immobilized in a certain way*.

Accordingly, this methodological procedure involves an extra step, one that is not present in the procedure he specified for seeking the causes of an eclipse. He did not specify some material part of the moon that is the primary subject that undergoes modification when an eclipse occurs, such that the moon as a whole undergoes eclipse because this part of the moon is modified in a certain way. In the eclipse case, the form-analogue (the cause ὡς εἶδος), or what he calls the 'account' (ὁ λόγος), was said to be privation of light.⁶⁹ This is the account that is supposed to be unclear (ἄδηλος) unless it is accompanied by the efficient cause.⁷⁰ The privation in the case of sleep is also unclear in very much the same way. Just as there are various ways of being deprived of light (not all of which are ways of being eclipsed), so too there are various ways in which an animal could be deprived of the ability to perceive (not all of which are ways of being asleep).

The animal is by nature a perceiver, and in its waking state it engages in perceptual activity. Additionally, it goes through regular periods of these states of rest during which it is unable to perceive. This is, though, not just any inability to perceive, but according to the *de Somno* is an inability that is for the sake of this good end (perceiving). Even if we were to bracket the

⁶⁷ See *Metaph.* Δ18, 1022a14–19.

⁶⁸ *Metaph.* H4, 1044b19. See also *Somn.* 1, 454b5–6 where he says that the affection is an incapacity (ἀδυναμία) due to an excess of being awake. At b10–11 it is described as “a certain affection of the perceptual part, a bond or inability (ἀκίνησις).”

⁶⁹ Note that in *Metaph.* Λ4, 1070b16–21, light is a form, darkness its privation, and air the matter. In H4, for an eclipse the form is a privation.

⁷⁰ *Metaph.* H4, 1044b13.

teleology, inabilities due to "unconsciousness, choking of a certain sort, and fainting"⁷¹ do not count as sleep. How, then, does Aristotle distinguish sleep from other cases of perceptual inability? In that work he goes about this by identifying the proximate efficient cause. If the work follows the *Metaphysics* H₄ pattern, then this is the agent that affects the primary organ of sense in such a way as to bring about perceptual incapacity. Identifying this agent would make the account of sleep clear in the way that the efficient cause of a lunar eclipse makes clear the way in which the moon is deprived of light when eclipsed. As in the astronomical case, the activity of the efficient cause is the same as whatever it is that the patient is undergoing. That is, it is the same in whatever way it is true quite generally that what agents do and patients undergo are the same.

However, there is an additional unclarity, not present in the astronomical case, and that is that there is some part of the animal that is the primary thing affected by the efficient cause. Initially, prior to inquiry, it is not clear what this might be. In the *de Somno* the primary thing affected when an animal sleeps is the primary organ of its perceptive faculty,⁷² whatever that may be. For blooded animals this is the heart, and for others the part analogous to this. To determine that the heart is the relevant organ the treatment in *Somn.* 456a4–6 first identifies it *via* its functional capacity, and then relies on something established elsewhere, that the organ for that functional capacity is the heart of a blooded animal. In the case of blooded animals quite generally the primary subject for the relevant *pathos* is the heart. However, in *Somn.* 2 it is first identified via its *functional role*. It is the master sense-organ (τὸ κύριον αἰσθητήριον).

In *Somn.* 2 Aristotle also argues that the part of the body in which sleep originates is the heart. Since the heart plays this functional role, it is the subject that is affected. The argument at the end of *Somn.* 2 for the claim that sleep originates in the heart is the conclusion of a phase of inquiry that started at the beginning of that chapter with the question as to why an animal sleeps or is awake, and to what sense or senses this is due.⁷³ This provides his grounds for holding that sleep originates in the master organ for perception, which is the heart in the case of blooded animals, and the analogous part in bloodless animals, including insects. It is the heart

⁷¹ *Somn.* 3, 456b9–11; cf. 2, 455b2–10.

⁷² *Somn.* 2, 455a21. This is the sense-organ that controls all of the other sense-organs (a33 ff), and is also characterized as the common faculty that accompanies the others, by virtue of which one perceives that one is seeing, or hearing (a15–17). Hence, it is a part that is common to all of the sense-organs (a19–20). He also refers to it as the primary sense-organ (τὸ πρῶτον αἰσθητήριον) (458a28).

⁷³ *Somn.* 2, 455a4–5.

(rather than, for instance, the brain) that is the origin of the changes that result in the kind of perceptual incapacity characteristic of sleep.⁷⁴ Hence the heart is both a remote efficient cause of sleep and also its proximate material cause.

Animals are self-regulating systems, and the normal transitions between wakefulness and sleep involve the condition of this physical organ alternating between periods in which it is affected in such a way that the animal sleeps and periods in which it is not. The efficient cause of sleep will be whatever it is that is responsible for the heart being affected in that way. However, the claim that the heart is the subject that is affected when the animal sleeps does not by itself tell us what the efficient cause is. Nonetheless, it does narrow down the list of candidates. Whatever the efficient cause is, it must be something that affects the heart.

Since the heart is the primary organ of perception, Aristotle looks for this kind of cause by considering what the animal does when it first starts its perceptual life. This would be when the heart starts performing its perceptual function, and occurs once the animal starts eating and growing.⁷⁵ That is, he claims that at the same time that the heart begins to function as an organ of perception the animal also starts nourishing itself by ingesting food. This is converted into an exhalation that enters its veins, and is transformed into blood. The blood is its 'ultimate' form of nutriment, and by traveling through the vascular system it goes to its 'origin,' the heart. Hence, on his view, once the perceptual system is operative, the primary organ of perception is not only affected in such a way that the animal perceives, but it also is the place to which the nutriment produced by eating travels. In some way still to be specified, this nutriment, in its partially digested form, leaves the area of the heart, moves to the brain, and once again returns to the heart. Upon its return, at least if the return is sufficiently massive, the heart is immobilized in such a way that it is temporarily incapable of being affected by external sense objects in such a way that the animal perceives them. Hence, the animal cycles back and forth between sleep and wakefulness, and the partially digested nutriment is the efficient cause that puts the heart in the condition for sleep. This efficient cause is intimately connected with the nutritive activity that commences with the animal's perceptive activity.

⁷⁴ It is also the part of the body that originates motion. This occurs, he says, in the area intermediate between the head and the lower abdomen (*Somn.* 2, 455b34–456a14).

⁷⁵ Of course there are ways in which the organism was nourished and grew before it started perceiving, but these do not involve eating food.

In the case of an eclipse the efficient cause is something that is external to the moon – it is neither the moon, nor a part of the moon. By way of contrast, for sleep the efficient cause turns out to be something that is not external to the animal itself. *Metaphysics* H4 itself does not identify this efficient cause, as it did for the eclipse. It does, though, require that one should ask for these causes of sleep:

- (1) the primary or proximate subject [τὸ πρῶτον πάσχον]
- (2) the efficient cause [ὑπὸ τίνος;]
- (3) the modification [τὸ πάθος] of the proximate subject (i),
and then answer the question:
- (4) [it is] this [modification] in virtue of the primary thing undergoing
what? [αὕτη τῷ τί πάσχειν τὸ πρῶτον].⁷⁶

We have already seen that he identifies the first of these, the primary subject, with the heart or some such part. If this listing of causes in H4 follows the same pattern as the previous case, that of the eclipse, then the second item (that by the agency of which sleep occurs) would be something that is responsible for affecting this primary sense-organ in such a way that it has the third item, the relevant πάθος (the form-analogue of sleep), present to it. This would be another application of the causal structure:

TRIAD-2:

<AFFECTION, UNDERLIER, AGENT>

This passage does not here say what this agent might be, but rather asks in what way the primary subject (the heart, or its analogue in bloodless animals) is affected such that it is due to being affected in that way that it is immobilized. Given that what the patient has done to it is the same as what the agent does, one can determine the latter by determining the former, and the efficient cause will be whatever it is that does precisely that to the heart. Since the animal does not lose its perceptive faculty when it sleeps, the relevant inability must be due to the absence of one, or more, of the conditions required for external sense objects to affect the heart in such a way that the animal perceives them. If this is parallel to the case just discussed, that of an eclipse, the relevant condition would be that of the medium of perception, and the efficient cause would be whatever it is that is responsible for the absence of the appropriate medium.

What are the candidates in the *de Somno* for an efficient cause that would deprive the heart of its proper medium for perception? Since sleep occurs

⁷⁶ *Metaph.* H4, 1044b19–20.

when the corporeal stuff (σώματῳδης) in the blood (or its analogue) descends from the brain to the heart, the chief candidates would be the brain itself, and the corporeal stuff it cools, thereby occasioning its return to the heart.⁷⁷ According to *Somn.* 3, sleep occurs when the exhalation from food eventually flows back upon the heart in a mass. The process is as follows. The exhalation from food initially enters the blood, and eventually makes its way to the region of the heart. After being heated there, it is first carried up by that heat to the brain, and then having been cooled descends downwards toward the heart where it is said to drive away ‘the hot [ἀπώση τὸ θερμόν].’⁷⁸ Scholars do not agree on just what ‘the hot’ is that gets driven away, or how driving it away is supposed to result in sleep. The controversy surrounding this point is mainly concerned with whether the heart is cooled or heated by the returning corporeal material, and what cooling, or heating, do to block occurrent perception.⁷⁹

However, given that one is looking for an efficient cause that blocks perceptual functioning in a way parallel to the blocking of the moon’s light, what is relevant is not how heating or cooling affects the heart, but rather how one or both of these brings about the relevant change in the medium. If sleep is induced by a change in the condition of the medium required for the primary organ to engage in active perception, then just as the moon cannot be seen unless there is a continuous⁸⁰ medium between it and the organ of sight of an observer, so too the external objects of sense perception cannot affect the primary organ of perception unless there is a continuous medium, in the right condition, between the primary organ of sense and the external sense objects.

⁷⁷ In favor of the brain, the *Parts of Animals* tells us that this part “produces sleep in those animals that have one; while in those without one, it is the analogous part. For by cooling the flow of blood from the nourishment, or on account of certain other similar causes, it weighs the region down . . . and makes the heat recede downwards along with the blood. Because of this greater accumulation in the lower region it produces sleep” (II.7, 653a10–17; Lennox translation). However, although the brain is *an* efficient cause, it is not the nearest, most proximate one. Once the blood flows to the brain and is cooled, it reverses direction and heads back down toward the region of the heart. In this way, once the blood has been cooled, the brain has done its part and makes no further contribution to controlling the causal chain that terminates at the heart. The brain is not responsible for what happens to the cooled blood before it enters or after it leaves the brain, and is not what acts on the primary sense-organ. Alternatively, in favor of the corporeal stuff, according to the *de Somno*, the solid stuff that is in the blood and gets cooled in the brain subsequently returns to the heart, which is the primary sense-organ, and when it does so this solid matter is in a condition that causes the heart’s immobilization.

⁷⁸ *Somn.* 3, 456b27.

⁷⁹ For a thorough account of the controversy and related textual issues see Wiesner 1978.

⁸⁰ For this purpose, the distinction between continuity and contiguity is not relevant just so long as all contiguous bodies are in the right condition for perception.

For colors, for instance, to affect the primary sense-organ there must be an actually transparent medium that is continuous between the external object of sight and the eye, and from there all of the way through the pores leading from the eye to the brain, and then through the vessels leading to the heart. Since the optimal conditions for perception occur when the purer and colder blood is in the upper regions of the body and the more turbid blood is in the lower regions, the more these conditions are disrupted, the less optimally the primary sense-organ will function.⁸¹ This is, in fact, what Aristotle thinks happens when nutriment is being digested in the blood. When the exhalation from food enters the blood, the purer and rarer blood gets mixed with the turbid and thicker blood. When blood in this mixed state comes down from the brain in a significant quantity, and displaces the blood in the region of the heart, it is the blood in this mixed state that surrounds the heart. This condition continues until it is fully digested and the animal awakens.

When this partially digested nutriment surrounds the heart, the medium surrounding the heart is not in the condition appropriate for occurrent perception. In fact, it is instead in a condition that is appropriate for the reception of various sensory images that have been stored in the sense-organs. These are conditions that are ideal instead for continuous dreams.⁸² However, once the digestion is complete, and the fine blood has been separated from the thick, optimal conditions for occurrent perception are restored and the animal awakens.⁸³ Prior to waking, the corporeal stuff that has descended from the brain to the heart plays the same kind of role that the earth plays in the explanation of an eclipse. It is what is responsible for the condition of the medium in contact with the underlier not being suitable for occurrent perception. In each case perceptible qualities are thereby prevented from affecting the organ of perception. The main difference is that during eclipses the medium in contact with the sense object is unsuitable for perception, whereas during sleep it is the medium surrounding the heart that is unsuitable. In the latter case, it is this incompletely digested blood that pushes away the blood around the heart, and ends up surrounding the heart itself. Although both heating and cooling are involved in the physiological changes that result in this placement of the partially digested nutriment, neither they nor the brain that does the cooling are sufficient to shut down perception. The nearest, or proximate, cause of this is rather the mixed blood that has come to surround the heart. With respect to the explanation of sleep, the questions as to whether the

⁸¹ See Gregoric 2007, pp. 44–45.

⁸² *Somn.* 3, 461a25–27.

⁸³ *Somn.* 3, 458a10–25.

heart is cooled or warmed are no longer relevant.⁸⁴ Once the medium of perception is changed in such a way that external sense objects no longer are able to affect the primary sense-organ, neither heating nor cooling of the heart itself plays a further causal role in bringing about sleep, although both played crucial roles at earlier, more distant, stages.

Whether this should be accepted as an interpretation of the explanation of sleep in the *de Somno* depends in part on textual issues. I will conclude this section with a brief discussion of a few of these. If we were to follow Ross, and delete the word ὑπὸ from the manuscript reading ἡ ὑπὸ τοῦ σωματώδους, then at the end of *Somn.* 3 Aristotle is stating that the cause of sleep is “the ἀντιπερίστασις of the solid stuff,”⁸⁵ where the ἀντιπερίστασις would have to be the massive reverse flow of the partially digested blood from the brain to the heart. If so, the translation of the entire sentence would then be something like:

It has been said what the cause of sleep is, that it is the massive reverse flow of the corporeal stuff, that is carried up by the natural heat, to the primary organ of perception.⁸⁶

As already noted, Ross takes this corporeal stuff to be the *material cause* of sleep.⁸⁷ He is right to hold that this stuff is something material, and that it plays some causal role in the specification of the efficient cause in this passage. Nonetheless, the *de Somno* never calls it the material cause, and Ross never says what criteria for being a material cause it satisfies. Additionally, if it were the material cause, then the *de Somno* could not be using the causal pattern found in *Metaphysics* H4. The partially digested nutriment is obviously not the primary organ of sense, and it is not the part of the body that is affected when the animal as a whole is asleep.

Alternatively, if the partially digested nutriment that descends from the brain to the heart is what causes the relevant perceptual incapacity, and does so simply by surrounding the heart (and hence depriving the heart of the right kind of medium for occurrent perception), then the ἀντιπερίστασις could not be the reverse flow of the corporeal stuff. In that case it would rather be the encircling compression itself. This is the meaning given by Liddell and Scott for the use of the term in this passage (‘surrounding so as to compress’), and is also how Aristotle uses it in this text from the *Meteorology*:

⁸⁴ Wiesner 1978, pp. 263–67, argues that an explanation in terms of the mixed state of the blood is not only not present in the *Parts of Animals*’ explanation of sleep, but is in fact ruled out by the remark at II.2, 648b1–10 that the hot and cold are causes of sleeping. However, although there are differences between the explanations in the *PA* and in *Somn.*, the accounts may nonetheless at least be consistent since heating and cooling are not the *proximate* causes of sleep.

⁸⁵ *Somn.* 3, 458a25–28. ⁸⁶ *Somn.* 3, 458a25–28. ⁸⁷ Ross 1955, p. 260.

We can see that a surrounding compression [ἀντιπερίστασις] occurs for the hot and cold on each other. Hence in warm weather the lower parts of the earth are cold and in a frost they are warm. The same thing, we must suppose, happens in the upper region, so that in the warmer seasons the cold is concentrated by the surrounding heat and causes the cloud to go over into water suddenly.⁸⁸

Given this understanding of ἀντιπερίστασις, when the mixed blood, after reaching the brain and being cooled, goes back down in a condensed mass to the heart, it is the surrounding compression by blood in the mixed state that is the efficient cause of sleep. This is the very condition that the undigested blood is in when the heart is affected in such a way as to be unable to perceive. In that case, we should retain the ὑπὸ at 458a25, and translate something like this:

It has been said what the cause of sleep is, that it is the massive surrounding compression by the corporeal stuff – that is carried up by the natural heat – upon the primary organ of perception.⁸⁹

Accordingly, just as in the case of an eclipse, the *logos* of sleep too is unclear until accompanied by the efficient cause. Sleep is not “any and every incapacitation of the perceptual part” (456b17–18), just as an eclipse is not just any and every loss of light by the moon. Sleep is rather the incapacitation of the perceptual part that is due to the descended nutriment, the mixed blood that is not yet completely digested, being in the condition of surrounding the heart in such a way as to render it incapable of perceiving. This is parallel to the moon’s loss of light due to the earth being in between the moon and its source of light in such a way as to render it incapable of being seen in the normal way.

Concluding remarks about hylomorphism, teleology and hypothetical necessity

Metaphysics H4 does not discuss the final cause of sleep, nor does it invoke hypothetical necessity. However, both are discussed in both *Somn.* 2, 455b13–34, and *Somn.* 3, 458a27–32, the two passages that Lowe argued are not part of the main treatise, but rather represent some earlier stage in Aristotle’s thinking about the causal explanation of sleep. However, if

⁸⁸ *Meteor.* 1.12, 348b2–8; E. W. Webster translation, modified.

⁸⁹ The last step in this efficient causal chain is described in the following lines, as part of the definition of sleep, as taking hold of the primary sense-organ (τοῦ πρώτου αἰσθητηρίου κατάληψις at 458a28–29).

the interpretation proposed in the preceding section for the explanation of sleep conforms to the pattern in *Metaphysics* H4, we are now in a position to see that that pattern could be augmented consistently with teleology and hypothetical necessity.

When *Somn.* 2 discusses sleep within the context of natural teleology it does so by invoking his claim that nature acts for the sake of something, and in particular acts for the sake of some good. Aristotle tells us that for things that cannot move by nature continuously and ‘with pleasure’ it is both good and necessary that they rest. He is not thereby giving an account of the physiological basis for sleep, but rather is appealing to the good of the animal as a teleological cause of its rest. Periods of inability to perceive that are due to sickness, or other deviant causes, would not restore optimal perceptual functioning. To make clear just what type of inability it is that preserves the animal, one would want an efficient causal story that shows how the right kind of incapacity is brought about in such a way as to preserve the life of a perceptually functioning animal, and this is what the explanation I have proposed accomplishes.

It is also something that the definition of sleep at the end of *Somn.* 3 (458a28 ff) purports to have done:

It has also been stated what sleep is; i.e., that it is a taking hold [κατάληψις] of the primary sense-organ, rendering it incapable of functioning. It occurs of necessity, since it is not possible for an animal to exist, should the conditions that produce it not obtain. Yet it is for the sake of animal preservation. For rest does preserve it.⁹⁰

This is a very particular kind of ‘taking hold.’ Among other things, it is different from the kind of seizure involved in epilepsy. It is a condition of the primary sense-organ that occurs in regular periods of rest that exactly coincide with the digestion of nutriment. During this part of the nutritive cycle optimal perceptual functioning is no longer possible, and sleep ensues. It lasts just so long as the digestive process is still taking place, and the result of successful digestion is what restores the conditions for the animal’s optimal perceptual functioning.

Both by invoking final causality, and by connecting it with hypothetical necessity, these concluding lines of *Somn.* 3 link the regular physiological processes involved both in the digestion of food and the perceptual life of the animal to a broader perspective. Sleep, and its physiological causes, are thereby viewed as part of an ongoing set of processes that regularly and

⁹⁰ *Somn.* 3, 458a25–32.

consistently support and preserve the kind of life that is natural for the animal. In order to live, the animal must ingest food, and convert it into blood, the primary form of nutriment for blooded animals. At the phase of the digestive process during which the mixed blood occupies the region surrounding the heart, the heart is temporarily incapable of functioning in its capacity as the primary organ of perception in the way characteristic of waking perceptual life. However, the perceptive faculty is not simply dormant, but instead functions in a different way that is also part of its perceptual functioning. In this condition it is affected by sensory images that have been stored in the sense-organs, and exercises its capacity of imagination both in dreams and other ways. There is no inconsistency between the more limited perspective of *Metaphysics* H4 and this more expansive view of the animal's life. The former is not some later, and more restrictive, methodology that repudiates or replaces teleological explanation and an associated employment of hypothetical necessity. Rather, it can be used to inquire into and to state the physiological causes of sleep in a way that embeds them in a comprehensive teleological perspective.⁹¹

⁹¹ I would like to thank David Ebrey for advice and critical comments that helped bring this out, and to highlight the connection between *Metaphysics* H4 on matter and the physiological account of sleep in the *de Somno*.