

## THE *DE SOMNO* AND ARISTOTLE'S EXPLANATION OF SLEEP

### I

At the end of the *De Somno*, Aristotle summarizes the results of his investigation of sleep:

What is the cause of sleep has, then, been stated: it is the recoil of the solid matter, carried upwards by the connatural heat, *en bloc* onto the primary sense-organ. Also what sleep is: it is a seizure of the primary sense-organ, making it incapable of activity. It occurs of necessity (for it is not possible for an animal to exist unless the causes which produce it occur), and is for the sake of the animal's preservation, since rest does preserve it. (458a25–32)<sup>1</sup>

If this provides an accurate statement of what he has achieved in the work, Aristotle will indeed have succeeded in explaining this particular affection of the *ψυχή* within the explanatory framework specified for the natural scientist in *De an.* 1.1 (at least, he would have done, if his theory of sleep had actually been true). In contrast to the dialectician, who is concerned only with form, or the type of physicist typified by most of his predecessors, who is concerned only with matter, the genuine physicist must neglect neither. Accordingly, his definitions of composite substances must have this form: 'it is that form in that matter with that purpose or end' (403b6–7).<sup>2</sup> Similarly, the fact that the affections of the *ψυχή* are 'enmattered accounts' (*λόγοι ἐνυλοῖ*, 403a25) has consequences for how they should be defined:

Thus their definitions should be of this kind: anger is some change of this kind of body or part or capacity, brought about by this for the sake of that. (403a25–7)<sup>3</sup>

Aristotle's definition of sleep at the end of the *De Somno* has exactly this form: he identifies the primary sense-organ as the part of the body which is affected—a part identified by reference to the capacity it supports—specifies the nature of the affection, describes what produces it and why it happens. In terms of meeting the requirements of Aristotelian psychology, one would have to judge his investigation of sleep a success.

At least one would, if one accepted the end of the *De Somno* as an accurate summary of the treatise it now concludes—and, surprisingly, this is just what recent commentators have denied. According to what stands in danger of becoming the accepted view, not only should this summation of the work be excised from the text, but the

<sup>1</sup> τί μὲν οὖν τὸ αἷτιον τοῦ καθεύδειν εἴρηται, ὅτι ἡ τοῦ σωματώδους τοῦ ἀναφερομένου ὑπὸ τοῦ συμφύτου θερμοῦ ἀντιπερίστασις ἀθρώως ἐπὶ τὸ πρῶτον αἰσθητήριον· καὶ τί ἐστὶν ὁ ὕπνος, ὅτι τοῦ πρῶτου αἰσθητηρίου κατάληψις πρὸς τὸ μὴ δύνασθαι ἐνεργεῖν, ἐξ ἀνάγκης μὲν γινόμενος (οὐ γὰρ ἐνδέχεται ζῶον εἶναι μὴ συμβαινόντων τῶν ἀπεργαζομένων αὐτό) ἔνεκα δὲ σωτηρίας· σῶζει γὰρ ἡ ἀνάπαυσις. Translations are generally my own, but I have been extremely happy, and grateful, to shadow closely those in J. Barnes (ed.), *The Complete Works of Aristotle: The Revised Oxford Translation* (Princeton, NJ, 1984), as well as D. Gallop, *Aristotle on Sleep and Dreams* (Peterborough, Ontario, 1991).

<sup>2</sup> ἕτερος δ' ἐν τούτοις τὸ εἶδος ἔνεκα τῶν δι.

<sup>3</sup> ὥστε οἱ ὅροι τοιούτοι οἷον 'τὸ ὀργίζεσθαι κίνησίς τις τοῦ τοιουτοῦ σώματος ἢ μέρους ἢ δυνάμειος ὑπὸ τοῦδε ἔνεκα τοῦδε'.

grounds for doing so are that it presents an account of the explanation of sleep which Aristotle did not offer—and indeed should not have offered, given his general theory of physical explanation. Specifically, it has been claimed that Aristotle's requirements on final causation do not permit the teleological explanation of sleep, and that a textually expurgated version of the work—without the summation and without 455b13–34—would not only be better structured, but philosophically more satisfactory. In fact, it is the earlier section, 455b13–34 (the major part of which contains Aristotle's argument for the claim that animals sleep for the sake of their survival) that has been the principal target of recent critical suspicion, but since the end of the *De Somno* makes reference back to the argument there, this too would need to be rejected.

I want here to defend the integrity of the *De Somno* as we have it. There is, I shall argue, no good reason to treat 453b13–34 as an interpolation, and so no reason to lose Aristotle's concluding summary of his investigation, or thus to resist finding that Aristotle's treatment of sleep fulfils the programme set out in the *De Anima*. Although, as I shall indicate, I do not take the objections brought against 453b13ff. to be at all powerful, they do need to be dealt with, and so I shall begin with an outline of them, together with a brief rejoinder. Even here, the discussion cannot be entirely negative: in effect, those who want to excise the passage pose a challenge to those who accept the text as it stands to show that the structure of the argument of the *De Somno* accommodates it without strain, and so I shall need to offer an alternative account of how that argument is structured. If I am right, suspicion of the place of the passage within the *De Somno* arises from a significant misunderstanding of Aristotle's explanatory method, and in the later part of the essay I shall try to show how we should understand both the requirements of that method and its application to the case of sleep in the *De Somno*.<sup>4</sup>

## II

Modern dissatisfaction with the state of the *De Somno* as it has come down to us can be traced back to the introduction to Drossart Lulofs' 1947 edition of the treatises on dreams.<sup>5</sup> Lulofs' approach there to the analysis of the psychological works came from an acceptance of Nuyens' developmental account of Aristotelian psychology. According to that account, Aristotle's theories of the  $\psi\upsilon\chi\acute{\eta}$  fall into three periods: initially, when still under the influence of Plato, he accepted that the  $\psi\upsilon\chi\acute{\eta}$  was a separable substance; then in his middle period (to which belong the biological writings and parts of the *Parva Naturalia*), he located it in the heart; finally, by the time of writing the *De Anima*, he had moved to a hylomorphic account, identifying it with the form of the living body as a whole.<sup>6</sup> Noting that all references to the *De Anima* in *De Somno* occur before 455b13, and that in the second part of the work Aristotle proceeds to cite the heart as the location of movement and perception, Lulofs argued that whilst the first part of the treatise was a late work, written after Aristotle had developed his hylomorphic theory of the  $\psi\upsilon\chi\acute{\eta}$ , the second part must

<sup>4</sup> Those whose interest lies less in the structure of the treatise than in its deployment of Aristotle's physical theory could profitably skip to Section VII.

<sup>5</sup> H. J. Drossart Lulofs, *Aristotelis de insomniis et de divinatione per somnum* (Leiden, 1947), xviff.

<sup>6</sup> F. Nuyens, *L'Évolution de la psychologie d'Aristote* (Louvain, 1948).

have been produced at an earlier stage, when he still took the  $\psi\upsilon\chi\acute{\eta}$  to be located in the heart.

This is not the place to rehearse the arguments concerning the merits or otherwise of Nuyens' version of Aristotle's development as a psychological theorist:<sup>7</sup> for the present purpose, it is sufficient to note that dissatisfaction with the structure of the *De Somno* has survived the general rejection of Nuyens' claims. So, in his more recent discussion of the work, Malcolm Lowe dismissed Lulofs' positive account of the text, but accepted that Lulofs had identified an intolerable discontinuity in the argument at 455b13.<sup>8</sup> To explain what he called the 'Lulofs break', Lowe suggested that we find in the passage from 455b13 to 455b34 a fragment of another work on sleep: 'presumably some editor found this loose fragment lying around and, out of pious respect for every word of the master, tried to fit it in at an appropriate place'.<sup>9</sup> On Lowe's view, however, that place was highly inappropriate. To restore the main body of the *De Somno* to its proper form, one needs to excise that passage, and with it the apparent summation of the argument at the end of the treatise.<sup>10</sup> With these alterations to the existing text effected, 'the *De Somno* suddenly becomes a notably well-organised treatise, and indeed one corresponding very closely to the division of topics specified in its introduction (453b11–17)'.<sup>11</sup>

Like Lulofs, Lowe offered not only structural but doctrinal grounds for finding the transmitted text of the *De Somno* to contain extraneous matter:

Although the fragment is short, there is indeed one striking lesson to be learnt: the main treatise, despite its much greater length, seems to presuppose a much more limited theory of causality. For whereas the fragment boldly starts upon an investigation of the four causes of sleep, the main treatise says nothing at all about two of them, the final and material causes. Even the formal and efficient causes are not independent of each other, since the former *cannot be defined* without specifying the latter (*only* its efficient cause distinguishes sleep from fainting fits, etc.); the formal cause amounts to the final cause *plus* something else. Thus, instead of the well-known four causes, the reader is offered (so to speak) merely one-and-a-half.<sup>12</sup>

However, whilst the fragment is explanatorily more ambitious than the main treatise, Lowe takes it to be less successful, and for that reason. Trying to explain sleep by reference to a final cause was an inappropriate attempt at teleological explanation, since 'the ultimate end of sleep is its *contrary* waking,' and this is in 'striking opposition to Aristotle's well-known tendency to see the formal and final causes as somehow *identical*'. By the time Aristotle came to write the *De Somno*, this explanatory ambition had duly been abandoned, and he was content to take sleep to be susceptible to explanation only in terms of an amalgamation of efficient and formal causation.

Not resting on Nuyens' account of Aristotle's development, but nevertheless offering an explanation of the supposed break in the argument at 453b13, Lowe's

<sup>7</sup> For critical discussion, see W. D. Ross, 'The development of Aristotle's thought', in I. Düring and G. E. L. Owen (edd.), *Aristotle and Plato in the Mid-Fourth Century* (Göteborg, 1960), 1–7; I. Block, 'The order of Aristotle's psychological writings', *AJPh* 82 (1961), 50–77.

<sup>8</sup> M. Lowe, 'Aristotle's *De Somno* and his theory of causes', *Phronesis* (1978), 279–91, see 279–80.

<sup>9</sup> Lowe (n. 8), 286.

<sup>10</sup> 'The same or a later editor either adjusted the final recapitulation appropriately, or was indeed the composer of this recapitulation' (Lowe [n. 8], 286).

<sup>11</sup> *Ibid.* 285.

<sup>12</sup> *Ibid.* 286.

interpretation of the *De Somno* has, it seems, proved appealing.<sup>13</sup> So, at the start of his commentary on the *De Somno*, David Gallop asserts simply that Lowe ‘has shown that one passage, 415b13–34, is an insertion from an alternative, and probably earlier, draft of the work, and that the concluding resumé (458a25–32) is also extraneous to the main treatise’.<sup>14</sup>

### III

It will be helpful to start by citing the passage which Lowe and Gallop claim to be an interpolation:

It must be stated through what cause sleep occurs, and what sort of thing the affection is. Now, since there are several kinds of cause (for we say that that for the sake of which, the source of change, the matter and the form are all causes), in the first place, then, as we say that nature acts for the sake of something, and that this is some good, and that for anything which naturally changes, but which is not capable of changing always or continuously with pleasure, rest is both necessary and beneficial; and since, in the light of the truth itself, people apply this metaphor to sleep, that it is rest; it follows that sleep is for the preservation of animals. But being awake is the end, since perceiving and thinking are the end for all things to which either belongs, for these are the best things, and the end is what is best, so that it is necessary for sleep to belong to every animal. I mean here hypothetical necessity; that if there is to be an animal having its own proper nature, certain things must belong to it of necessity; and because these belong so will certain others. Next it must be stated from what kind of change or action occurring in their bodies, sleep and waking come about in animals. It should be accepted that the causes of the affection in other animals are as they are in sanguineous animals—either the same or analogous—and that the causes in these are those in man. (455b13–34)<sup>15</sup>

It would, of course, be difficult to doubt the Aristotelian provenance of this passage: the explanatory machinery is too obviously fully Aristotle's own. Why, then, should it seem to Lowe and Gallop so alien in its present context? Lowe sums up his position thus: ‘the section of text between 455b13 and 455b34 is preceded and succeeded by sharp discontinuities, while the intervening material is almost entirely duplicated elsewhere in the *De Somno*. Quite evidently, this section is a fragment of

<sup>13</sup> So, whilst Lowe's account is in a certain sense ‘developmental’, in that it posits a development in Aristotle's views, it does not presuppose any general change in Aristotelian psychological doctrine: the development in question is restricted to Aristotle's beliefs about how one might explain sleep.

<sup>14</sup> Gallop (n. 1), 118, with my italics. He also (at 127), finds convincing the claim that Aristotle had abandoned the ambition to explain sleep teleologically by the time of writing the main treatise.

<sup>15</sup> δι' ἣν δ' αἰτίαν συμβαίνει τὸ καθεύδειν, καὶ ποῖόν τι τὸ πάθος ἐστὶ, λεκτέον. ἐπεὶ δὲ τρόποι πλείους τῆς αἰτίας (καὶ γὰρ τὸ τίνας ἔνεκεν, καὶ ὅθεν ἢ ἀρχὴ τῆς κινήσεως, καὶ τὴν ὕλην καὶ τὸν λόγον αἴτιον εἶναι φαμεν) πρῶτον μὲν οὖν ἐπειδὴ λέγομεν τὴν φύσιν ἕνεκά του ποιεῖν. τοῦτο δὲ ἀγαθόν τι, τὴν δ' ἀνάπαυσιν παντὶ τῷ πεφυκότι κινεῖσθαι, μὴ δυναμένῳ δ' αἰεὶ καὶ συνεχῶς κινεῖσθαι μεθ' ἡδονῆς, ἀναγκαῖον εἶναι καὶ ὠφέλιμον, τῷ δὲ ὕπνῳ αὐτῇ τῇ ἀληθείᾳ προσάπτουσι τὴν μεταφορὰν ταύτην ὡς ἀναπαύσει ὄντι- ὥστε σωτηρίας ἕνεκα τῶν ζώων ὑπάρχει. ἢ δ' ἐργήγορσις τέλος· τὸ γὰρ αἰσθάνεσθαι καὶ τὸ φρονεῖν πᾶσι τέλος οἷς ὑπάρχει θάτερον αὐτῶν. βέλτιστα γὰρ ταῦτα, τὸ δὲ τέλος βέλτιστον, ὥστε ἀναγκαῖον ἐκάστῳ τῶν ζώων ὑπάρχειν τὸν ὕπνον. λέγω δ' ἐξ ὑποθέσεως τὴν ἀνάγκην, ὅτι εἰ ζῶον ἔσται ἔχον τὴν αὐτοῦ φύσιν, ἐξ ἀνάγκης τινα ὑπάρχειν αὐτῷ δεῖ, καὶ τούτων ὑπαρχόντων ἕτερα ὑπάρχειν. ἔτι δὲ ποίας κινήσεως καὶ πράξεως ἐν τοῖς σώμασι γιγνομένης συμβαίνει τό τε ἐργηγορέναι καὶ τὸ καθεύδειν τοῖς ζώοις, μετὰ ταῦτα λεκτέον. τοῖς μὲν οὖν ἄλλοις ζώοις καθάπερ τοῖς ἐναίμοις ὑποληπτέον εἶναι τὰ αἷτια τοῦ πάθους ἢ ταῦτ' ἢ τὰ ἀνάλογον, τοῖς δ' ἐναίμοις ἄπερ τοῖς ἀνθρώποις· ὥστε ἐκ τούτων πάντα θεωρητέον. (I have accepted with Gallop ὥστε for Ross's ἐτι δ' at 455b25.)

an alternative version of the *De Somno* which has mistakenly found its way into its present place'.<sup>16</sup>

We can divide the passage into three sections: the first (455b13–16) announces the investigation of the aetiology of sleep and outlines the doctrine of the four causes, whilst the second (455b16–28) specifies the final cause of sleep, and the third (455b28–34) turns to the investigation of the bodily changes which give rise to sleep. According to Lowe, each part is objectionable, either in its own terms, as with the teleological explanation of sleep, or as the occupant of its current position in the *De Somno*. Thus, since the first part gives 'the promise of a discussion of the four causes of sleep', and this promise goes unfulfilled, this is a good sign that it is extraneous to the treatise.<sup>17</sup> However, rejection of the first part requires rejection of the second, since they are not grammatically independent: the discussion of the final cause begins with a sentence which is the apodosis of the conditional sentence whose protasis contains the promise of the discussion of the four causes. Moreover, the 'substance' of the account of the final cause 'is actually duplicated *elsewhere* in the *De Somno*, and in a barely disguised form'. As for the third part, it begins with a further duplication—the 'announcement that an account of the efficient cause is about to begin'—which is followed by a passage which marks 'a second discontinuity in the discussion, one which is as fundamental as the "Lulofs break", though a little better disguised'. The problem here is that the announcement of the investigation of the efficient cause at 455b28f. 'is not followed by any discussion of this cause whatsoever', but rather by the procedural claim that 'the case of bloodless animals is the same as that of sanguineous ones, while that of these is the same as that of men, so that it suffices to consider the latter'. However, the discussion in the remainder of chapter 2 (to 456a29), fails to follow this procedure, since it 'is concerned *not* with men in particular, but rather equally with sanguineous and bloodless animals'. Then, at 456a30, the start of chapter 3, Aristotle announces again that he will state the efficient cause of sleeping. In the light of all this, Lowe feels confident that of the progression between 455b28–34 and what follows it, 'a more severe break than this there could hardly be'.<sup>18</sup>

#### IV

According to Lowe, then, we should dispense with the first section because it gives an explanatory commitment which goes unfulfilled by the work as whole: to excise this

<sup>16</sup> Lowe (n. 8), 285.

<sup>17</sup> Lowe (n. 8), 284. All the citations from this article in the remainder of the present section are from pp. 284–5, and the several italicizations are his own.

<sup>18</sup> In principle, one might bow to Lowe's arguments against some sections of the passage whilst remaining unmoved by others. Accepting that the first two sections stand or fall together, one might still hold onto those whilst accepting that the third section has to go, or retain that whilst dispensing with the material on the four causes and the purpose of sleep. That Lowe argues for a break in the argument at 455b34 supports the claim that any break at 455b13 is to be explained by the interpolation of an extraneous passage of text—but, if we do not find that argument persuasive, this will not in itself cast doubt on the presence of the Lulofs break, any more than denying that would show that the transition at 455b34 is seamless. Even if one thinks that Lowe's arguments have some cumulative force, it is nevertheless helpful to keep in play the fact that the passage need not stand or fall as a whole. In fact, I shall not try for either of these less radical options, and shall argue that the whole passage should be retained; but those who are unconvinced by particular points in the defence should not feel that the only alternative to keeping all of it is to keep none.

will require losing the account of the final cause, but this is unproblematic since there are in any case both textual and doctrinal reasons for denying its proper place in the treatise. It may not have gone unnoticed, however, that there is a certain tension between Lowe's textual and his doctrinal grounds for rejecting the account of the final cause here. For, doctrinally, he thinks that the passage commits Aristotle to a substantive teleological claim that violates the principles of final causation, but textually he argues that in fact the 'substance' of the section merely duplicates material found elsewhere in the *De Somno*. It is difficult reasonably to object to the passage both because it contains nothing significant that would be lost by its excision and because it contains a substantive claim that one thinks Aristotle had reason to abandon. If we are to provide him with an effective line of criticism here, we should adapt his formulations, which were no doubt incautious, to say just that much of the material is duplicated elsewhere, and that what is particular to the section is unwelcome.

This would certainly be an effective claim if true, but it is not. That Aristotle takes the final cause of sleep to be waking certainly goes against any tendency he might have to identify the final cause of a change with its formal cause, but the easy response to this is, of course, that whilst one may go against, one cannot violate a tendency, since tendencies do not present the requisite normative constraints. Happily, the easy response here is sufficient. There is nothing either in the notion of a final cause, nor in Aristotle's discussions of teleological explanation, that causes any difficulty for the possibility that the final cause of a change may differ from its formal cause, or even be its contrary. We remember, for instance, that when Aristotle introduces final causes in *Ph.* 2.8, the example he gives is of someone's walking in order to be healthy, and here the end of the action is certainly distinct from what it is to act in that way. Again, in the standard cases of hypothetical necessity, what is necessitated is that something—an axe or an eye, say—should have a certain material constitution: the coming into being of something with a particular material nature is explained as being for the existence of something of a certain form, and any attempt to identify the material nature of a substance with its form would certainly violate basic principles of Aristotelian metaphysics.

There is thus no principled objection to Aristotle's explaining sleep as occurring for the sake of the activity of waking, and so for the preservation of the animal which sleeps. Nor does this teleological explanation duplicate what he says elsewhere in the *De Somno*. What he has said before, when addressing the question of whether there might be animals which are always awake, is this:

Since it is necessary for the things which have a characteristic function by nature to lose the capacity when they go beyond the time for which they can do something, and to cease to do this, as eyes in respect of seeing; and similarly the hand, and everything else which has a function; so, if perceiving is the function of some thing, then this too, when it goes beyond whatever is the time for which it is capable of perceiving continuously, will lose its capacity and do this no longer. (454a26–32)<sup>19</sup>

<sup>19</sup> ἐπεὶ ὅσων ἔστι τι ἔργον κατὰ φύσιν, ὅταν ὑπερβάλλῃ τὸν χρόνον ὅσον δύναται τι ποιεῖν, ἀνάγκη ἀδυνατεῖν, οἷον τὰ ὄμματα ὁρῶντα, καὶ παύεσθαι τοῦτο ποιοῦντα, ὁμοίως δὲ καὶ χεῖρα καὶ ἄλλο πᾶν οὗ ἔστι τι ἔργον. εἰ δὴ τινὸς ἔστιν ἔργον τὸ αἰσθάνεσθαι, καὶ τοῦτο, ἂν ὑπερβάλλῃ ὅσον ἦν χρόνον δυνάμενον αἰσθάνεσθαι συνεχῶς, ἀδυνατήσῃ καὶ οὐκέτι τοῦτο ποιήσει. Hugh Johnstone has suggested to me that οἷον τὰ ὄμματα ὁρῶντα in 454a28 looks like a scribal addition, and this seems plausible. Not only will the sentence run much better without it, but there would be a certain inelegance in Aristotle's using a perceptual



It is true that Aristotle here introduces the idea of capacities which cannot be indefinitely exercised, and claims that perception is one of these—but he says nothing at all here to suggest that the loss of perceptual capacity, which is sleep, occurs for the sake of the exercise of the capacity.<sup>20</sup> Indeed, rather than finding this passage to provide a worrying overlap with the later treatment of the final cause, the progression to that later discussion has a certain argumentative elegance. Having already established that perception is the kind of capacity that cannot be exercised continuously, so that anything which perceives must also undergo periods when it cannot do so, Aristotle is able to utilize this to make the further move that the periods of the loss of the capacity actually occur for the sake of, and so are necessitated by, its exercise. Both doctrinally and textually, the second section of the passage is unobjectionable.

## V

What, then, of the objections to the first section: that its beginning effects a sharp break with what precedes it, and that its promise of a full explanation of sleep in terms of all four causes is not fulfilled by the *De Somno*, even with the disputed passage included? In fact, Aristotle does nothing so specific at 455b13ff. as to signal that he will provide all four kinds of explanation of sleep. To see what he is doing here, and how it follows on from what precedes it, one needs to consider what has so far been achieved in the *De Somno*. At the very start of the work, Aristotle presents a series of questions which his account of sleep should answer (453b11–17): what are sleep and waking and are they specific to the *ψυχή* or the body or common to both? If common, to what part of the *ψυχή* and body do they belong? What is the reason why animals sleep? Do all animals have episodes of both sleep and waking, or are there some which have only one, or even neither? In the first chapter, Aristotle has determined the answers to all but one of these questions: it is common to the body and the *ψυχή*; all animals must both sleep and be awake (though not, of course, simultaneously); sleep is the ‘fettering or immobilisation in a certain way of perception’,<sup>21</sup> whilst being awake is its ‘release’.<sup>22</sup>

With these questions answered, Aristotle can move to the remaining question of what causes sleep: ‘We must now investigate why it is that one sleeps or wakes, and in virtue of what sort of sense (or what sorts, if more than one) those states occur’ (455a4–5).<sup>23</sup> That he here couples this question with the task of determining which sense is responsible for sleep is not haphazard. The perceptual system is complex both formally and materially, consisting of the individual senses and, as he will now argue, a common sense that is responsible for perceptual awareness. Thus, to say, as he just has done, that sleep consists in the immobilization of perception must be provisional;

example here, when what he is establishing is a generalization to support a conclusion about perception.

<sup>20</sup> So, Gallop’s commentary on 454a26–9, that ‘if the later account [i.e. 455b16–28] is an insertion into the text of a fragment from an earlier draft of the *De Somno*, the present argument is merely a reformulation of the idea that sleep has a ‘final cause’, in order to serve Aristotle’s present purpose’ cannot be right (Gallop [n. 1], 122). One does not reformulate an argument by removing its key step. It is rather that when Aristotle later comes to consider why we sleep he builds on the weaker claim which he has made earlier.

<sup>21</sup> ὁ γὰρ ὕπνος πάθος τι τοῦ αἰσθητικοῦ μορίου ἐστίν, οἷον δεσμός τις καὶ ἀκνησία . . . (454b9–10).

<sup>22</sup> τὸ ἐγρηγορεῖν ὥρισται τῷ λελύσθαι τὴν αἴσθησιν (454a32–b1).

<sup>23</sup> Διὰ τί δὲ καθεύδει καὶ ἐγρήγορε καὶ διὰ ποίαν τινὰ αἴσθησιν ἢ ποίας, εἰ διὰ πλείους, σκεπτέον.

to be made properly precise by specifying which part of the system is immobilized in sleep. Since sleep requires the total incapacitation of the senses, he argues that this is best explained by taking it to be the immobilization of the common sense, located in the central controlling organ in the heart: when this is incapacitated none of the five senses can exercise their common capacity for perceptual awareness, whilst incapacitation of any individual sense does not affect any other part of the perceptual system.

Determining the common sense as that which is responsible for sleep is not a distraction from the investigation of the causes of sleep. It is not until this is done that Aristotle can determine which organ is involved in sleep, and this is an essential move in fulfilling the explanatory programme. As we have seen from *De Anima* 1.1, the physicist must specify not only the form of psychological substances and affections, but the matter as well, and to do that he must locate the relevant capacities to the material structures which support them.<sup>24</sup> In order to determine the cause, or causes, of sleep, Aristotle needs to determine which part of the perceptual system is affected, and this requires first that he should specify what is the relevant sense, and then what its organ is. This is achieved by 455b2. He is then able also to refine his account of what sleep is. As he points out here, there are cases of perceptual incapacity which do not count as sleep—such as fainting or when someone falls unconscious because pressure is applied to the veins in his neck (455b5-8)—which is why sleep cannot be identified with just any loss of perceptual awareness. Now, having determined which organ is affected in sleep, he can make more precise his earlier claim that sleep is the fettering in a certain way of perception (454b25-7): 'but it occurs, rather, when the incapacity for use happens in neither any chance sense-organ, nor from just any cause, but, as was just said, in the primary organ by which one perceives everything' (455b8-11).<sup>25</sup>

With this established, Aristotle can properly pick up the question which led to the investigation of the organ responsible for sleep, which he does at 455b13, the start of the disputed passage: 'it must be stated through what cause sleep occurs, and what sort of affection it is' (455b13). This is just what is required at this point. Not only can he now properly take up the question of the causation of sleep, necessarily delayed from 455a4, but it has become clear that specifying the cause of sleep will also be to show what kind of affection it is. He had established that it is not just any incapacitation of perception, but one which occurs in some particular sense-organ for some particular cause. Having now established which organ that is, he can complete the physical definition of sleep by identifying its cause. Far from there being an intolerable discontinuity in the argument at this point, its course is seamless.

As for the complaint that the promise of a four-fold explanation of sleep is not fulfilled by the *De Somno*, this is easily dealt with, since the passage delivers no such promise, explicitly or otherwise. Aristotle does set out his distinction between the different 'causal' relations, but this is not to require that he should cite causes of all four types for sleep—though he may do that—but rather to allow for clarification of his claim that he is about to state the cause of sleep. For of course one may do that in

<sup>24</sup> According to Lowe (n. 8), 285, it is not until 455b34-456a29 that Aristotle turns to the question of which organ is responsible for sleep, but this is to confuse the question of determining what the organ is, which can be specified by reference to the capacity which defines it, and determining its material properties, such as its location. It is the latter which Aristotle pursues at 455b34f.

<sup>25</sup> ἀλλ' ὅταν ἡ ἀδυναμία τῆς χρήσεως μήτ' ἐν τῷ τυχόντι αἰσθητηρίῳ, μήτε δι' ἣν ἔτυχεν αἰτίαν, ἀλλά, καθάπερ εἴρηται νῦν, ἐν τῷ πρώτῳ ᾧ αἰσθάνεται πάντων.



more than one way. There will be no inconsistency in the *De Somno* if in fact sleep turns out not to be susceptible to all four kinds of explanation. The point is rather that one will need to be clear about the nature of whatever explanations one does provide for it—a moral which, as we shall see, is not one to which Aristotle's commentators have paid sufficient attention.

## VI

What, then, of Lowe's objections to the third section of the passage? One of these was that Aristotle's procedural claim at (455b31–4)—that one can focus on the case of humans, since the causes of sleep in their case are the same as that for sanguineous animals, and so the same as, or analogous to, those in the case of bloodless animals—is not followed through. Now, it is certainly true that in what follows, Aristotle does not focus on the aetiology of human sleep in particular, but it is hardly obvious that *τούτων* in 455b33 picks up *ἀνθρώποις* rather than *ἐναίμοις*. Indeed, given that it is sanguineous animals that are said to be relevantly similar both to bloodless animals and to humans (themselves sanguineous animals, of course), it is more natural to take *τούτων* here to pick up *ἐναίμοις*. If we do so, then Aristotle's procedural claim is not ignored in the discussion which follows, since he does indeed focus on the physiology of sanguineous rather than bloodless animals.<sup>26</sup>

However, the more prominent mark of the claimed discontinuity between the third section of the disputed passage and what follows it is, according to Lowe, that whilst the text as it stands has Aristotle announce the investigation of the efficient cause of sleep at 455b28–30, this is not followed by any such investigation, but rather by his arguing, as we have just seen, that the heart is the origin of perception. For that aetiological investigation, we have in fact to wait until 456a30ff. (the start of chapter 3), when Aristotle again declares that he will give the efficient cause of sleep, and this time goes on to do so. By getting rid of the disputed passage, the embarrassment presented by the currently redundant announcement of the efficient cause at 455b28 will be avoided, and Aristotle's interest in efficient causation can be restricted to the final part of the work, where it is actually contained.

Of Lowe's objections to the passage, this seems the most compelling. There is certainly more than an air of duplication between the claim at 455b28 that 'it must be stated from what kind of change or action occurring in their bodies, sleep and waking come about in animals', and 456a30: 'Following on from what has been said, it remains to consider, for both waking and sleeping, what occurrences give rise to the affection, and from what does it have its origin.'<sup>27</sup> It also true that what comes between these in the text seems to have little to do with the investigation of the efficient cause of sleep. To see why this is not a sustainable objection to the text, one

<sup>26</sup> It is true that at 456a12–5 he distinguishes between sanguineous animals, which breathe, and bloodless animals which use their innate breath, and it might seem that were he following the procedure laid down at 455b31–4, he would not mention bloodless animals at all here. However, the crucial move is to locate the primary sense-organ in the heart, the same part of the body which is also responsible for movement, breathing and cooling generally, and this does focus on the case of sanguineous as opposed to bloodless animals. The claim about the bloodless animals' use of their innate breath is a subsidiary one, made to confirm that their case is not relevantly different. When Aristotle turns to set out the physiological explanation of sleep in chapter 3, he duly pays no attention to bloodless animals.

<sup>27</sup> 'Εόμενον δὲ τῶν εἰρημένων ἔστιν ἐπελθεῖν τίνων γιγνομένων καὶ πόθεν ἡ ἀρχὴ τοῦ πάθους γίγνεται, τοῦ τ' ἐγρηγορέναι καὶ τοῦ καθεύδειν.

needs finally to turn to the question of what kinds of explanation Aristotle does in fact provide for sleep.

## VII

When Lowe describes Aristotle as announcing the investigation of the efficient cause of sleep, this is, of course, interpretative. Aristotle himself talks rather of the changes and actions in the body in virtue of which sleep occurs (at 455b29), and (at 456a30) of the occurrences (*γιννομένων*) which are the source (*ἀρχή*) of sleep, without making it explicit which of the four types of causation he is investigating. It may well seem, however, that taking his explanatory concern in these passages to be with efficient causation is, whilst a matter of interpretation, only lightly so. Gallop, in his commentary on the *De Somno*, voices a common thought when he says that, of Aristotle's four causes, 'the modern English 'cause' covers, at best roughly, only the "efficient cause"'.<sup>28</sup> It is not quite clear how significant the qualification there is supposed to be, but if one were to assimilate efficient causation to causation as we standardly think of it, then it will be natural enough to find Aristotle's interest at 455b29 and 456a30 to be with the efficient causes of sleep. For modern causal explanation is concerned with specifying those events whose occurrence brings about the event to be explained, and this, it seems, is just what Aristotle claims to be investigating in these places. Certain things have to happen in the body for sleep to occur, and these events will be what bring sleep about. These will be the cause of sleep, and if to give the cause of sleep is, in Aristotelian terms, to give the efficient cause of sleep, then they will be, as Lowe and Gallop assume, the efficient cause of sleep.

Aristotle begins his discussion of the aetiology of sleep by summarizing what happens in nutrition (456b1–5), and then uses this as basis for distinguishing sleep from other kinds of general perceptual incapacity:

Yet, as we said, not every incapacity of the perceptual part is sleep; rather this affection comes about from the exhalation involved in nutrition. For it is necessary that what is exhaled must continue to some point and then turn back and change course, like the Euripon. Now in every animal the hot matter naturally rises upwards; but when it has reached the upper areas, it turns back again in a mass and moves downwards. That is why episodes of sleep occur especially after food: it is because the matter, both liquid and solid, rises in a dense mass. This, then, while static, weighs down and causes nodding. But when it has descended again, and by returning has repelled the hot matter, at that point sleep ensues and the animal falls asleep. (456b17–28)<sup>29</sup>

He can then conclude at 457a33: 'So it is clear from what has been said that sleep is a sort of concentration or natural reflux of the hot matter due to the cause specified' (457a33–b2).<sup>30</sup>

<sup>28</sup> Gallop (n. 1), 127.

<sup>29</sup> ἀλλὰ γάρ, ὥσπερ εἵπομεν, οὐκ ἔστιν ὁ ὕπνος ἀδυναμία πάσα τοῦ αἰσθητικοῦ, ἀλλ' ἐκ τῆς περὶ τὴν τροφήν ἀναθυμιάσεως γίγνεται τὸ πάθος τοῦτο· ἀνάγκη γάρ τὸ ἀναθυμιάμενον μέχρι τοῦ ὠθεῖσθαι, εἴτ' ἀντιστρέφει καὶ μεταβάλλειν καθάπερ Εὐριπον. τὸ δὲ θερμὸν ἐκάστου τῶν ζώων πρὸς τὸ ἄνω πέφυκε φέρεσθαι· ὅταν δ' ἐν τοῖς ἄνω τόποις γένηται, ἀθρόον πάλιν ἀντιστρέφει καὶ καταφέρεται. διὸ μάλιστα γίνονται ὕπνοι ἀπὸ τῆς τροφῆς· ἀθρόον γάρ πολὺ τὸ τε ὕγρὸν καὶ τὸ σωματώδες ἀναφέρεται. ἰστάμενον μὲν οὖν βαρύνει καὶ ποιεῖ νυστάζειν· ὅταν δὲ ῥέψῃ κάτω καὶ ἀντιστρέψῃ ἀπώσῃ τὸ θερμὸν, τότε γίγνεται ὁ ὕπνος καὶ τὸ ζῶον καθεύδει.

<sup>30</sup> ὥστε φανερόν ἐκ τῶν εἰρημένων ὅτι ὁ ὕπνος ἐστὶ σύννοδος τις τοῦ θερμοῦ εἶσω καὶ ἀντιπερίστασις φυσικὴ διὰ τὴν εἰρημένην αἰτίαν. The details of Aristotle's explanation of sleep, and hence of his account of what sleep in fact is are obscure and controversial. Both

This explanation of sleep, however, suffers from a *prima facie* problem of principle, which Aristotle must deal with:

It is after meals that sleep occurs most heavily; and wine and other such things containing heat are soporific. Yet it is not reasonable that sleep should be a cooling process, when the things that cause sleeping are hot. (457b6–10)<sup>31</sup>

One does not, of course, have to be committed to any substantive theory of causation to find it worrying that one should try to explain a process of cooling by taking it to be the consequence of the presence of something hot. It is a fact of experience that hot things heat colder things and cold things cool hotter things. For Aristotle, however, this is supported by more than experience: as Gallop points out, it goes against the idea that the efficient cause of a change should itself possess the property which the change is a change towards.<sup>32</sup> This causal principle is not the result of inductive inference from experience of causal relations, but rather a principled solution to the problem Aristotle found in his predecessors as to whether the agents and patients of change should be like, or unlike, each other. His own solution is that they can neither be entirely like nor entirely unlike each other: each must have the relevant material to support the same form, but for one to be such as to act on the other, the patient must lack the form possessed by the agent. Even in the case of changes brought about by human action, as when someone who possesses a productive art such as medicine, what is produced will have the form known by the person who produces it.

It is strange, however, that Gallop can recognize Aristotle's concern that his account might appear to violate this requirement on efficient causation, and yet not worry that this will also cause difficulties for taking the kind of physiological processes specified in Aristotle's explanation of sleep to stand as its efficient causes. As a psychological affection, sleep cannot be defined simply by reference to its form, which is why Aristotle's definition of sleep cannot be completed until he has determined its causes; but it is certainly no part of the form of sleep that it is a cooling process. That form is rather what is given in chapter 1: it is the incapacitation of perception. If there is to be an efficient cause of sleep that meets the constraints on efficient causation, then this would be need to be something which itself had the form of sleep—and certainly nothing cited by Aristotle in the *De Somno* satisfies that condition.<sup>33</sup>

## VIII

To see what Aristotle is doing here, it is helpful to attend to the way he introduces his discussion at 455b28: he will specify the change and action *in the bodies* of animals

ancient and modern commentators have disagreed over whether he thinks that sleep is the result of the heart's being warmed or cooled. Fortunately, since our interest is merely with what kind of explanation Aristotle is offering, this does not have to be resolved here, but for a very helpful survey of these debates, see J. Wiesner, 'The unity of the *De Somno* and the physiological explanation of sleep in Aristotle', in G. E. R. Lloyd and G. E. L. Owen (edd.), *Aristotle on the Mind and the Senses* (Cambridge, 1978), 241–80.

<sup>31</sup> καίτοι τοῦτό τις ἀπορήσειεν ἂν, ὅτι μετὰ τὰ σιτία ἰσχυρότατος ὁ ὕπνος γίγνεται, καὶ ἔστιν ὑπνωτικά οἶνος καὶ ἄλλα θερμότητα ἔχοντα τοιαῦτα, ἔστι δ' οὐκ εὐλογον τὸν μὲν ὕπνον εἶναι κατάψυξιν, τὰ δ' αἰτία τοῦ καθεύδειν θερμά.

<sup>32</sup> Gallop (n. 1), 133. For this account of efficient causation, see *Gen. corr.* 1.7.

<sup>33</sup> Given that sleep is not infectious, it would seem that the only plausible candidate for an efficient cause of sleep would be, say, a doctor who knew how to put people or animals to sleep.

such that when these happen, sleep occurs. This itself should have alerted Aristotle's critics to the fact that whatever his explanatory interest here, it is not in the efficient causation of sleep. We have seen that he begins the treatise with the question of whether sleep is particular to either the  $\psi\upsilon\chi\eta$  or the body, or is rather common to both—and it is clear from this, as well as from the first chapter of the *De Anima*, that by 'body' here, he does not have in mind the living body which is the animal, but rather what materially constitutes it. Living bodies, whether animals or the organic parts of animals, are the psychologist's subject matter: any such body will have a form, which is its  $\psi\upsilon\chi\eta$ , and a material constitution, and the psychologist must investigate both. That was the moral of the psychological definitions cited from *De Anima* 1.1 in Section I above. So, when Aristotle talks of bodily changes, as when he refers to the boiling of the peri-cardial blood in the example of anger in *De Anima* 1.1, he is not dealing with changes whose proper subject is the living creature, but rather with changes that occur to material parts of that creature. A heart is itself something which is a living body, a combination of form and matter, but it is also (and, on Aristotle's view, necessarily) a material part of the animal whose heart it is.<sup>34</sup> When the heart is affected in a certain way, this is a change to the matter of the animal, whereas sleep is a change in respect of the animal itself, since it is an alteration in respect of the capacity for perception, and having that capacity is (part of, in the case of human animals) what it is to be that animal. In seeking to explain perceptual changes by reference to physiological events, Aristotle is not concerned with efficient, but with material, causation.<sup>35</sup>

Perhaps because Aristotle himself is so concerned to attack his scientific predecessors' exclusive reliance on material causation, and perhaps also because of the modern tendency to treat the explanation of change by reference to necessitating events monolithically as causal explanation, the role and nature of material causation in Aristotle's science has been both neglected and generally misunderstood. Gallop, in his commentary on the *De Somno*, characterizes the role of material causation in physical science as when we 'explain the properties of an item in terms of its material constitution'.<sup>36</sup> It is not quite clear here just how limited the extension of 'item' is intended to be, but one would more readily take it to include materially constituted substances than events. Moreover, this would be a natural way to understand its role if one were to try to assimilate efficient causation to causation as we now think of it, since efficient causal explanation would then mop up all events which were part of the necessitating conditions for the event to be explained. It is, I suspect, often at least

<sup>34</sup> See *Gen. an.* 1.1, 715a9–11.

<sup>35</sup> This was partially seen by Ross, who claims in his commentary on the *De Somno* that Aristotle 'makes it plain that the material cause is the hot matter contained in food (457a33–b1)', *Aristotle, Parva Naturalia* (Oxford, 1955), 260. Gallop, who believes that Aristotle does not deal with the material cause of sleep anywhere in the *De Somno* responds that 'there is no indication in the text that a "material cause" for sleep is being identified'. One wonders quite what sort of indication could satisfy him, or what sort of thing he would count as a material causal explanation if not the sort of thing we find in chapter 3 of the *De Somno*. Ross does not quite see what is going on either, though, taking Aristotle to be concerned until 457a33 with efficient and not material causation. The clue may lie in the fact that he takes the material cause to be the hot matter, assuming perhaps that a material cause has to be a material substance and that all explanation which makes reference to changes must be efficient-causal explanation. Understanding material causation in this way, however, he has to distort what Aristotle says at 457a33 in order to find it there, since it is not the hot matter itself which is said to be the cause, but its inward concentration.

<sup>36</sup> Gallop (n. 1), 127.

tacitly assumed that of Aristotle's four causes, only the efficient and final causes enter into the explanation of events, and that the role of the formal and final causes is rather in the explanatory analysis of substances. This is not, however, how Aristotle sees things when he introduces the doctrine of the four causes in *Physics* 2.3: there, all four kinds of cause are given as providing explanations of natural *changes*. This is well motivated. Given that he does distinguish between a material substance and the matter which constitutes it, we should expect that changes which occur to the substance itself should require, and be necessitated by, changes to its constituent material. This indicates the need to distinguish between the formal changes a substance undergoes—changes of which the substance is capable in virtue of being the kind of substance it is—and changes to the material parts of a substance. So, perception, for instance, will be a formal change, whilst alteration of the sense-organs—the heating or cooling of the organ of touch, for instance—will be a material change. The role of material-causal explanation will be to show how changes to the substance itself are determined by causes to its material parts.

The difference, and yet close connection, between formal and material changes is well illustrated in Aristotle's discussion of growth. This is helpful, because whilst growth might well seem initially to be a purely material change, it is in fact something that living things undergo in virtue of being alive. So, in *De Anima* 2.4, growth is duly cited as something for which the *ψυχή* is the efficient cause (415b25–8), indicating that this is a change that is undergone by the substance itself. This is confirmed by Aristotle's most sustained discussion of it, in *Gen. corr.* 1.5, where, after uncovering the problems which a theory of growth has to solve, he begins his own account precisely by pointing to the relevance of the distinction between matter and form:

We must grasp the cause, having already determined, first, that the non-homoeomerous parts grow by the growth of the homoeomerous parts (for every thing is composed of these); and, secondly, that flesh, bone, and every such part—like every other thing which has its form in matter—has a twofold nature; for both the matter and the form are called flesh or bone.

(321b16–22)<sup>37</sup>

This, it seems, enables Aristotle to make sense of one of the *phainomena* of growth, that 'every part of [the growing thing] has become larger' (321a2–3):

Now, that any and every part should grow—and grow by the accession of something—is possible in respect of form but not in respect of matter. For we must think of the process as being like what happens when a man measures water with the same measure; for what comes-to-be is always different. And it is in this way that the matter of the flesh grows, it isn't added to just every bit of it, but some flows out and some flows in. There is, however, an addition to every part of its shape, i.e. its form.

(321b22–8)<sup>38</sup>

What is important here for the present purpose is that, even in the case of growth, Aristotle distinguishes the change which occurs to the substance—its growing—from

<sup>37</sup> ληπτέον δὲ τὸ αἴτιον διορισσάμεναις πρῶτον ἔν μὲν ὅτι τὰ ἀνομοιομερῆ αὐξάνεται τῷ τὰ ὁμοιομερῆ αὐξάνεσθαι (σύνκειται γὰρ ἐκ τούτων ἕκαστον), ἔπειθ' ὅτι σὰρξ καὶ ὀστούν καὶ ἕκαστον τῶν τοιούτων μορίων ἐστὶ διττόν, ὥσπερ καὶ τῶν ἄλλων τῶν ἐν ὕλῃ εἶδος ἔχόντων· καὶ γὰρ ἡ ὕλη λέγεται καὶ τὸ εἶδος σὰρξ καὶ ὀστούν.

<sup>38</sup> τὸ οὖν ὅτι οὐκ ἔστιν αὐξάνεσθαι καὶ προσιόντος τινὸς κατὰ μὲν τὸ εἶδος ἐστὶν ἐνδεχόμενον, κατὰ δὲ τὴν ὕλην οὐκ ἔστιν. δεῖ γὰρ νοῆσαι ὥσπερ εἴ τις μετροίῃ τῷ αὐτῷ μέτρῳ ὕδωρ· αἰεὶ γὰρ ἄλλο καὶ ἄλλο τὸ γινόμενον. οὕτω δ' αὐξάνεται ἡ ὕλη τῆς σαρκός, καὶ οὐχ ὅτι οὐκ ἐστὶν παντὶ προσγίνεται, ἀλλὰ τὸ μὲν ὑπεκρεῖ τὸ δὲ προσέρχεται, τοῦ δὲ σχήματος καὶ τοῦ εἶδους ὅτι οὐκ ἐστὶν μορίων.

changes which are undergone by the matter which constitutes the substance.<sup>39</sup> Obviously, however, this formal change could not be merely contingently related to relevant material changes. Something cannot grow unless its matter undergoes suitable changes, and if its matter undergoes suitable changes it cannot but grow.

Now, it is perhaps knowable *a priori* that a substance's growth both requires and is necessitated by material changes: someone who denied either of these relations would perhaps not understand what it is for a substance to grow<sup>40</sup>—but Aristotle does not restrict material necessitation to those changes whose material necessitation is knowable *a priori*. Thus, in *De Anima* 1.1, he supports his claim that the affections of the *ψυχή* are 'enmattered accounts' by pointing to the occurrence of emotions where there is no appropriate cause:

It seems, moreover, that all the affections of the *ψυχή* are with body — passion, gentleness, fear, pity, courage, and also joy, loving and hating; for in all these the body is affected in some way at the same time. It is evidence for this that while sometimes when violent and striking things occur, one is not frightened or exasperated, at other times, one is affected by small and hardly noticeable things, when the body is excited and in the same condition as when one is angry. Here is a still clearer case: in the absence of anything fearful, one has the same emotions as those of someone who is afraid. If this is right, it is obvious that the affections of the *ψυχή* are enmattered accounts. (403a16–25)<sup>41</sup>

Here Aristotle accepts (and indeed accepts as evident) that even in the absence of the relevant (efficient) causes, someone can be in a particular psychological state *just because* he is in the right kind of bodily condition. For these token psychological changes, the *only* explanation available to the natural scientist, other than the formal, will be explanation in terms of material causes. The relation between the psychological (the formal) states and changes and material states and changes is the same in these aberrant cases as in the standard cases where the psychological changes can also be explained by reference to other modes of cause. If this were not true, then Aristotle would not be able to generalize from the aberrant cases to make his claim that all the affections of the *ψυχή* are 'with body'. Accepting this universalizing claim, then, we can say that whenever someone undergoes a psychological change, there will be a material change which is itself sufficient for the occurrence of that change.

<sup>39</sup> Moreover, he is surely right in this. Whilst if a material substance is to grow, then the matter which constitutes it before it grows must occupy less space than the matter which constitutes it when it has grown, it need not be that these definite descriptions are satisfied by the same stuff (and standardly they will not be, since growth generally occurs by the accretion or generation of new matter, rather than the diffusion of the matter which is already there). For discussion of this passage, see C. J. F. Williams, *Aristotle's De Generatione et Corruptione* (Oxford, 1982), ad loc., and G. E. M. Anscombe, 'The principle of individuation', in her *From Parmenides to Wittgenstein: Collected Philosophical Papers* (Oxford, 1981), 1.57–65, at 64–5.

<sup>40</sup> Although note that it may be that only this rather vague claim is knowable *a priori*: that particular types of material change will produce growth could still only be knowable *a posteriori*.

<sup>41</sup> ἔοικε δὲ καὶ τὰ τῆς ψυχῆς πάθη πάντα εἶναι μετὰ σώματος, θυμός, πραότης, φόβος, ἔλεος, θάρσος, ἔτι χαρὰ καὶ τὸ φιλεῖν τε καὶ μισεῖν· ἅμα γὰρ τούτοις πάσχει τι τὸ σῶμα. μὴνύει δὲ τὸ ποτὲ μὲν ἰσχυρῶν καὶ ἐναργῶν παθημάτων συμβαινόντων μηδὲν παροξύνεσθαι ἢ φοβεῖσθαι, ἐνίοτε δ' ὑπὸ μικρῶν καὶ ἀμαυρῶν κινεῖσθαι, ὅταν ὀργᾷ τὸ σῶμα καὶ οὕτως ἔχῃ ὥσπερ ὅταν ὀργίζηται. ἔτι δὲ μᾶλλον τοῦτο φανερόν· μηδενὸς γὰρ φοβεροῦ συμβαινόντος ἐν τοῖς πάθεσι γίνονται τοῖς τοῦ φοβουμένου. εἰ δ' οὕτως ἔχει, δῆλον ὅτι τὰ πάθη λόγοις ἐνυλοὶ εἰσιν.



## IX

If this is right, it will be apparent that Aristotle holds a much richer theory of the explanation of change than that employed by modern scientists and philosophers, who have typically seen the provision of a causal explanation for an event to require just the citing of those conditions which were jointly sufficient for its occurrence. On the current proposal, the Aristotelian scientist may meet that requirement by citing only the material cause or causes of a change—these are *in themselves* sufficient to bring about the event they cause—without having made any reference to the efficient cause of the change. This is certainly not because the efficient cause of a change does not necessitate that change. So, in *Metaph.* 9.5, Aristotle says that when ‘the agent and the patient meet in the way appropriate to the capacity [for change] in question, the one must act and the other be acted upon’ (1048a5–7).<sup>42</sup> Since to cite the efficient cause of a change is to cite the possessor of the capacity to bring about the change to be explained, the efficient cause does necessitate its effect. This shows that one cannot succeed in capturing the complexities of Aristotelian ‘causal’ explanation simply by means of the apparatus of necessary and sufficient conditions. If material explanation of change is by itself inadequate to provide understanding of most natural changes, this is not because in providing such explanation one has yet to specify conditions which are sufficient for the occurrence of the change to be explained, but rather because one has so far failed to specify the capacities for change which the substance possesses in virtue of having the form it does.

This connection between efficient causation and form is confirmed by his account of change in *Phys.* 3. In 3.2, he defines change as ‘the actualization of what is changeable *qua* changeable—when this occurs by contact with what can bring about change’ and claims that ‘the agent of change will always transmit a form’ (202a9–12).<sup>43</sup> In order for something to undergo a change, it must have the capacity to change in that way, and its changing will be the actualization of that capacity. For this to occur, it must come into contact with something that has the capacity to bring about that kind of change (see also *Metaph.* 9.1, 1046a9–16). Change is the result of substances’ coming into contact (either directly or through a medium), where those substances have the relevant capacities for bringing about and suffering the same kind of change. Efficient causal explanation, then, requires citing the agent of the change to be explained: one needs to determine what actually brought about the change and to pick it out as the possessor of the relevant capacity for agency. So, the efficient cause of a heating will be whatever hot object came into contact with what was heated and the efficient cause of a statue will be whatever sculptor shaped the material to form the statue.

Given this restrictive understanding of efficient causation, clearly not all necessitating conditions for a change will be efficient causes. If the amassing of leaf-matter causes the leaf to grow, or the boiling of the peri-cardial blood causes one to be angry, then this will not be an instance of efficient causation—rather, this will be material

<sup>42</sup> τὰς μὲν τοιαύτας δυνάμεις ἀνάγκη, ὅταν ὡς δύνανται τὸ ποιητικὸν καὶ τὸ παθητικὸν πλησιάζωσι, τὸ μὲν ποιεῖν τὸ δὲ πάσχειν . . . The claim is here restricted to non-rational capacities: the efficacy of a rational capacity will depend upon the presence of a suitable desire on the part of the agent.

<sup>43</sup> εἶδος δὲ αἰεὶ οἷσεται τι τὸ κινεῖν, ἥτοι τόδε ἢ τοιόνδε ἢ τοσόνδε, ὃ ἔσται ἀρχὴ καὶ αἴτιον τῆς κινήσεως ὅταν κινή, οἷον ὃ ἐντελεχεία ἀνθρώπου ποιεῖ ἐκ τοῦ δυνάμει ὄντος ἀνθρώπου ἀνθρώπον.

causation, where changes to the matter of the substance necessitate formal changes. It is only because the blood which boils is part of the system of matter that constitutes a human body that it is able to cause the psychological (that is, formal) change, but since it is part of the matter of a human body, its boiling is sufficient to make the person angry. Part of the point of Aristotle's distinguishing material from efficient causation at all is to argue, against his materialist predecessors, that (generally speaking) even once one has specified the material causes of a natural change, and even though those material changes will indeed necessitate the change they are cited to explain, there is still explanatory work to do. One will still have to understand what capacity for change was actualized in the material substance considered not as the mass or arrangement of its constituent matter but precisely as a substance of *that type*. It is compatible with the fact that the boiling of the blood around the heart materially necessitated the anger both that the efficient cause of the anger was the person who has harmed one, and that he also made one angry. What allows this compatibility is that one could not think of him without the occurrence of certain physiological changes and these will bring about other physiological changes—for instance, the boiling of the blood around the heart.<sup>44</sup>

## X

Some psychological changes, however, are not susceptible to efficient causal explanations and so could not be explained at all without reference to their material causes. This should come as no surprise after Aristotle's argument in *De Anima* 1.1 for the claim that the  $\pi\acute{\alpha}\theta\eta$  of the  $\psi\upsilon\chi\eta$  are 'enmattered accounts', since his principal evidence for this was that we over-react to some things emotionally, and even undergo some emotions in the absence of any external object. So, there are occasions when we are frightened in the absence of any such efficient cause. On such occasions, the psychologist will obviously not be able to provide an efficient-causal explanation, but this does not mean that there is no explanation available of why one is frightened, since this can still be explained, as in the normal case, by reference to the condition of one's body; it is just that, in the abnormal case, the material cause bears the whole explanatory burden by itself.

Generally, no doubt, particular instances of fear will be explicable by reference to efficient as well as to material causes. As with action, it will only be in abnormal circumstances that the sole explanatory work will be done by appeal to material causes.<sup>45</sup> There are some types of psychological change, however, whose instances always lack efficient causes—as is the case, for instance, with dreams. So, at the start of *Ins.* 2, Aristotle says that one can best investigate what a dream is, and how it comes about by considering the circumstances of sleep: when, in perception, an external sense-object produces perception, it produces a  $\pi\acute{\alpha}\theta\eta$  which is present in the sense-organs not only when the senses are active, but even after the object has gone (459a23–8). The  $\pi\acute{\alpha}\theta\eta$ —an  $\alpha\sigma\theta\eta\mu\alpha$ —is material (or, at least, is describable in material terms as an affection of the matter of the organ) and is located in the sense-organs. Such remnants are always present in the sense-organs, but one is generally not

<sup>44</sup> For a detailed example of how an efficient-causal progression at the formal level is subserved by efficient-causal progression at the material level, see the explanation of animal movement given in *De motu an.* 7.

<sup>45</sup> Such cases, I should argue, include that of akratic action, but I shall not try to argue that here.

aware of them, since they are obscured by our normal perceptions (3.460b28–461a3). When one sleeps, however, and the senses are shut down, the blood travels inwards from the extremities rather than outwards, and they ‘are borne down to the source of perception, and become apparent as the disturbance subsides’ (461a3–8). Thus,

in sanguineous animals, when the blood has become still and separated out, the movement of the perceptual affections from each of the sense-organs is preserved and makes the dreams coherent. It makes something appear and one believe that one is seeing, because of what are carried inward from the organ of vision, and that one is hearing, because of those from the organ of hearing, and similarly from the other sense-organs. For when one is awake also, one believes that one is seeing, hearing or perceiving because the movement from these reaches the source [sc. of perception]. (461a25–b1)<sup>46</sup>

The material explanation of awareness in dreams is the same as that for perception generally: the material affections brought about (either directly or originally) by the objects of perception are carried down to the master sense-organ and the subject has a perception or *φαντασία* corresponding to the content of the affection.<sup>47</sup> The difference between the ordinary case of perception and the case of dreaming is that the first has an efficient cause (the external object of perception), whilst the second arises just because of changes in the sense-organs. It is in order to have awareness of the *αἰσθήματα* brought about by the objects of perception that the perceptual organs (including the heart) are constituted and arranged as they are. That we are also aware of dreams when we are asleep is a consequence of the constitution of this organic system, but it is not what the system is for. Nevertheless, it is certainly a psychological change (the subject does indeed dream), and one that can be explained by reference to its material causes—and must be so explained if it is to be explained at all.

## XI

In the case of the changes undergone by a material substance, the only constantly available explanation are those which specify the formal and the material causes: in the case of any such change, we should in principle be able to specify what it is to undergo a change of its type, and how that particular change was determined by changes to the matter of the substance which was changed. Additionally, some changes will also be explicable in terms of an efficient cause or a final cause, or of both. So, a change may also involve the patient’s taking on the form of the agent of the change or be for the sake of some good. It is important to Aristotle’s theory of natural substances that there are changes where all the causes of the change, except the material cause, are the nature of the substance itself. It is equally important for the applicability of his theory of explanation, however, that some changes to natural substances will not be susceptible to all four kinds of explanation—as in the case of dreams, for instance, whose only non-formal cause is the material cause, and of sleep.

<sup>46</sup> καθισταμένου δὲ καὶ διακρινομένου τοῦ αἵματος ἐν τοῖς ἐναίμοις, σφζομένη τῶν αἰσθημάτων ἢ κινήσεις ἀφ’ ἐκάστου τῶν αἰσθητηρίων εἰρόμενά τε ποιεῖ τὰ ἐνύπνια, καὶ φαίνεσθαι τι καὶ δοκεῖν διὰ μὲν τὰ ἀπὸ τῆς ὄψεως καταφερόμενα ὄραν, διὰ δὲ τὰ ἀπὸ τῆς ἀκοῆς ἀκοῦειν, ὁμοιοτρόπως δὲ καὶ ἀπὸ τῶν ἄλλων αἰσθητηρίων· τῷ μὲν γὰρ ἐκείθεν ἀφικνεῖσθαι τὴν κίνησιν πρὸς τὴν ἀρχὴν καὶ ἐγγηγορῶς δοκεῖ ὄραν καὶ ἀκοῦειν καὶ αἰσθάνεσθαι . . .

<sup>47</sup> Although not entirely determined by it: the content of the *φαντασία* will also be determined by, for instance, the subject’s emotional condition (cf. 460b3ff.) and his recognitional abilities (cf. *Div. somn.* 464a30–2). I discuss the relation between the properties of *αἰσθήματα* and the content of the perceptions they give rise to in ch. 5 of S. Everson, *Aristotle on Perception* (Oxford, 1997).

Unlike dreams, sleep is susceptible to explanation in terms of a final cause, but this does not require that it should have an efficient cause as well. That an animal needs to have periods of perceptual incapacity if it is to be healthy and to survive, requires (that is, hypothetically necessitates) that it should be so materially constructed as to have such periods, just as the need to perceive requires that it should have organs which can be affected by the proper sensibles. In the case of perception, the organs need to be such that their objects will act on them as efficient causes, so that their form is transmitted, but there is no parallel requirement for sleep. This is why Aristotle's explanation of sleep in terms of its final and material causes is entirely sufficient, and why any attempt on the part of Aristotle's interpreters to elicit from the *De Somno* an explanation which cites its efficient cause will end up in distorting its argument. By recognizing that at *De Somno* 455b28–31 Aristotle signals that he is turning his attention not to the efficient but to the material causes of sleep, we can find the succeeding argument to progress entirely logically. To specify the material causes of sleep, he will, of course, have to determine what does go on in the body when one falls asleep, and so he must place the primary sense-organ within the physiology of the body: he would not be able to determine the material causes of its incapacitation without knowing how it is connected to any other relevant parts of the body. Only when this is done can he proceed, as he confirms he is now doing at 456a30, to explain what material changes are such as to bring about the incapacitation of that organ so that the animal is no longer capable of perceiving. Since his account of the details of the physiology of sleep is, as he says it will be, restricted to that of sanguineous animals, he needs to note, as he does at the end of the disputed passage, that that account can be generalized to include other animals as well.

Once it is clear how Aristotle's scientific method is applied to the explanation of sleep, the disputed passage can be seen to play an essential role in the argument of the *De Somno*. Crucially, without it the work would lose the teleological explanation of sleep—which, as we have seen, is not an optional component of Aristotle's theory. The perceptual capacity is necessarily an 'enmattered' capacity and so it cannot be exercised indefinitely without harm to the animal, and yet its exercise is determined by the activity of the external objects of sense. What is needed, then, if the animal is not to be harmed by over-activity, is for the organ of perception to be periodically rendered incapable of being affected by these objects, and this is the function of the material changes which bring about the on-set of sleep. A perceiving creature that was not subject to sleep would not survive to exercise that capacity for very long: the nature of the capacity requires that it be instantiated in an organ which will be subject to incapacitation. This, however, is not something which will be effected by the operation of the capacity itself, but requires that the organ of the capacity should be materially affected so as to be unable to function. It is this which secures the fact that sleep is hypothetically necessitated, and so teleologically explicable. Rather than being a disposable part of the theory of sleep, the teleological explanation contained in the disputed passage could not be abandoned without giving up the idea that perception requires a materially constituted organ, and that such organs cannot function without periods of rest.

The *De Somno* is indeed 'a notably well-organised treatise', and requires no alteration to make it so. That it is the very passage which brings together the two central components of Aristotle's explanation of sleep—in terms of final and of material causes—that has been attacked as not genuinely a part of the *De Somno* shows how difficult it can be for a modern reader to see how Aristotle's explanatory method in

physical science is intended to be applied. As it is, there is no reason to excise the passage from the text, and compelling reason to keep it where it is. Retaining it, of course, we shall retain the conclusion of the work, and find after all that Aristotle's treatment of sleep properly fulfils the programme he himself sets out in *De Anima* 1.1.<sup>48</sup>

*University of York*

STEPHEN EVERSON

se8@york.ac.uk

<sup>48</sup> I am grateful to Hugh Johnstone for discussions of the texts of the works I have discussed, and to Malcolm Schofield for looking at a much earlier, and much more unwieldy, version of this paper.