

ARISTOTLE ON THE PERCEPTION AND COGNITION OF TIME

John Bowin

Aristotle claims that time can be perceived. In *Physics* 4.11 he says we perceive motion and time together and he says that we can perceive instants, or “nows” as he calls them (219a3–4; 219a30–b1). At various places in *De Memoria* 1, he also says that the perception of time is involved in remembering (*Mem.*1.449b29, 450a19, 451a17). Aristotle thinks that by measuring time we can grasp it intellectually as well. He talks of “apprehending time by a measure” in *De Memoria* 2 (452b7), and I shall argue that this is a way of grasping time intellectually.

This chapter will attempt to clarify what is and is not involved in these two modes of apprehending time, and the way in which they interact. I will ultimately argue that, according to Aristotle, one’s intellectual grasp of time has an effect on one’s perception of time for those beings who have intellect. But first I will establish that, for Aristotle, perceiving time does not presuppose grasping it intellectually. This is important, for Aristotle, because he wishes to credit animals lacking intellect with memory, and he defines memory in a way that presupposes the perception of time: Some animals are sagacious (φρόνιμος) and can be taught, and since they lack intellect, they must rely on memory for this ability (*Meta.*A.1.980a28 ff.). But we remember having learned something only when we recognize that we have learned it *before*, and this requires the perception of time (*Mem.*1.450a14–450a20). Hence, in order to explain animal sagacity without crediting them with intellect, Aristotle must maintain that time can be perceived without intellect.

Still, two things might tempt one to suppose that the perception of time nonetheless requires intellect. First, since Aristotle defines time as “a number of motion in respect of the before and after” (*Physics* 4.11.219b1–2), and since number is a mathematical object, and according to Aristotle, mathematical objects are grasped by the intellect through abstraction¹ and, in the case of numbers, counting, it would appear that time must be grasped in this way. And indeed, Aristotle seems to say in *Physics* 4.11 that it is by a process of counting that we come to know that time exists. Second, in *Physics* 4.14 Aristotle argues that time would not exist in the absence of beings who can count. Since the existence of time depends on

counting, one might suppose that the perception of time depends on counting also. I will argue that neither time's status as a number, nor its apparent dependence on mind requires it to be grasped intellectually. In particular, I will argue that commentators, both ancient and modern, have overemphasized the importance of counting in Aristotle's account of time at the expense of time perception.

1. Perceiving time

Albert the Great, for instance, commenting on Aristotle's claim at *De Memoria* 1.449b28–9 that memory is possible only in beings who perceive time says,

Time is perceived (*sentire*) in twofold fashion. One way is in itself (*in se*), according to a number of motion. Only rational beings perceive (*sentire*) and know (*cognoscere*) time in this manner. In another way time is perceived relationally and not in itself; then it is perceived according to a fixed distinction of time, according to which a time is located near a temporal event.

(B. Alberti Magni 1890, 100)²

Themistius, while commenting on Aristotle's claim at *De Anima* 3.11.433b5–11 that a conflict between reason and desire is possible only in beings who perceive time, makes a very similar claim:

For [a human being] perceives (αἰσθάνεσθαι) time [as time is] in itself, but the other [animals perceive it] incidentally, since they [perceive] not time but [only] the way that they were affected at an earlier time. . . . Only a human being is “at once turned front and back”, for it alone has an intellect (νοῦς) by which to count (ἀριθμεῖν) what is before and after, and this number is time.

(Themistius 1899, 120,12–17)³

Nothing in the immediate context of the passages that occasion these comments justifies these claims.⁴ But the mention of time as a number evidently refers to Aristotle's definition of time as a number of motion. Albert the Great seems to think that merely because time is a mathematical object, grasping it in itself must require grasping it intellectually. Themistius' thought appears to be that perceiving time in itself requires νοῦς⁵ because it requires counting and, according to Aristotle, only beings with νοῦς are able to count (*Phys.*4.14.223a26; cf. *Top.*6.5.142b26).⁶

Must, then, time be grasped intellectually because it is a mathematical object? This would clearly be the case if numbers were ontologically constituted by the mind of the mathematician. The extent to which Aristotle thinks this is true of mathematical objects in general is controversial.⁷ It is clear that, in Aristotle's view, mathematical objects are sensible objects studied *qua* having certain

properties. But it is not clear if or to what extent these properties are actually present in the sensible world independently of the mind of the mathematician. For it is not clear, as Aristotle seems to admit in places (*Metaph.*B.2.997b35–998a6; K.1.1059b10–12), whether ordinary sensible objects supply properties of sufficient quality and variety for mathematical study. And Aristotle does talk, in places, about the construction by geometers of geometrical objects in the course of geometrical proofs, a process by which such objects are brought from potential to actual existence (*Metaph.*Θ.1.1051a21–33; cf. M.3.1078a28–31).

But I think it would be wrong to suppose that just because sensible reality does not supply all of the mathematician's needs, none of the properties that the mathematician is interested in can be found fully actual in the sensible world. And the case of arithmetic is very different from the case of geometry. A geometer studies geometrical objects, which are sensible objects *qua* having geometrical qualities. And it is perhaps plausible to say that sensible objects can only instantiate these properties imperfectly or potentially, and that, as a result, abstraction from their imperfections is required to bring geometrical objects to actuality. But an arithmetician studies numbers, which are pluralities of things studied *qua* indivisible and countable.⁸ And there is no reason to suppose that perfect and actual specimens of indivisibles cannot be found among sensible objects and events. A man, for instance, is perfectly and actually indivisible *qua* man. And more importantly in the case of time, as we shall see, instantaneous motion stages are perfectly and actually indivisible insofar as they are instantaneous. No abstraction is required to bring them to actuality.

Does *Physics* 4.11, nonetheless require us to count in order to grasp that time exists? The answer to this question turns on the interpretation of a passage shortly before Aristotle's definition of time as "a number of motion in respect of the before and after" at 219b1–2:

But time, too, we apprehend when we mark off motion, marking it off by the before and after, and we say that time has passed when we get a perception of the before and after in motion. We mark off motion by taking them to be different things, and some other thing between them; for whenever we conceive of the limits as other than the middle, and the soul says that the nows are two, one before and one after, then it is and this it is that we say time is. (What is marked off by the now is thought to be time: let this be taken as true.)

(*Physics* 4.11.219a22–219a29)⁹

It is clear that "number", here, refers to a number of instantaneous stages of motion, because what are numbered are the bounds or limits of a motion. What Aristotle's definition of time appears to tell us, in the light of this passage, is that time exists just in case there is a number (i.e., two or more, since Aristotle thinks one is not a number) of instantaneous stages of motion limiting something in between (a number of instantaneous stages of motion being just a plurality of

instantaneous stages of motion studied *qua* indivisible and countable). What lies between is temporal duration.

We can also gather from this passage that to perceive time and to notice that time has passed, it is sufficient to perceive a number of motion stages. One might take this to mean that we thereby perceive time only indirectly,¹⁰ if at all, but I think this is mistaken. Aristotle is willing on many occasions to simply say that we perceive time (*Phys.* 4.11.219a3–4, *Mem.* 1.449b29, 450a19, 451a17), and he says at *Phys.* 4.11.219a30–b1 that we perceive the now as both one and as before and after in a motion. He also says we perceive motion and time together (219a3–4). What Aristotle means by this is that we perceive both time and motion directly because to perceive a number of nows is to perceive a plurality of instantaneous motion stages under a certain description. That is, both the now and time are what are before and after in motion *qua* countable (*Phys.* 4.14.223a28–9, *Phys.* 4.11.219b23–8). So to perceive time and to notice that time has passed, it is sufficient to perceive a number of nows (*Phys.* 4.11.219a30–219b1). That to perceive time in a way *just is* to perceive a number of nows is implied by Aristotle's reformulation of the definition of time at *Physics* 4.14.223a28–9. There he says, "the before and after are in motion, and time is these *qua* countable". Since what are before and after in motion *qua* countable are nows, and in particular, a number of nows ordered as before and after, to perceive time *just is* to perceive a number of nows ordered as before and after.

It is also commonly thought that when Aristotle says "the soul says that the nows are two" at *Physics* 4.11.219a27–8, he is talking about counting nows. One might be tempted to conclude from this that in order to perceive a number of motion stages it is necessary to count them. This seems to be Themistius' interpretation, since he says that the before and after in motion is recognized as a succession whenever it is counted (148,12–13). On the other hand, one might accept that Aristotle is talking about counting nows, here, but deny that counting nows is necessary for perceiving that time has passed.¹¹ To perceive that time has passed, it is merely necessary to recognize that there are a number of motion stages. But one may wonder, then, why should Aristotle talk about counting nows at all in *Physics* 4.11?

One suggestion has been that nows must be counted because they are brought into existence by the act of counting.¹² This is thought to follow from three assumptions: first, that nows are only potential divisions in time; second, that there are not infinitely many potential divisions in a continuum (hence, they are not already there to be counted even as potential entities); third, that the only way to create potential divisions or mark them off (*ὀρίζειν*) is by counting them. Aristotle clearly says that the now "divides potentially" (*Phys.* 4.13.222a14), but the second assumption appears to be contradicted by Aristotle's claim at *Physics* 8.8.263a27–8, 263b3–6 that time has infinitely many potential parts.¹³ So nows exist potentially, prior to being marked off, and since this is how nows exist in any case, it follows that they already exist prior to being marked off or counted. But even if we reject this interpretation of *Physics* 8.8 and hold that it is necessary

to mark off nows in order for them to exist, the third assumption seems unwarranted, since it seems entirely possible to mark off nows by merely perceiving them. Aristotle says that nows can be perceived at *Physics* 4.11.219a30–219b1 and he says that perception is capable of discriminating (*Post. An.* 2.19.99b35; *Top.* 2.4.111a14–20; *DA*.2.11.424a6; 3.2.426b8–21). And if marking off nows means discriminating them as individuals, there is circumstantial though convincing evidence that Aristotelian perception is perfectly able to do this by itself, without the help of intellect. First, incidental perception is the perception of individuals, for example, Diare’s or Cleon’s son, though not necessarily *as* Diare’s or Cleon’s son. If Diare’s or Cleon’s son were necessarily perceived as Diare’s or Cleon’s son, the perceiver would presumably need to possess the sortal concept *man*, and, therefore, possess intellect as well.¹⁴ But as Cashdollar¹⁵ points out, at *De Anima* 2.6.418a16–17 Aristotle also offers “where” as well as “what” as incidental perceptibles, which seems to imply that one can incidentally perceive, for example, “the thing over there” or “the white thing” as well. Hence, we can perceive individuals incidentally, and while perceiving an individual incidentally sometimes involves the possession of a sortal concept, it does not always require it.¹⁶ The second reason to think that Aristotelian perception can discriminate individuals is that Aristotle appears to talk of perceiving individual φαντάσματα¹⁷ of both objects and events in the *De Memoria*. The account of the way in which φαντάσματα are formed in *De Memoria* 1 seems to imply that they appear as, and indeed *are* fully individuated particulars. Aristotle uses the metaphor of a signet ring (cf. *DA* 2.12.424a19) to describe how a percept gives rise to a φαντάσμα (*Mem.* 1.450a27–32), and the mechanical nature of this metaphor, as well as of the ensuing discussion about the causes of defects in memory, suggests that individual sense objects give rise to individual φαντάσματα. And in *De Memoria* 2.452b23 ff. where φαντάσματα take the form of motions instead of images, Aristotle talks of matching motions representing events (e.g., ὅτι ὀδήποτε ἐποίησεν) with motions representing time lapses (e.g., τρίτη ἡμέρα), and it seems that this pairing could not proceed unless the motions were individuals. Finally, in *De Memoria* 1, Aristotle talks of φαντάσματα serving as the raw material from which, by a process of abstraction, the intellect grasps essences, which presumably includes sortal concepts (449b31–450a7). So it seems the possession of sortal concepts presupposes the prior perception of individuals rather than the other way around.

In fact, I do not think that when Aristotle says, “the soul says that the nows are two”, he is talking about counting nows. Counting (ἀριθμεῖν) is not explicitly mentioned in chapters 10 or 11 until *after* Aristotle’s definition of time at *Physics* 4.11.219b1–2, and there in a conjunction with being countable (ἀριθμητόν). He says,

For that is what time is: a number of motion in respect of the before and after. So time is not motion but in the way in which motion has a number. An indication: we discriminate the greater and the less by number, and greater and less motion by time; hence time is a kind of number. But

number is [so-called] in two ways: we call number both that which is counted and countable, and that by which we count. Time is that which is counted and not that by which we count. (That by which we count is different from that which is counted.)

(*Phys.* 4.11.219b1–9)

Counting, I think, plays a much smaller role in *Physics* 4.10–14 than is often supposed.¹⁸ What is important for Aristotle is that numbers are *countable*, not necessarily that they are counted: time is the before and after in motion *qua countable* (*Phys.* 4.14.223a29) and the now is the before and after in motion *qua countable* (*Phys.* 4.11.219b25; 28). This is borne out by a survey of the text. After the passage quoted previously, the verb ἀριθμεῖν appears eight more times in the remainder of book 4. Of these occurrences, three are concerned only with the possibility of counting (*Phys.* 4.14.223a23–5) and three are concerned with repeating the distinction between the number with which we count and the number which is counted (*Phys.* 4.11.219b6–9; *Phys.* 4.12.220b4–5, 8–9), or *countable*, as we have just seen. The remaining two uses are idiosyncratic.¹⁹

I suggest, rather, that when Aristotle says “the mind pronounces that the ‘nows’ are two” at *Physics* 4.11.219a27–8, this need only imply that the mind *perceives* the number of (countable) nows, not that it counts them. Aristotle says that number is perceived directly (καθ’ αὐτά) by the common sense in *De Anima* 3.1 (425a16, cf. 2.6.418a7–11), soon after saying that “all the senses are possessed by those animals that are neither imperfect nor maimed” (425a9–10). So the direct perception of number is not limited to beings with intellect. The common sense, in both animals and humans, has the ability to perceive a collection of objects or events and just see (or hear or feel) how many there are without counting them.²⁰ And in fact, Aristotle credits animals with the ability to perceive numbers even while denying them the ability to count.²¹ For how else could birds, for example, keep track of the number of eggs in their clutch, as Aristotle says they do in *HA* 6.6: “The eagle lays three eggs and hatches two of them, as it is said in the verses ascribed to Musaeus: ‘That lays three, hatches two, and cares for one’” (563a17–19).

So the soul may perceive that “the ‘nows’ are two” without counting them. The soul can also, no doubt, perceive that the “nows” are three or four, without much difficulty either, and perceive their order of succession without counting them. In fact, since nows appear in succession, and not in unstructured sets, it is possible to perceptually discriminate relative quantities of motion, and the relative sizes of elapsed durations by perceiving the number as well as the order of the instantaneous motion phases, since later nows bound more of the past than earlier ones. This, I think, is what Aristotle is getting at when, shortly after giving his definition of time he says, “we discriminate (κρίνειν) the greater and the less by number, and greater and less motion by time”. As I said, perception is a faculty that discriminates. By perceiving the number and order of successive instantaneous phases of a motion, at least if one perceives more than two of them, we perceptually

discriminate whether more or less time has passed. This is not yet time measurement, since it does not involve the application of a standard. It is merely a perceptual grasp of the number and relative magnitude of motion.

2. Measuring time

Perceiving time, then, consists in either perceiving *that* time has passed by perceiving a number (two or more) of nows, or perceiving *how much* time has passed, in purely relative terms, by perceiving the order as well as the number of nows. Perceiving time in no way requires counting. But *measuring* time *does* require counting in a way, and therefore also intellect. In the following passage, the verb ἀριθμεῖν is used in an extended sense to mean measuring:

Since there is locomotion, and, as a kind of locomotion, circular motion, and since each thing is counted (ἀριθμεῖται) by some one thing of the same kind (units by a unit, horses by a horse), and therefore time too by some determinate (ὀρισμένῳ) time, and since, as we said, time is measured by motion and motion by time (that is, the quantity of the motion and of the time is measured by the motion defined by time) – if, then, that which is first is the measure of all things of the same sort, then uniform circular motion is most of all a measure, because the number of this is most easily known. (There is no uniform qualitative change or uniform increase in size or uniform coming-to-be, but there is uniform locomotion.) This is why time is thought to be the motion of the [celestial] sphere, because the other motions are measured by this one, and time by this motion.

(*Physics* 4.14.223b13–24)

Here, Aristotle says that we measure time by counting units of time (e.g., days) which are determinate because they are marked out by motions that are determinate in time (e.g., celestial motions). The reason that the use of ἀριθμεῖν is extended, here, is that strictly speaking, counting is a type of measurement for Aristotle, not *vice versa*. Counting is the type of measurement that is most exact because the measure that it involves is absolutely indivisible, rather than “indivisible in relation to perception” (*Metaph.*I.1.1053a1, 23). So strictly speaking, nows may be counted, because they are absolutely indivisible, but durations may only be measured. Still, at *Physics* 4.12.220a27–8, Aristotle says that parts of continua can have a “number of a sort” (τις ἀριθμῶς) insofar as they can be divided into a number of parts, and this, presumably, is the sense of number here. In fact, it is primarily in counting number in this extended sense, that is, in measurement, that the process of counting has any prominence in these chapters.²²

It is this, time measurement, that requires νοῦς, and it is this that affords an intellectual grasp of time. The best evidence for this is in *De Memoria* 2, where,

in language very similar to the passage quoted from *Physics* 4.14, Aristotle claims that measuring time affords a certain type of cognition of it:

But the main thing is that one must apprehend (γνωρίζειν) the time, either by a measure (μέτρῳ) or indeterminately (ἀορίστως). . . . Sometimes a person does not remember (μηνῆσθαι) the time by a measure e.g. that he did something or other the day before yesterday; but sometimes also he does remember the time this way. Nonetheless, he remembers, even if it be not by a measure. And people are in the habit of saying that they remember but don't know (εἰδέναι) when, whenever they do not apprehend the amount of time by a measure.

(*Mem.*2.452b8–9; 452b30–453a4)²³

Whenever we measure time by counting determinate units of time like days, we apprehend (γνωρίζειν) time and the amount of time determinately. Otherwise, we apprehend time and the amount of time indeterminately (ἀορίστως). Γνωρίζειν is a general term that comprehends both perceiving (αἰσθάνεσθαι) and thinking (διανοεῖσθαι) (cf. *GA*.1.23.731a33–4). The contrast, here, is between grasping time or the quantity of time intellectually (διανοεῖσθαι) by means of a measure (μέτρῳ) and perceiving time (αἰσθάνεσθαι).

Apprehending time by a measure is clearly an achievement of the intellect. Aristotle claims that a measure must be of the same genus as what it measures. For example, spatial magnitudes are measured by a spatial magnitude and times are measured by some definite time (*Phys.* 4.14.223a22–8, *Meta*.I.1053a24–30). And since a measure is that by which a quantity is apprehended, it is clear that one must grasp the genus of the measure and the thing measured in order to measure it. Thus, one must possess what we would call the universal sortal concept of *horse* when counting horses and the sortal concepts of *day* and *hour* when measuring time. Conception is an activity that Aristotle denies beings lacking intellect.²⁴ Apprehending time indeterminately, on the other hand, seems only to be an achievement of perception. It entails perceiving that time has passed since some remembered event, but not knowing how much. This could be construed, as in *Physics* 4.11, as merely perceiving a number of motion stages ordered as before and after, which, minimally, could be just perceiving that a past event is distinct from what one is now experiencing. To apprehend time indeterminately, according to the account of time perception in *Physics* 4.11, is merely to perceive time.

3. Memory, imagination, the perception of time, and the perception of motion

Aristotle talks of remembering time at *De Memoria* 2.452b30–453a4 rather than perceiving time and this raises a number of questions, the most obvious of which is whether Aristotle recognizes a difference between remembering and perceiving time. For instance, perceiving time might be perceiving time as it is passing

while remembering time might be remembering that time has elapsed since a remembered event. Aristotle could not be clearer that it is remembering time, in this sense, that he is concerned with in the *De Memoria*. It is remembering that time has elapsed since a remembered event that makes contemplating a representation of that event remembering something. But he calls *this* perceiving time in *De Memoria* 1: “For, as we said before, when someone is actively engaged in memory, he perceives in addition (προσαισθάνεται) that he saw this, or heard it, or learned it earlier; and earlier and later are in time” (449b29; cf. 450a19, 451a17). Sorabji speculates that Aristotle is using a broader sense of “perceive”, here, to emphasize that memory is a perceptual and not an intellectual activity.²⁵ But I think that Aristotle calls this perceiving time because he does not distinguish between remembering time and perceiving time as it is passing, and I say this for two reasons.

First, I would distinguish between perceiving time as it is passing from perceiving time passing, that is, perceiving the passage of time. In *Physics* 4.11, where the topic is time and not memory, Aristotle speaks of perceiving time as it is passing in terms of perceiving time *having* passed, not perceiving time passing. While temporal passage is mentioned seven times in this chapter, Aristotle nowhere talks about perceiving time passing. Each time he speaks of time *having passed* (γεγονέναι χρόνος) in the perfect tense rather than the present. In each case we are said to think, say or suppose that time *has passed* rather than that time is passing (*Phys.* 4.11.218b23, 32–3, 219a6, 7, 14, 24, 32–3). Aristotle is of course interested in the phenomenon of temporal passage. The puzzle of the ceasing instant at *Physics* 4.10.218a8–21 and his claim in Chapter 11 that the now is always “other and other” (219b9–10) are clearly references to temporal passage. And in *De Memoria* 1, Aristotle speaks of memory as a state or affection of perception whenever time passes (ὅταν γένηται χρόνος, 449b25). But in neither work does he speak of perceiving time passing. The second reason to think Aristotle does not distinguish between remembering time and perceiving time as it is passing is that, according to the account of perceiving time in *Physics* 4.11, perceiving time having passed is just remembering that time has elapsed since a remembered event. According to *Physics* 4.11, to perceive time is to perceive a number of motion stages ordered as before and after. But if as I said, this can be just perceiving that a remembered event is distinct from what one is now experiencing, it is no different from remembering that time has elapsed since a remembered event.

Another question that talk of remembering time raises concerns the relationship between memory and the perception of time, and due to the definitional relationship between time and motion, the relationship between memory and the perception of motion. If to perceive time is to perceive a number of motion stages ordered as before and after, one might think that in order to do this, it is at least necessary to remember the motion stages perceived as before. If to perceive motion is just to perceive a plurality of motion stages, and since only one instantaneous motion stage can be present at a time, it follows that some of the motion stages will need to be remembered. Hence both the perception of time and motion

seem to presuppose memory.²⁶ But since Aristotle claims that memory requires the perception of time, this would imply that memory and the perception of time presuppose each other.

A way to avoid this consequence would seem to lie in Aristotle's discussion of certain memory failures.²⁷ In *De Memoria* 1, Aristotle explains the notion of perceiving time by saying, "When someone is actively engaged in memory, he perceives in addition that he saw this, or heard it, or learned it before; and before and after are in time" (450a19–22). In Chapter 2 we find out what "perceives in addition" means. Both memory and the perception of time involve φαντάσματα and therefore φαντασία; two φαντάσματα, in fact, one representing the event remembered and one representing the time elapsed since the event.²⁸ To remember, or to recognize that an event happened before is to have a φαντάσμα of a movement corresponding to the time match a φαντάσμα of a movement corresponding to the event (*Mem.* 2.452b31–453a4). If, however, one of these φαντάσματα is missing, one fails to remember. Hence, memory presupposes the perception of time, and both memory and the perception of time presuppose the having of φαντάσματα, but the perception of time does not presuppose memory.

It is clear from this that the perception of time depends on φαντασία.²⁹ But it is not yet clear that time, after all, does not in some way depend on memory. The problem is that a φαντάσμα of a movement corresponding to a time is itself of a series of events that can be remembered. (The movement corresponding to the time is a φαντάσμα or an *appearance*, not an unconscious internal clock process, as envisaged by modern theories of interval perception.) One could say, perhaps, that these events are not remembered unless there is a further series of φαντάσματα to match the events in the movement corresponding to the time. But then we are off on a regress. Why, however, must the movement corresponding to the time and the movement corresponding to the event be separate? One could concede that they are sometimes or even often separate without requiring that they must always be separate. And when they are not separate we could say that to perceive time and to remember an event is the same activity under different descriptions. This is because, according to *Physics* 4.11, to perceive time is to perceive a number of events ordered as before and after. Since the perception of an event that happened before *as* before must inevitably be a φαντάσμα (Aristotle says we can perceive φαντάσματα at *Mem.* 1.450b17–18), then to remember an event is to perceive time and *vice versa*. So memory and the perception of time are interdefined, which is a circularity, but not necessarily a vicious one.

What of the apparent dependence of the perception of motion on memory? Perhaps we could say we perceive motion by perceiving a plurality of motion stages, but none of them *as* having happened before. Or more accurately, since Aristotle talks of "perceiving" φαντάσματα, we perceive a retained plurality of φαντάσματα³⁰ representing motion stages, but none of them as having happened before.³¹ But if the past phases of a motion can be represented by φαντάσματα that are not perceived as before, then perceiving a number of motion stages is not sufficient for perceiving time. According to *Physics* 4.11, in order to perceive

time, past phases of a motion must be perceived *as* past. How could past phases of a motion not be perceived as past? Perhaps if they fell within a specious present (though there is little evidence for this concept in Aristotle).³² Still, it seems plausible that past motion stages could be so recent that they *seem* to be present.

4. The effect of intellect on the perception of time

So according to Aristotle, perceiving time does not presuppose grasping it intellectually, but grasping time intellectually, I will now argue, has an effect on how one perceives time for those beings who have intellect. This idea, I think, is behind the following passage from Pseudo-Philoponus:

By “time” Aristotle means determinate (ὀρισμένον) time, not indeterminate (ἀόριστον). In this way, at least, he says in the *de Interpretatione* “some simply, some in time”,³³ meaning by “simply” indeterminate time, and by “in time” determinate time. Non-rational beings, then, even if they have conscious perception (συναίσθησις) of time, do not have conscious perception of determinate time, but only of winter, say, or summer. Human beings have conscious perception of determinate time because they count (ἀριθμεῖν) days and hours. Counting is proper only to the rational soul (ἡ λογικὴ ψυχή). On this account, then, he says that only man has conscious perception of determinate time, for non-rational beings too have conscious perception of the indeterminate.³⁴

The distinction, here, is different from the one Aristotle makes at *Mem.* 2.452b8–9 and 452b30–453a4 because it is a distinction between types of perception (αἴσθησις), not apprehension in general (γνώσις). If we take a “determinate time” to mean, as in *Physics* 4.14, a time used as a measure because it is marked out by a regular motion, Pseudo-Philoponus is saying that only humans perceive, for example, days *as* measures of time. Only humans can do this because only humans can treat days as measures by using them to count. Animals may still perceive a day, but not *as* a day if by “day” we mean a unit of measurement.

Pseudo-Philoponus, like Themistius in the passage quoted earlier, is commenting on *De Anima* 3.10, 433b5–11, where Aristotle claims that perception (αἴσθησις) of time is necessary in beings where reason (ὁ λόγος) and desires (αἱ ἐπιθυμίας) conflict because “νοῦς bids us hold back because of what is future”. Now the perception of time, here, is obviously not of the sort we encountered in *Physics* 4.10–14 or in the *De Memoria*. Perceiving time in those texts amounts to perceiving an ordered series of past or present events. Here, perceiving time is perceiving the future. Strictly speaking, though, one does not perceive the future, as Aristotle points out in *De Memoria* 1, 449b27.³⁵ But we can perceive φαντάσματα (*Mem.* 1.450b17–18), and in *De Anima* 3.7, he says this is very much *like* perceiving the future: “Sometimes by means of the φαντάσματα or thoughts which are within the soul, just as if it were seeing, [the faculty of thinking] calculates and deliberates what is to come

(τὰ μέλλοντα) by reference to what is present” (*DA.3.7.431b6–8*). The justification for calling this perceiving, perhaps, is that if contemplating φαντάσματα of past events can be called perceiving time, contemplating φαντάσματα of future events can as well, even if the events may never happen.

The involvement of deliberation, here, is important. The νοῦς that holds us back because of what is future is calculative or deliberative reason (i.e., διάνοια, cf. *DA.3.10.433a14*). And the φαντασία involved in perceiving the future, I suggest, is deliberative φαντασία, which is contrasted with perceptual φαντασία in the following passage:

Perceptual φαντασία, as we have said, is found in the other animals also, but deliberative [φαντασία] in those which are capable of calculating [ἐν τοῖς λογιστικοῖς] (for the decision whether to do this or that is already a task for calculating [λογισμοῦ ἔργον]; and one must measure (μετρεῖν) by a single standard; for one pursues what is greater (τὸ μείζον); hence one has the ability to make (ποιεῖν) one image out of many (φαντασμάτων).
(*DA.3.11.434a6–15*)³⁶

When Aristotle says, “one must measure (μετρεῖν) by a single standard; for one pursues what is greater (τὸ μείζον)”, what springs to mind is something like Socrates’ ἡ μετρητικὴ τέχνη at Plato’s *Protagoras* 356d–e, that is, a measure of value. We reckon by some measure of value which of two contemplated actions will result in more, for example, pleasure, wealth, or happiness. But the text is more general than this. It says only that deliberation or calculation about a choice of actions requires a measure with which to calculate what is greater (τὸ μείζον); a single unified measure that is synthesized out of many φαντάσματα. I do not think this generality is accidental, because, while deliberation may often culminate in calculations of value, it also typically requires calculating other sorts of quantities as well. In order to maximize the value of a crop, for instance, one must first deliberate about how much seed to plant, how often to water, how long to wait before planting, and how long to wait before harvesting. According to Aristotle, in this case we start our deliberation with the objective of maximizing crop value, and work backward from that in a chain of reasoning that ends in determining the first action towards achieving this goal, for example, buying a certain quantity of a certain type of seed at a certain time. If, indeed, Aristotle is expressing himself with an eye towards this more general idea of measurement and calculation, then one of the many functions of deliberative φαντασία should be to effect a synthesis of φαντάσματα into a unified φαντάσμα that we use to reckon time: days, months, and years. If this is accepted, it can support Pseudo-Philoponus’ distinction between the perception of determinate and indeterminate time because the former will be a function of deliberative φαντασία while the latter will be a function of perceptual φαντασία.

As we have already noted, Aristotle talks of inner “movements” by which we discriminate greater and smaller times in *De Memoria* 2. Though called “movements”, these are also φαντάσματα, as *De Memoria* 1, 451a3 makes clear, and so

the representation of time periods is a function of φαντασία. And as already noted, these “movements” are of two kinds. When the “movement” represents a determinate time (cf. *Phys.* 4.14.223b15), for example, a day, we apprehend time and the amount of time determinately. Otherwise, we apprehend time and the amount of time indeterminately. So the suggestion, here, is that “movements” representing determinate time are a product of a synthesis of φαντάσματα undertaken by deliberative φαντασία.

If this is accepted, then Pseudo-Philoponus’ distinction will be one between real differences in phenomenal content, not just differences in the way we regard or use phenomenal content.³⁷ This is because deliberative φαντασία is a sort of φαντασία that is modified by the active involvement of intellect. When Aristotle says that the measure consists in a φαντάσμα that is a unity made out of many φαντάσματα, it sounds very similar to what he says about the genesis of experience from memory. In *Posterior Analytics* 2.19.100a3–9, Aristotle says, “From perception there comes memory, as we call it, and from memory (when it occurs often in connection with the same thing), experience; for memories that are many in number form a single experience”, and at *Metaphysics* A.1.980b26–981a12, “many memories of the same thing produce finally the capacity for a single experience”. A memory, we know, is a special sort of φαντάσμα; one in which the φαντάσμα is taken to represent an experience of the subject at a prior time. So the relationship between experience and deliberative φαντασία is very close. One difference, I think, is that one who deliberates is said to *make* (ποιεῖν) a unity out of several φαντάσματα, which suggests that deliberative φαντασία is an exercise of active φαντασία as described at *De Anima* 3.3.427b18–20: “[φαντασία] is up to us when we wish (for it is possible to produce something before our eyes, as those do who set things out in mnemonic systems³⁸ and form images of them)”. There is no suggestion in *Metaphysics* A 1 and in *Posterior Analytics* 2.19 that experience requires the active manipulation of images. Another difference is that the synthesis of images involved in deliberative φαντασία is found only “in those which are capable of calculating”, while experience is also found in at least some irrational animals (*Meta.*A.1.980b25–7). Deliberative φαντασία, then, would seem to be a sort of experience, but one that occurs only in beings who can calculate, and that characteristically requires the active manipulation of images. Perceptual φαντασία presumably is what is involved in animal perception of time. All animals have perceptual φαντασία (*DA.*3.11.433b31–434a10, 2.2.413b21–3, 3.10.433a9 ff., *Metaph.* A 1, 980b25 ff.), except, perhaps, grubs (*DA.*2.3.415a6–11 and 3.3.428a10 ff.). And humans with no deliberative faculty (e.g., slaves allegedly) or an underdeveloped deliberative faculty (e.g., children) will have only perceptual φαντασία (*Politics* 1.13.1260a12–14).

The suggestion, then, is that the “movements” representing determinate time are a product of the active manipulation of images by deliberative φαντασία in beings who can deliberate. A worry, here, might be that this active manipulation of images is a matter of conception rather than perception, and that Pseudo-Philoponus’ distinction is misguided after all. Rather than distinguishing different

types of perception, we would have distinguished cognition from perception. But I think it is reasonable to take the view that while intellect has a role in determining the content of the images produced by deliberative φαντασία, the content itself remains non-conceptual. I suggest that while perceiving a day as a day for the purpose of measuring time might employ a sortal concept, the perceptually disambiguated image of a day in one's mind – the normalized image of a day shorn of the rough edges of its particularity such as seasonal variations in length of daylight – may nonetheless be non-conceptual.³⁹

While not requiring it, this interpretation would be strengthened if we could establish that Aristotle envisages non-conceptual ἐμπειρία, that is, that many memories may form a single experience in beings not possessed of reason. This is a controversial subject, and one of the key texts on the issue is ambiguous. *Posterior Analytics* 2.19, which describes the genesis of principles of art and science from more primitive mental states, is ambiguous in its description of the transition to these states from a state of experience. In the critical sentence describing this transition, Aristotle says that principles of art and science arise “from experience, or from the whole universal that has come to rest in the soul” (100a6–7). Depending on whether we read the “or” epexegetically or as a corrective meaning “or rather”, the sentence will say either that experience involves universals or that it does not.⁴⁰

Still, there are other texts that would seem to favor the existence of non-conceptual ἐμπειρία. Aristotle claims at *Nicomachean Ethics* 7.3.1147b5, that animals “have no universal beliefs (καθόλου ὑπόληψιν) but only imagination (φαντασία) and memory (μνήμη) of particulars”. And then in *Metaphysics* A 1, he credits all animals with sensation and only some with memory and ἐμπειρία (980b25–7). So the animals that have experience must have non-universal, which I take to be non-conceptual, ἐμπειρία. And Aristotle seems to say that experience, which some animals possess, does not involve universal concepts when he claims that a single universal is present in the man with art but not in the man with experience (cf. *EN*.6.7.1141b14–21). Humans also possess art and reason, which he contrasts with experience in the respect that art apprehends universals while experience apprehends particulars. Nonetheless, the examples that Aristotle provides are unhelpful in deciding this issue because they represent human cases of experience which clearly presuppose the possession of concepts. Perhaps what Aristotle means is not that the man possessing experience but not art lacks universal concepts altogether, but just that he lacks the universal concept of a particular art, for example, medicine. This does not bar him from having universal concepts altogether.

5. *Physics* 4.14: if there were no νοῦς would there be time?

In the following passage from *Physics* 4.14 Aristotle argues that time would not exist in the absence of beings who can count:

One might find it a difficult question, whether if there were no soul there would be time or not. For if it is impossible that there should be

something to do the counting, it is also impossible that anything should be countable, so that it is clear that there would be no number either, for number is either that which has been counted or that which can be. But if there is nothing that has it in its nature to count except soul, and of soul [the part which is] intellect, then it is impossible that there should be time if there is no soul, except that there could be what underlies time; as for example if it is possible for there to be motion without soul. The before and after are in motion, and time is these *qua* countable.

(*Phys.* 4.14.223a21–29)

As I said at the outset, this passage might tempt one to think that the perception of time depends on counting since the existence of time depends on the existence of beings who can count.⁴¹ Since perceiving something presupposes its existence, if nows were brought into existence by the act of counting,⁴² this would seem to have some plausibility, since acts of perception would depend on acts of counting. And since it also seems plausible to assume that these acts must take place in the same mind, it would have the consequence that no being could perceive time that could not count. But Aristotle is very clear in the *De Memoria* that animals that are unable to count can perceive time.

If, however, nows are already there for us to perceive as suggested by *Physics* 263a27–8, 263b3–6, or it is only necessary to mark nows off perceptually for them to exist, then no such problem arises. Then, if we assume that perceiving something presupposes its existence, the perception of time would depend counterfactually only on the existence of beings who can count, which does not require beings who perceive time to be able to count. In fact, it does not require beings who perceive time, or the before and after in motion *qua* countable, to perceive time *as* countable.

Still, the mind dependence of time implied by this passage has seemed to many a philosophical mistake, either due to a straightforward logical error⁴³ or a confusion about modality.⁴⁴ But, assuming that deliberative φαντασία produces a perceptually normalized image of a day in the perceiver, and only beings with νοῦς have deliberative φαντασία, we can infer a similar conclusion about the measurability of time, that is, that in the absence of beings with νοῦς, time would not be measurable (or countable in the extended sense of time being countable by means of some determinate time discussed at *Physics* 4.14.223b13).

In *Metaphysics* Δ 15, Aristotle says that what are measurable, or knowable, or thinkable, or visible are called relatives, not because they are called just what they are of something else but because something else, that is, a measure or knowledge or thought or sight, is called just what it is of them. I take it that the difference is that a measure is definitionally and intrinsically related to the measurable, while the measurable is not similarly related to the measure, and as a consequence, while the measure cannot be but described as a measure, the measurable admits of other descriptions. *Categories* 7 tells us that the correct way of talking about the measurable in relation to the measure is not to say that the measurable is

measurable of the measure, but that the measurable is measurable *by* the measure (6b28–6b36). This use of the instrumental dative is familiar from *Physics* 4: “each thing is counted by some one thing of the same kind (units by a unit, horses by a horse), and therefore time too by some determinate time” (*Physics* 4.14.223b13–15). The measure, then, by being only an instrument of the measurable’s measurability, is only incidentally related to the measurable.

Since the measure is only incidentally related to the measurable, this shows that there is another contingency we might consider in connection with the counterfactual in *Physics* 4.14.223a21–29, *viz.*, the absence of the measure by which the measurable is measured. Now clearly, there are some cases where the measure will never be absent. For example, pluralities of horses will always have a measure available to count them because every horse in the plurality will stand in the required relation to the plurality. In general, discrete pluralities of substances are always measurable because their mere existence entails the existence of an intrinsically indivisible measure that they stand in the required relation to.

But continuous magnitudes, however, will not always be measurable in this sense. This is because no part of a continuous magnitude, such as time and motion, is intrinsically indivisible. Continuous magnitudes are only indivisible in relation to perception (*Meta*.I.1.1053a1, 23), which means that they can only be measured by a measure that *appears* indivisible to a being capable of perceiving it. Or perhaps I should say “imagining” since we know from *De Memoria* 2 that the measure by which we have a determinate cognition of the time as being, for example, this or that many days, is an “inner movement” or a φαντάσμα; a normalized φαντάσμα of a day synthesized from multiple φαντάσματα by deliberative φαντασία. So then, in a world without beings possessing νοῦς, and, therefore, deliberative φαντασία, time would not be measurable because no measure would stand in a measuring relation to it, nor would it be countable in the extended sense of time being countable by means of some determinate time.

Notes

- 1 *DA* 3.4, 429b18 ff.; *Mem.* 1, 449b31–450a7; *Post. An.* 1.5, 74a32–74b4; *Metaph.* M 3, 1077b17 ff.; *Phys.* 2.2, 193b24–194a7.
- 2 This translation, with minor modifications, is from Ziolkowski (2002).
- 3 This translation, with minor modifications, is from Todd (1996). “At once turned front and back” is from Homer, *Il.* 1.343, 3.109.
- 4 As Sorabji (2004, pp. XXII–XXIII) points out in the case of Themistius.
- 5 Here the word νοῦς is being used in Aristotle’s broad sense of “that whereby the soul thinks (διανοεῖται) and judges (ὑπολαμβάνει)” (*DA* 3.4, 429a23) rather than in the narrow sense of that whereby the soul grasps the principles of a demonstration (*Post. An.* 2.19, 100b15).
- 6 For a modern example of this sort of interpretation, see Gregoric (2007, p. 104–5), who seeks to block the inference that the common sense perceives time by claiming that perceiving number and motion is not sufficient for perceiving time. According to Gregoric, one also must be able to count nows in order to perceive time.
- 7 For a survey of the controversy, see White (1993, pp. 174–182). On Aristotelian arithmetic, see also Mignucci (1987).

- 8 On number as countable see *Phys.* 4.11, 219b6–7; 4.14, 223a24–25, 223b13–16; *Metaph.* Δ 6, 1016b9–11; K 10, 1066b25–26). On number as a plurality of objects studied *qua* indivisible see *Metaph.* M 3.
- 9 Translations of Aristotle’s *Physics*, in this chapter are, with minor modifications, from Hussey (1983).
- 10 See Sorabji (2004, p. XXII) and Kahn (1966, p. 53, n. 23).
- 11 This is Sorabji’s interpretation. See Sorabji (2004, p. XXIII).
- 12 See Coope (2005, pp. 9–13; ch. 5, esp. pp. 89–92).
- 13 At *Physics* 8.8, 263a27–8, and 263b3–6, Aristotle clearly envisages the traversal of an infinite number of things that exist potentially rather than a potentially infinite number of things. Otherwise, he would not be showing, as he says he is, how in a way it is possible and in a way it is impossible to get entirely through an infinite number of things.
- 14 Beare (1906, p. 286 ff.), Kahn (1966, p. 46), and Block (1960, p. 94) take this to imply that incidental perception is a performance of intellect.
- 15 Cashdollar (1973, p. 163).
- 16 Thus, Caston (1996, p. 42) is right to claim that incidental sensibles may involve the cooperation of intellect in humans, but it is not an essential feature of incidental perception.
- 17 On perceiving φαντάσματα, see *Mem.* 1.450b17–18.
- 18 For example, by Coope (2005) and by Sorabji (1983, p. 84 ff.).
- 19 Of the remaining two, one expresses the odd idea that insofar as the now counts, it is a number (4.11, 220a22) and another extends the sense of ἀριθμεῖν to mean time measurement (4.14, 223b13. More on this later).
- 20 In this, Aristotle recognizes what has been rigorously demonstrated only in the 20th century, that is, that humans and many other animals have a modicum of perceptual numerical competence. In particular, it has been shown by cognitive scientists that both infant and adult humans, as well as many other animals, including birds, fish, and various other mammals, have the ability to accurately and non-verbally assess the cardinality of sets of objects or events of up to about three or four members. This, called “subitizing”, is done by keeping track of individual elements in the sets, probably by using discrete perceptual representations. It has also been shown that many animals also have a non-verbal ability to roughly discriminate the relative size of larger cardinalities, and that a few have the ability to grasp ordinal relations within ordered sets of up to about seven items. See Nieder (2005).
- 21 *Top.* 6.5.142b26 says that only humans are able to count.
- 22 There are 22 occurrences of the verb μετρεῖν in chapters 12–14, nearly twice as many occurrences as ἀριθμεῖν in the whole of Aristotle’s discussion of time.
- 23 This translation, with minor modifications, is from Sorabji (2004, pp. 57–58).
- 24 *EN.* 7.3.1147b5.
- 25 Sorabji (2004, p. 70).
- 26 cf. Irwin (1988, p. 316).
- 27 cf. Taormina (2002, p. 38); King (2009, p. 65).
- 28 I assume that, as at *Mem.* 1.451a3, the κινήσεις in *Mem.* 2.452b8–453a4 are φαντάσματα.
- 29 *Mem.* 1.450a9–11 seems also to point to this conclusion, but the text less clear. Here, the received text says, “Now, one must apprehend magnitude and motion by means of the same thing by which one apprehends time; and τὸ φάντασμα is an affection of the common sense” (*Mem.* 1.450a9–11). In the preceding lines Aristotle has implied that magnitudes are apprehended by means of φαντάσματα, so the thought here seems to be that time is apprehended by means of φαντάσματα too. It can also, perhaps, be inferred from Aristotle’s remark that we cannot think of anything without a continuum or think of non-temporal things without time that the reason for these two claims is the same, that is, that φαντάσματα must be involved.

- 30 The following passages characterize φαντασία as a faculty for the retention of perceptual representations: *DA*.3.3.429a1–2; *Insomn.*1.459–a17–18); *Rhet.*1.11.1370a27.
- 31 Cf. Caston (1996, p. 42), who takes *Mem.* 1, 450a9–11, which implies that magnitudes are apprehended by means of φαντάσματα, to suggest that φαντασία is involved in the perception of common sensibles. Caston also thinks that *De Anima* 3.3.428b18–25 implicates φαντασία in special, common, and incidental perception.
- 32 The specious present is “the short duration of which we are immediately and incessantly sensible” (James 1905, p. 631). Sorabji (2004, p. 91) tentatively detects the concept of a specious present in Aristotle’s use of the aorist ἔπαθε at *Mem.*2.451a31, but this, as Sorabji recognizes, is uncorroborated in any of Aristotle’s other discussions of time.
- 33 The phrase is at *De Int.* 1, 16a18 and is difficult to interpret. Charlton suggests that it distinguishes between untensed and tensed uses of verbs (Charlton 2000, p. 64, n. 30). Ackrill dismisses this as an unsupported conjecture, but offers the even more difficult reading of a distinction between present uses of verbs on the one hand, and past and future uses of verbs on the other (Ackrill 1963, p. 115). Pseudo-Philoponus’ reading seems even more improbable.
- 34 Philoponus, J. 1897, 580,27–37. This translation, with minor modifications, is from (Charlton 2000, p. 31).
- 35 Aristotle also seems to say that we do not perceive the past either at *Mem.*1.449b27. Taormina makes much of this (Taormina 2002, pp. 46–49), but if this claim is strictly maintained, it will make nonsense of the account of perceiving time in *Physics* 4.11, which requires perceiving at least some motion phases (or *qua* countable, nouns) as past.
- 36 This translation, with minor modifications, is from Hamlyn (1993, pp. 71–72).
- 37 *Pace* for example, Polansky (2007, p. 530) and Moss (2012, p. 146), who insist that deliberative φαντασία is distinguished from perceptual φαντασία only by the use to which it is put. But I maintain, as I shall explain later, that there is a difference in phenomenal content, though not one that requires deliberative φαντασία to be conceptual.
- 38 Although these people are called μνημονικοί instead ἀναμνηστικοί, the reference is clearly to mnemonic systems used by ἀναμνηστικοί (cf. *Top.* 8.14.163b28; *Mem.*2.452a12; *Insomn.*1.458b20). Recollecting is described in *De Memoria* as a συλλογισμός τίς along with deliberation and is said to belong only to those animals (i.e., humans) possessing a deliberative faculty (βουλευτικόν) (*Mem.*2.453a5–13).
- 39 Similarly, Michael Tye argues that while concepts might be involved in perceptually disambiguating a figure with an ambiguous decomposition into spatial parts, such as the two faces-vase figure, the resulting phenomenal content may remain, nonetheless, non-conceptual (Tye 1995, pp. 140–141).
- 40 For the exegetical reading, see Sorabji (1993, p. 34). For the corrective reading, and a survey of the interpretative possibilities, see McKirhan (1992, p. 243).
- 41 Even though the counterfactual contemplated is one where there is no soul *simpliciter*, the argument that there would be no time in this case relies on only the assumption that there is no νοῦς or intellect.
- 42 As suggested by Coope (2005). See endnote 12.
- 43 Mignucci (1987, pp. 184–186).
- 44 Sorabji (1983, p. 89 ff.)

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