Aristotle on Learning in De Anima II.5

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Myles Burnyeat has argued that when Aristotle says, in *De Anima* II 5, that someone who learns “either ought not to be said ‘to be acted upon’ at all—or else we must recognize two senses of alteration, viz. the change to conditions of privation, and the change to a thing’s dispositions and to its nature” (417b13-6), he is distinguishing learning as an ‘unordinary’ sort of alteration; “unordinary” in the sense that it has termini that are not opposed, and that it preserves and perfects the learner’s nature. But outside of *De Anima* II 5, Aristotle persistently uses learning as a paradigm example of ordinary change, so if we are going to accept Burnyeat’s interpretation, we need to somehow reconcile the special treatment of learning in *De Anima* II 5 as something out of the ordinary, with its customary treatment elsewhere.

Burnyeat deals with this problem by claiming that learning can be classified either as an *alloiôsis simpliciter* or as a special sort of *alloiôsis* depending on how we describe it. In Burnyeat’s view, learning is an *alloiôsis simpliciter* if it is described as having termini that are opposed to each other, and is a special sort of *alloiôsis* if it is described as lacking this opposition. This approach, however, is not viable as it stands, insofar as it requires Aristotle to hold that an event may or may not be a change, depending on how we describe it. As Burnyeat points out, a fundamental feature of change, according to Aristotle, is that it involves the dissimilarity of termini. According to *Generation and Corruption* I 7, alteration essentially involves the assimilation of a patient to an agent, which implies that they are in initially dissimilar states, and according to *Physics* III, change is governed by a potentiality to become dissimilar to an initial state. Now if learning can be described as having termini that are not opposed to each other, i.e., if the *terminus a quo* and *terminus ad quem* of learning are not dissimilar, then this description would appear not to be a description of a change. This is problematic because Aristotle’s references at 417a1-2 and 17 to the discussions of change and alteration in *Physics* III 3 and *Generation and Corruption* I 7, his identification, in accordance with these texts, of alteration with assimilation throughout *De Anima* II 5, and his persistent use of the technical term *alloiôsis* throughout the chapter, strongly suggests that Aristotle wants to retain the status of learning as a change under any description. Burnyeat would, no doubt, object that what Aristotle has in mind is a ‘refined’ sort of assimilation, from which you cannot expect anything you would normally expect from assimilation. But I submit that we should expect from any refined sort of assimilation, if it is to be assimilation at all, an initial dissimilarity, and therefore opposition of termini. If Aristotle were to ‘go on using the language of alteration’ (57) and ‘assimilation’ while denying the most basic requirement for its correct application, then one would have to call this sort of talk misleading rather than ‘refined’. Regardless of how Aristotle chooses to speak, on Burnyeat’s view, Aristotle will have, as Burnyeat puts it, ‘cut the links with the dialectic of *De Generatione et Corruptione* I 7 and the categorial analysis of change in *Physics* III 1-3’ that make his psychology ‘the crowning achievement of his physics.’

There is a way, however, to incorporate Burnyeat’s insight that learning, when described as it is in *De Anima* II 5, lacks a certain sort of opposition, without creating the problem I just described. The key

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2. As Burnyeat (73) points out, the identification of alteration with assimilation begins at the outset of the chapter and is reaffirmed at the very end (418a1-3), where he says ‘we must go on using ‘being affected’ and ‘being altered’ as if these words < still> had their standard meaning.’
3. Hence, I disagree with Burnyeat that under his interpretation ‘We have made distinctions, but in terms which leave unchallenged the idea that (Alt1), (Alt2) and (Alt3) are all examples of change (kinêsis) in the sense of *Physics* III 1-3’ where (Alt2) and (Alt3) are allegedly alterations that lack opposition of termini (66).
4. M.F. Burnyeat, ‘*De Anima* II 5,’ pp. 36, 58 and 78.
is that the class of changes to which ‘preservative’ changes are contrasted in *De Anima* II 5, is explicitly a class of changes between *contraries*, not opposites (417b3). Contrariety is not the only sort of opposition a change can have. In *Physics* VIII 7, 261a32-3, Aristotle says that although not all changes proceed between contraries as alterations do, all changes except circular motion proceed between opposites. Substantial comings to be, for instance, proceed between opposites but not contraries, while alterations proceed between opposites which are also contraries. I propose that learning, when described as preserving and perfecting the learner’s nature, lacks contrariety but *not* opposition of termini, and is, therefore, a refined sort of alteration, and while not so described, is an *alloiôsis simpliciter*. I am not suggesting, of course, that learning under this description *is* a substantial coming to be, but rather that it is *like* a substantial coming to be insofar as it lacks contrariety but *not* opposition of termini.

The idea that learning is like a substantial coming to be is not new, and it has the fairly obvious point in it’s favor that Aristotle uses the concepts of first potentiality and first actuality to explain both, when he claims, in *De Anima* II 5, that the coming to be of the perceptive faculty in the embryo is analogous to the acquisition of knowledge because each is a ‘first transition’ between first potentiality and first actuality. This proposal is not new because Alexander and Philoponus have already suggested that learning, insofar as it is the acquisition of a natural disposition in a human being, is like a substantial coming to be because it perfects the faculty that differentiates a human being as a human being. Since, as Alexander says, ‘a human being in the proper sense is one who both possesses the dispositions and is active in accordance with those in respect of which a human being is a human being most of all and in the proper sense,’ the acquisition of these dispositions can be viewed as an extension of substantial coming to be. In defense of this, one may, first of all, note that in the *Generation of Animals*, Aristotle does cast substantial coming to be in terms of perfection, since he often uses the word *teleiôsis* to describe the attainment of stages of animal generation. But more importantly, he also likens attainments of virtues, understood as perfections (*teleiôseis*) of natural faculties, to substantial comings to be at *Physics* VII 3, 246a10-b2, and characterizes them as extensions of substantial comings to be:

> Again, dispositions (*hexeis*), whether of the body or of the soul, are not alterations. For some are virtues and others are vices, and neither virtue nor vice is an alteration: virtue (*aretê*) is a sort of perfection (*teleiôsis tis*) (for when anything acquires its virtue we call it perfect (*teleion*), when it becomes really a circle (*malista genêtau kuklos*) and when it is best (*belistos*), while vice (*kakia*) is a perishing (*phthora*) of or departure (*ekstasis*) from this. So just as when

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5 And presumably, it is in order to allow for both of these processes that Aristotle characterizes the subject of a 1st potentiality as having a certain sort of matter as well as belonging to a certain genus at 417a27. Cf. Philoponus in *DA* 305,34-306,7; cf. also *Physics* VIII 4, 255a24-b31, where the substantial coming to be of air out of water corresponds to the acquisition of knowledge because each is a transition between 1st potentiality and 1st actuality. Burnyeat (*De Anima* II 5, p. 50-1) points out the problem that whereas a second potentiality knower was formerly a first potentiality knower without also being a second potentiality knower, it is not the case that something alive in the sense of 2nd potentiality was formerly alive in the sense of 1st potentiality without being alive in the sense of 2nd potentiality. This doesn’t, however, disqualify the application of the triple scheme to the acquisition of the faculty of perception because the 1st potentiality perceivers is *to kuêma*, something already alive, not the pre-existing matter or *ta katamênia*, which is not.

6 Alexander, *Quaest.* 82,14-6, cf. 84,28, where Alexander says that learning is a *genesis pôs*; Philoponus glosses Aristotle’s *metabolê epi tas hexeis kai tên phusìn* at 417b16 with *metabolê eis teleiôtêta kai tên phusìn* at *in DA* 304,24, and claims that ‘these changes too are perfections in a way’ (304,27), where the ‘too’ refers to his earlier characterization of the switch from disposition to activity as ‘leading ... to perfection’ and ‘not properly called affection or alteration but rather coming to be’ (301,10-11).

7 *GA* 753a10, 757a32, 776b1, 770b26, 777b10, and 777b27.

8 cf. *Metaph.* Δ 16, 1021b14-25: ‘That which in respect of excellence and goodness cannot be excelled in its kind, e.g. a doctor is complete and a flute-player is complete, when they lack nothing in respect of their proper kind of excellence. ... And virtue is a *teleiôsis tis*; for each thing is complete and every substance is complete, when in respect of its proper kind of virtue it lacks no part of its natural magnitude. The things which have attained a good end are called complete; for things are complete in virtue of having attained their end.’
speaking of a house we do not call its arrival at perfection (*teleiôma*) an alteration (for it would be absurd to suppose that the coping or the tiling is an alteration or that in receiving its coping or its tiling a house is altered and not perfected (*teleioutai*), the same also holds good in the case of virtues and vices and of the things that possess or acquire them.

As Simplicius (*In Phys.* 1065,7-8) points out, this passage appears to reduce *all* dispositions of the body and soul to virtues and vices, and the generality of this reduction is evident from the first sentence.\(^9\) The point of the passage is that the acquisitions and losses of bodily and psychological dispositions, considered as virtues and vices that are characteristic of their bearers as members of their natural kinds, are to be viewed as perfections and departures from perfections, and as such, are to be assimilated to substantial comings to be and destructions or viewed as extensions of substantial comings to be and destructions. This is clearly Aristotle’s intention with his analogies of the house and the circle. The perfection of the house would appear to be a proper part of the process of becoming a house, much like the perfection of the embryo is a proper part of the generation of an animal, since putting the roof on a house is the completion (*teleiôsis*) of its coming to be. The point of the analogy in which this is embedded, then, is to liken the coming to be and destruction of an artifact to the arrival at and departure from bodily and psychological virtues.\(^10\) The analogy of the circle, however, seems to cast perfection as an *extension* of substantial coming to be. The circle is most a member of its geometrical kind when it is perfectly circular, so if the coming to be *simpliciter* of a circle is the coming to be a member of a geometrical kind, then becoming more perfectly circular is, in a sense, an extension of becoming a circle. Likewise, presumably, a man is most a member of his natural kind when he is perfectly virtuous, so if the coming to be *simpliciter* of a man is the coming to be a member of a natural kind, then becoming more perfectly virtuous is, in a sense, an extension of becoming a man. Knowledge, then, insofar as it perfects the rational faculty that differentiates human beings as human beings, is like a substantial coming to be and, in a sense, is an extension of a substantial coming to be. Now Burnyeat takes the process of perfecting such a faculty to lack opposition of termini, but I want to suggest that, because Aristotle assimilates perfection to coming to be, one need only suppose that it lacks contrariety. The way it does this, I propose, is that it proceeds from a privation to a natural disposition, but *not* from a contrary to a contrary.

It is an easy matter to prove that this holds for the acquisition of virtues of character by extending an argument found in *Metaphysics* Iota 5. Here, Aristotle reasons that since we normally ask ‘whether’ a quantity is greater than, less than, or equal to another, being equal to another quantity must be incompatible both with being less than it and being greater than it. And if equality is incompatible with both of these properties, it must be opposed to both of them in some way. But, since ‘one thing cannot have more than one contrary’ (*Metaph.* Iota 4, 1055a19-20), equality cannot be contrary to both. But neither can it be contrary to one but not the other, ‘for why should it be contrary to the greater rather than the lesser?’ (1056a5-6). It remains, then, for ‘the equal’ to be opposed to both ‘the greater’ and ‘the lesser’ as either a negation or as a privation (1056a15-6). ‘The equal’ is certainly a negation, insofar as it is *neither* ‘the lesser’ *nor* ‘the greater’, but it cannot be simply a negation, because if this were so, everything would be such that it is either equal or unequal, but only quantities can have these properties (1056a20-4), so it must also be a privation in that it is ‘determinate or taken along with its receptive material’ (1055b7-8). The equal, Aristotle concludes, is opposed to both ‘the lesser’ and ‘the greater’ not as a contrary, but as a ‘privative negation’ (1056a17-8). Thus, Aristotle’s claim at *Metaphysics* Iota 4,

\(^9\) Indeed, the paragraphs that follow appear to effect a division of the genus discussed in this paragraph (i.e., bodily and psychological dispositions). First, Aristotle considers bodily dispositions in general (246b4-20), then dispositions of the soul in general (246b20-247a7). Then he effects a division of dispositions of the soul into dispositions of character (247a7-19), and intellectual dispositions, i.e., knowledge (247b1-248a9).

\(^{10}\) It is worth noting that in both the α text and the β text of *Physics* VII, the coping and tiling example are each adduced, but in the β version for the conclusion that *genesis* is not alteration and in the α version for the conclusion that changes of *hexeis* are not alterations.
1055b15-6, that not every privation is a contrary because ‘that which is deprived may be deprived in several ways’ is borne out in the case of the opposition of the equal to the lesser and the greater. And thus, Aristotle implies that when a thing changes from having a quantity that is equal to another to having a quantity that is either greater than or less than another, or when a thing changes from having a quantity that is either greater than or less than another to having a quantity that is equal to another, it proceeds from a disposition to a privation or from a privation to a disposition, respectively, where the disposition and privation are not also contraries.

We can extend this argument to prove the same result about the acquisition and loss of virtues of character because this sort of virtue consists in a mean, and at Physics VIII 7, 261b19-20, Aristotle claims that the mean, like the equal, is the opposite, but not the contrary of both ‘that which surpasses it and of that which it surpasses’. The mean is a ‘privative negation’ of both excess and deficiency, and since virtue of character consists in a mean with respect to actions and passions (EN II 6), this sort of virtue is also a privative negation, but not a contrary11 of both excess and deficiency in actions and passions. Courage, for instance, is the ‘privative negation’, but not the contrary of both cowardice and rashness, temperance is the ‘privative negation’ but not the contrary of both insensibility and self-indulgence, and liberality is the ‘privative negation’ but not the contrary of both prodigality and meanness (EN II 7). From this we can infer that when a person changes from virtue to vice, or vice versa, he proceeds from a disposition to a privation or from a privation to a disposition, respectively, where the disposition and privation are not also contraries.12

Unfortunately, one cannot prove that learning proceeds from a privation to a disposition, but not from a contrary to a contrary in the same way that the acquisition of virtues of character does because knowledge does not consist in a mean. Philoponus, however, argues for a similar conclusion about a certain type of learning based on a distinction about the sort of ignorance from which the process of learning proceeds. According to Philoponus, there is a difference between the transition from a mere lack of knowledge to knowledge, and the transition from a false opinion to knowledge, because whereas the former proceeds from a privation to a form, the latter proceeds from a contrary form to a contrary form, and whereas the latter is ‘alteration in the strict sense’ (Aet. 72,4), the former ‘more closely resembles coming to be than alteration’ (72,15-6). Philoponus cites the Physics as the source for this doctrine (72,5), and he may have in mind Physics VII 3, 246a10-b2, where Aristotle claims that the acquisitions and losses of bodily and psychological dispositions, considered as virtues and vices that are characteristic of their bearers as members of their natural kinds, are to be viewed as perfections and departures from perfections, and as such, are to be assimilated to substantial comings to be and destructions. But as Michael Share points out,13 Philoponus also might be thinking of Physics V 1, where Aristotle talks of changes from ‘non-subject’ to ‘subject’ and from ‘subject’ to ‘subject’ where ‘subject’ means ‘what is affirmatively expressed’, and in the light of his characterization of accidental change in the next chapter as ‘change from one form to another’, it seems plausible to take ‘subject’ to mean form and ‘non-subject’

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11 In the light of this, we shall have to take Aristotle’s claim at EN 1108b14-5 that the mean in which virtues consists is contrary to both extremes as loose talk. One might object to this that Metaphysics Iota 5 only applies to ‘perfect’ or ‘complete’ contraries since he argues against intermediates being perfect contraries at 1056a12-5, but in any event, if it holds quite generally of contraries that ‘one thing cannot have more than one contrary’ (Metaph. Iota 5, 1055a19-20) the ‘contraries’ of EN 1108b14-5 will fail this test.

12 Aristotle also argues, in Categories 10, 12b26-13a36 that the loss of a natural faculty is a change from a hexis to a sterêsis but not also a change between contraries because, while reciprocal change is always possible between contraries, it is not possible to regain a natural faculty like sight once one has lost it. In Categories 10 passim, and Top. I 15, 106b21-6, II 2, 109b19, II 8, 114a7-13, V 6, 135b28-36, Top. VI 9, 147b26, Aristotle seems to ignore the distinction between dispositions (hexeis) and faculties (dunameis) that he makes in EN II 5 and EE II 2, lumping both under the heading hexis. In Categories 10, when contrasted with sterêsis, hexis appears to mean a natural dunameis, like hê opsis, while in Categories 8 and 15, hexis is more broadly construed to include things like virtue and knowledge.

to mean privation. The main point of the chapter, moreover, seems to fit Philoponus’ purpose to an extent, viz., that while substantial comings to be must be described as contradictory changes from a ‘non-subject’ to a ‘subject’, alterations may also be described in this way and called ‘a sort of coming to be’ (genesis tis), i.e., a coming to be of an accidental quality. I say ‘to an extent’ because this does not justify a preference for calling the transition from a mere lack of knowledge to knowledge ‘a sort of coming to be’ and the transition to knowledge from false opinion an ‘alteration’.

There are, however, two texts that together make the attribution of this doctrine to Aristotle quite plausible. The first, which is suggested by Ps-Simplicius,14 and is in the Posterior Analytics, makes a distinction between two types of ignorance, one ‘in virtue of a negation (apophasis),’ and one ‘in virtue of a condition (diathesis);’ the latter being a state of error, the former, presumably, being a mere lack of knowledge (79b23-4). This, at least, makes the distinction between termini a quo that Philoponus needs. As for the claim that the change from false opinion to knowledge is more ‘alteration in the strict sense’, I propose that we look to De Interpretatione 14, which considers the question of the contrariety of true and false beliefs. Here, Aristotle seems to assume that truth and falsity are contrary properties of beliefs, and tries to determine what sorts of false beliefs are most opposed to true ones by considering in which cases the believer in the false belief is most deceived. We need not get into the controversial subject of exactly how Aristotle takes this to work,15 since the point for my purposes is just that false beliefs are contrary to true beliefs because a certain sort of false belief is opposed to true belief as its unique and primary contrary. Since this is the case, and since alteration is paradigmatically a change between contraries,16 then we do have grounds to prefer calling a change from false belief to knowledge an alteration.17 It does not necessarily follow from this that we should also prefer to assimilate a change from the mere lack of knowledge to its possession to a substantial coming to be, but it is a natural assumption given that we already have grounds to think that learning under some description resembles such a change and that there obviously is such a thing as coming to know something without previously having been deceived about it. One might, for instance, come to know that Phidias was an excellent sculptor without having believed that he was not the son of Charmides, and then learn from a teacher that he was the son of Charmides. Learning as an example of ‘change to a thing’s dispositions and to its nature’, which takes place ‘through the agency of one who actually knows and has the power of teaching’ (417b12-3) would seem to be an instance of this sort of learning, and should be called ‘a sort of coming to be’, since learning from a teacher will, in most cases, prevent one from falling into error.

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14 See Ps-Simplicius ad loc., in DA, 121,35-122,7.
15 I prefer L. M. De Rijk’s (Aristotle. Semantics and Ontology. Volume One. Philosophia Antiqua, 91/1. Leiden: Brill, 2002, pp. 347-51) interpretation, since it saves Aristotle from the ‘astounding confusions’ and inconsistencies of which Dancy (Sense and Contradiction: A Study in Aristotle, Dordrecht, 1975, pp. 143-52) and Ackrill (Categories & De Interpretatione. Transl. w. notes by J.L. Ackrill. Oxford, Clarendon Press, 1963, pp. 153-5) accuse him. De Rijk’s view, very briefly, is that what are opposed as the content of beliefs in De Int. 14 are assertibles (i.e., what are expressed by ‘that-clauses’) and not assertions, so Aristotle need not be contradicting what he has said elsewhere about the contrariety of assertions. Moreover, since the content of a belief can be an incomplete assertible (e.g., ‘not being good’), it is possible to read a sentence like ‘the good is not good’ so that ‘the good’ has wide scope. So rather than believing a contradiction, which, as Aristotle him self says, would make a deceived person no different than a vegetable (100b11-2), the deceived person believes of a given good thing, e.g., temperance, that it is not good. This, on De Rijk’s interpretation, is the sort of false belief that is the unique and primary contrary to a true belief.
16 See e.g., Physics VI 10, 241a32: ex enantion gar tinon è alloiois; Physics VIII 3, 253b30: eis tounantion gar è alloiois; Physics VIII 7, 260a33: anagkè oun alloioisin einaî tèn eis tanantia metabolèn; Cael. I 12, 283b21-2: alloioitsal de tois enantiois; See also Physics V 2, 226b1-8, VIII 7, 261a34-5, and GC I 4.
17 The term ‘ignorance in virtue of a condition (diathesis)’ seems to fit false belief on this account. If knowledge is a disposition (hexis), which is a long lasting condition (diathesis), and false beliefs are conditions (diatheseis) which are not necessarily long lasting, then true and false beliefs are contrary conditions (diatheseis) of the believer.
Now one might suppose from this that when one learns something, having previously been deceived about it, one would only be correct to call this sort of learning an alteration. But this is not borne out by the text of De Anima II 5. The description of learning at 417a22-32 involves change from ‘a contrary disposition’, which suggests that it is ‘alteration in the strict sense’ and entails an initial state of deception, but learning is also described in this passage as a transition to a disposition which the learner is able to acquire “because his genus and matter are such”, and this suggests it is one of the special sort of alterations described as a ‘change to a thing’s dispositions and to its nature’. The critical sentence, here, is 417a31-2, where Aristotle says that the first potentiality knower “[becomes possessed of knowledge], having been altered through learning, i.e. having repeatedly changed from a contrary disposition.”

This sentence consists of an implied main verb and predicate adjective, which according to the usual interpretation, is ‘becomes possessed of knowledge’ (gignetai epistêmôn), the participial phrase ‘having been altered through learning’ (dia mathêseôs alloiôtheis), and an epexegesis of this participial phrase ‘i.e. having repeatedly changed from a contrary disposition’ (kai pollakis ex enantias metabalôn hexeôs). Philoponus appears to make his distinction between types of learning in response to the mention of contrary dispositions (enantias hexeôs) in this epexegesis. So on Philoponus’ reading, ‘having been altered through learning’ is flagged, by the epexegesis, as meaning ‘changing from false opinion to true’, which is an alloiôsis simpliciter, in contradistinction to a change from the mere lack of knowledge to its possession, which ‘more closely resembles coming to be than alteration’.

Surprisingly, this is as far as Philoponus takes his interpretation of learning in De Anima II 5. But there are some fairly obvious further steps that one can take. First, it seems reasonable to take, in the light of Philoponus’ interpretation, ‘repeatedly changing to a contrary disposition’ to mean oscillating (hence the pollakis) between true and false opinions, so that the participial clause ‘having been altered through learning’ describes the familiar process of trial and error that precedes the acquisition of the settled disposition (hexis) of knowledge. (When interpreted in this way, it is fitting that this sort of learning should be so frequently adduced as an example of change simpliciter, because, at least in this writer’s experience, learning by trial and error is, by far, the most common way we learn.) The next step is to construe, in the light of this, the main clause and its relation to the participial clause. The main clause ‘becomes possessed of knowledge’ would appear to be a description of the acquisition of knowledge, in itself or as such, that a human is able to undergo “because his genus and matter are such” (417a27). As for the relation of the participial clause to the main clause, since the participle alloiôtheis is clearly circumstantial, the relation can either be one of time, manner, means, cause, purpose, condition, concession, and attendant circumstance. So the participial phrase either states when the acquisition of knowledge occurs, the manner in which it occurs, the means by which it occurs, the cause of it occurring, a condition for it occurring, or an attendant circumstance of it occurring which may or may not be

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18 ho men dia mathêseôs alloiôtheis kai pollakis ex enantias metabalôn hexeôs
19 See Ross, Hicks, Alexander and Philoponus for the orthodox reading. Burnyeat advocates an alternate reading, in which kata dunamin estin is implied instead, on the grounds that it is more economical than supplying gignetai epistêmôn, that it accords with the Kosman reading of Aristotle’s definition of change such that change is governed by a potentiality to be in the terminus ad quem, and that it offers a series of contrasts that are all concerned with ways of being in potentiality. But none of these considerations is decisive. Since Aristotle’s prose is notoriously elliptical, the preference for economy should not hold much weight. As for the second point, while it is true that Burnyeat’s reading confirms the Kosman reading of Aristotle’s definition of change, it is also true that the traditional reading does not contradict it, and even if one agrees with Kosman’s interpretation, Aristotle should not be required to confirm it at every opportunity. Finally, that Burnyeat’s reading makes 417a31-2 a contrast between ways of being in potentiality is of dubious benefit, since on Burnyeat’s own admission, the philosophical intent of 417a31-2 is to contrast ways of changing.
20 pollakis ex enantias metabalôn hexeôs seems to suggest a back and forth motion between contraries. Thus, Burnyeat’s (p. 53) claim that it just means that learning is a stage by stage process does not sit well with the text.
opposed in some way to it occurring.\textsuperscript{21} If the participial phrase describes, as I have suggested, the process of trial and error that precedes the acquisition of the settled disposition of knowledge, the most likely relations of the participial clause to the main clause would appear to be means and cause. We talk of learning \textit{by} trial and error because it is by means of trial and error that we come to know things, and it is the ability of trial and error to cause the acquisition of knowledge that makes it fit for this role.\textsuperscript{22} Thus, when Aristotle says that the first potentiality knower becomes possessed of knowledge, ‘having been altered through learning, i.e. having repeatedly changed from an opposite disposition’, ‘becoming possessed of knowledge’ (the implied \textit{gignetai epistêmôn}) is an example of the acquisition of a nature preserving and perfecting disposition in itself or as such, while ‘having been altered through learning, i.e. having repeatedly changed from an opposite disposition’ is an example of an \textit{alloiôsis simpliciter} by means of which or because of which this acquisition comes about.

The notion that the acquisition and loss of dispositions, though not alterations themselves, are necessarily accompanied by alterations is also expressed in \textit{Physics} VII 3 in a closely analogous way. Aristotle uses participles of \textit{alloiôsthai} three times in genitive absolutes\textsuperscript{23} to claim that the acquisition and loss of bodily and psychological dispositions are necessarily accompanied by alterations.\textsuperscript{24} He also uses a participle of \textit{alloiôsthai} in a genitive absolute to claim that substantial comings to be are necessarily accompanied by alterations.\textsuperscript{25} And just as in the case of knowledge and the process of trial and error that attends it, the alterations that accompany substantial comings to be are best described as causal or instrumental to such comings to be. Just as the first potentiality knower may become possessed of knowledge, having been altered by means of learning or as a result of learning in the sense of exchanging true opinions for false ones and false opinions for true ones until, by trial and error, a stable disposition of knowledge is attained, in the same way, a pile of stones may acquire the form of a house, having been altered by means of stonelaying or because some stonelaying takes place, i.e., chiseling, troweling, pointing and etc. It is a common, and I think, reasonable assumption to take these sorts of instrumental processes to \textit{constitute} the processes they are instrumental to.\textsuperscript{26} Just as the various alterations of the builder and the building materials constitute, but are not ‘the same in being’ as the process of

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\item \textsuperscript{21} It is unlikely that the participial phrase would describe the purpose for which the acquisition of knowledge occurs, since circumstantial participial phrases expressing purpose are usually in the present or future tense, whereas \textit{alloiôtheis} is aorist.
\item \textsuperscript{22} Philoponus does not make the distinction between the acquisition of knowledge and a process that attends it, but his interpretation, I think, requires something like it. Philoponus claims that Aristotle is speaking loosely, at 417a30-b2, by calling ‘the change from being in potentiality to being in act’ an \textit{alloiôsis}, and he does so pending the more exact distinctions set forth in 417b14-6. But this cannot be all there is to it. If it were merely the case that the word \textit{alloiôtheis} were being used loosely to denote the transition from 1st potentiality to 1st actuality knowledge, then we would expect the epexegesis that follows \textit{alloiôtheis} to point us toward a more precise characterization of this transition. But in fact, under Philoponus’ interpretation, \textit{kai pollakis ex enantias metabalôn hexeôs} gives us exactly the wrong sense of the word, i.e., the sense appropriate if Aristotle were using the word \textit{alloiôtheis} precisely, as he understands it.
\item \textsuperscript{23} The genitive absolute is necessary in \textit{Physics} VII 3 because the subject of the participle of \textit{alloiôsthai} is different from the subject of the \textit{geneseis}. But in \textit{D4 II 5}, instead of knowledge coming to be, Aristotle talks of a person coming to be a knower, so the subject is the same and the genitive absolute is not necessary.
\item \textsuperscript{24} “But perhaps it is necessary that [dispositions of the body] come into being and perish as certain things are being altered.” (246b14-15); “It is necessary that [dispositions of the soul] come to be as the perceptive component undergoes alteration.” (247a6-7); “This is clear: when something undergoes alteration then it is necessary that it [the subject at issue] should also lose and acquire [virtues and vices of the soul].” (247a17-8).
\item \textsuperscript{25} “But perhaps it is necessary that in every case of [substantial] coming to be something is being altered.” (246a6-7)
\item \textsuperscript{26} cf. Victor Caston, “The Spirit and the Letter: Aristotle on Perception,” in Ricardo Salles (ed.), \textit{Metaphysics, Soul, and Ethics: Themes from the work of Richard Sorabji}, 245–320. Oxford: Oxford University Press, 2004, 268, who claims that although the transition to housebuilding at 417b9 is not, in itself, a locomotion or alteration in the builder, this transition must be brought about by means of such changes. As such, Caston argues, the transition to housebuilding is ‘realized in’ and ‘constituted by’ such changes.
\end{itemize}
housebuilding, the process of trial and error that the learner undergoes constitutes, but is not ‘the same in being’ as the acquisition of knowledge that results from it. And when one process constitutes another, it is natural to think of them as the same process under different descriptions, or as being ‘one in number, but two in being’ as Aristotle would say.

This interpretation has the advantage of reconciling what appear to be conflicting tendencies in Aristotle’s accounts of substantial coming to be and learning. Given the logic of how Aristotle distinguishes alteration from substantial coming to be in *Generation and Corruption* 3 and 4, and in particular, that these are distinguished by the presence or absence of a persisting underlying substance, substantial coming to be should, as a rule, be instantaneous. But we ordinarily talk about coming to be as an extended process, and, in fact, in the *Physics*, Aristotle provides an alternate way to describe coming to be that conforms with this way of talking. In *Physics* VI 6 237b9 ff. and VI 9, 240a16 ff., Aristotle describes coming to be, so that it may be either an extended process or an instantaneous completion, depending on whether what is described is the coming to be of the form/matter composite or of the form.27 The tension, here, stems from Aristotle’s desire to incorporate the ordinary but conflicting intuitions that coming to be is both an extended process undergone by what is coming to be, and that what comes to be emerges as a subject at the end of this process. But the conflict dissolves if we take the extended process as the process by means of which the substantial coming to be comes about, and as the process that constitutes, but is not identical to this substantial coming to be. A similar conflicting tendency can be found in Aristotle’s descriptions of learning. Usually, learning is described as a paradigm κίνησις, which means it takes time. But in *Physics* VII 3, 247b9-248a6 Aristotle describes ‘the initial acquisition of knowledge’ not as a change, but as a ‘coming to rest’ or a ‘settling down’ from ‘natural disturbance.’ So just as the coming to be of a substance may be described as either an extended process or the completion of an extended process depending on whether it is described as the coming to be of the composite or of the individual form,28 so the process of learning may be described as either an extended process or the completion of an extended process depending on whether it is described as the oscillation between states of truth and error or as the ‘settling down’ or cessation of this oscillation at the stage where knowledge has become a stable disposition (*hexis*).29 And again, the conflict dissolves if we take the extended process as the process by means of which the acquisition of knowledge as such comes about, and as the process that constitutes, but is not identical to this acquisition of knowledge.

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27 In *Physics* VI 6 237b9 ff. and VI 9, 240a16 ff., Aristotle claims that, although the coming to be of a substance in one sense occurs instantaneously at the completion of its coming to be, in another sense it does not, since the coming to be of its material parts is infinitely divisible, and this is the case because its matter is infinitely divisible, and in VI 9, he says, as a general principle, that while a thing is changing between contradictory termini, such as being and not being, a changing thing is never wholly in either state, since some of its parts are always in the *terminus a quo* and some parts are always in the *terminus ad quem*. The possibility of substantial coming to be being described as an extended process also seems to be implied in *Physics* III 1, since the definition of *kinēsis* there includes substantial coming to be and destruction, and this definition, as an incomplete actuality, entails that the process takes time.

28 cf. Croese (Simplicius on Continuous and Instantaneous Change, PhD diss., Leiden-Utrecht Research Institute, Utrecht 1998, 87-97) on the claim that the genesis of the form is instantaneous, and also *Metaph.* 1032a17-19, 22-25, 1033a24-b19, 1034b11, 1035a6-9, 1036a16-19, 1037a7-11, 1043a29-b4, 1043b14-8, 1044b21-4, 1069b35-1070a4.

29 Burnyeat, p. 64, claims that “none of this is on display in *De Anima* II 5,” but, I claim, this is precisely what is entailed by *pollakis ex enantias metabalôn hexeōs* at 417a31-2.