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Substantial Generation in Physics I 5-7

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Introduction

The focus of this paper is on the conceptual machinery of Aristotle's theory of generation in *Physics* I 5-7. According to the standard interpretation, *Physics* I 7 imposes two requirements on *all* processes of change. First, all change requires an underlying subject from which the change proceeds. During the course of the change this subject comes to be *F* from being not-*F*. Second, the subject must remain through the change to become a constituent of the finished product. For example, Socrates survives the healing process and simply exchanges sickness for health, and bronze survives the production of the statue and simply changes from being unshaped to being shaped. The central question of this paper is whether or not Aristotle thinks that both of these conditions hold in cases of substantial generation. Does he think that when a new substance comes into being there is a preexisting subject that survives that change and becomes a constituent of what comes to be? The orthodox view is that he does and that his argument for this is to be found in *Physics* I 7. This, it is held, forms part of Aristotle's argument forhylomorphism, the claim that every particular thing is a composite of matter and form. My aim in this paper is to reevaluate this entrenched view of the *Physics*. I shall argue that *Physics* I 7 is silent on the question of whether or not substantial generation requires a persistent subject, while evidence external to the *Physics* strongly suggests it does not. On this reading, while Aristotle thinks substantial generation requires a subject from which the change proceeds, he does not claim that this subject survives as a constituent of the substance that comes into being.

To begin it will be useful to call attention to the distinction Aristotle makes in the works on natural science between qualified coming to be (γίγνεσθαι τι) and coming to be in the unqualified sense (γίγνεσθαι ἀπλῶς).¹ All change for Aristotle is a form of coming to be (or passing away) in one of these two senses.² As a first pass at this distinction we can say that when "coming to be" (γίνεται, γίγνεσθαι) is used in the

¹ See also Jones (1974, 478-80).

² For the main distinction see *Physics* I 7, 190a31-3, *GC* I 3, 318a34-5. My focus in this paper is mainly on coming to be, though much of what I have to say applies equally to passing away.

qualified sense the verb is always transitive in the sense that it remains incomplete without specifying what the subject comes to be. For example, we say that a human comes to be *healthy* or that he comes to be *bigger*. When used in the unqualified sense, the verb is intransitive in the sense that it is complete all on its own. In this case we say that a human comes to be (full stop), not that he comes to be *so-and-so*. This linguistic distinction has a metaphysical basis. For the difference also turns on which category of being the change concerns.³ When a thing comes to be in the qualified sense the change always occurs with respect to one of the non-substantial categories. Alteration (ἀλλοίωσις) is coming to be in the category of quality (e.g. Socrates comes to be healthy), growth is coming to be in the category of quantity (e.g. Socrates comes to be bigger), and locomotion is coming to be in the category of place (e.g. Socrates comes to be in the market). All of these count as instances of coming to be in the qualified sense because the substance (Socrates) already exists and merely becomes qualified in some particular way. Coming to be in the unqualified sense, by contrast, is a change in the category of substance; it is substantial generation. In this case a new substance comes into being that was not there before. In what follows I shall reserve the term “generation” for coming to be in the unqualified (ἀπλῶς) and strict (κυρίως) sense and use the more general term “change” (μεταβολή, κίνησις) for the broader category that includes coming to be in the qualified sense (alteration, growth, locomotion).

At the outset of the *Physics* Aristotle tells us that when the objects of any inquiry have principles, causes, or elements (ἀρχαὶ ἢ αἴτια ἢ στοιχεῖα), knowledge and understanding are acquired by grasping these: “For we do not think we know a thing until we are familiar with its primary causes or first principles and have carried out our analysis as far as its elements. Clearly, then, also in the science of nature our first task will be to determine its principles.” (184a10-16) Aristotle’s positive inquiry into these principles is set out over *Physics* I 5-7.⁴ According to the results of that inquiry every change involves a subject *S* that undergoes the change (τὸ ὑποκείμενον) and a pair of

³ With the following see *GC* I 3, 317a27-8, *GC* I 4, 319a11-16, and *Metaphysics* XII 2, 1069b9-14.

⁴ Compare *GC* II 9, *Metaphysics* VII 7, and *Metaphysics* XII 4. Of these four places only *Metaphysics* XII 4 offers the complete list of principles of coming to be (form, privation, subject/matter, primary moving cause).

contraries *F* and *G* that represent the two extremes of the change. Within this tripartite schema, *S* is always a body of some kind (e.g. human, wood, seed), while the contraries are identified with the form (the possessed state, ἔξις; e.g. musical) and its privation (the absence of that state, στέρησις; e.g. unmusical). When the change proceeds from the privation to the form it is coming to be. When it proceeds in the opposite direction from the form to the privation it is passing away. Together *Physics* I 5-7 argue that these three items (form, privation, and subject) constitute the principles of coming to be for all natural things: *Physics* I 5 argues that the contraries are principles; *Physics* I 6 shows that there must be some third thing besides these; *Physics* I 7 argues that this third thing is the subject that underlies the change.⁵

Aristotle's main position is developed at length in *Physics* I 7. The core of that theory can be extracted from two key passages: 190a13-21 and 190b10-23. For our purposes we can focus on the celebrated passage at 190a13-21:

Once these distinctions have been made one can grasp the following from all the cases of coming to be, if one looks at them as we suggested (ἐάν τις ἐπιβλέψῃ ὥσπερ λέγομεν), namely, that there must always be an underlying subject (which is what comes to be), and that this, though always numerically one, is not one in form. By 'in form' I mean the same as 'in account'; for what it is to be a human is not the same as what it is to be musical. And one survives, while the other does not: for what is not an opposite survives (for the human survives), but not-musical or unmusical does not survive nor does the compound of the two, namely, the unmusical human.

Aristotle makes two main claims here. First, coming to be requires an underlying subject, which is the thing that comes to be (τὸ γινόμενον).⁶ This subject is numerically one but not one in form; rather, it changes from *F* to *G* as a result of coming to be.

⁵ For a general discussion of these chapters, see Kelsey (2008) and Bostock (2006, Ch. 1).

⁶ Aristotle uses τὸ γινόμενον to refer both to the subject from which a change proceeds (the *terminus a quo*) and to the thing that results from that change (the *terminus ad quem*). In the present context Aristotle means the former, while at 190b10-23 (quoted below) τὸ γινόμενον picks out the latter. In the *GA* Aristotle uses τὸ γινόμενον almost exclusively for the embryo that comes to be an *F*.

Second, in the process of change one part survives (the subject) while the other does not (the privation or the subject-*cum*-privation). I shall call these the Subject Requirement and the Survival Requirement, respectively:

Subject Requirement. Coming to be requires an underlying subject from which the change proceeds.

Survival Requirement. When something comes to be the subject endures and remains as a constituent of the finished product.

Most scholars take *Physics* I 7 to be developing the concept of underlying subject in close connection with the idea of being a continuant of change so that the Subject Requirement and the Survival Requirement come out as equivalent. Bostock (2006, 9), for example, argues that the expression τὸ ὑποκείμενον is being made to do “double duty” in *Physics* I 7, both for the starting-point of the change (the *terminus a quo*) and for what persists through the change. On this reading, to say coming to be requires a subject that underlies the change just means there must be something that persists through the change and survives as a constituent of the finished product.⁷ On the reading I shall defend, the concept of subject and continuant come apart: the concept of subject (τὸ ὑποκείμενον) is playing only the one role of starting-point of change; it is a separate claim to say that this subject also persists through the change.⁸

It is obvious that cases of non-substantial change meet both requirements. For example, when Socrates comes to be healthy from being sick there is an underlying subject from which the change begins (Socrates). And that subject persists through the change and remains as a constituent of the finished product (healthy-Socrates). However, while *Physics* I 7 argues that substantial generation must also satisfy the Subject Requirement (190b1-5), there is a question about whether or not Aristotle means to commit himself to the view that in cases of substantial generation this subject

⁷ See also Broadie (1982, e.g. 47), Gill (1989, 6, 90, 106), Witt (1989, 66).

⁸ Compare Charlton (1970, 77; cf. Bostock 2006, 7-8). Charlton denies that substantial generation involves a persistent subject. While I shall eventually side with this reading, here I only mean to make the point that the Subject Requirement and the Survival Requirement are independent of one another. That point does not require taking a stand on the question of whether or not Aristotle is committed to the Survival Requirement in cases of substantial generation.

survives as an element of the substance that results from that change. Before turning to that I want to start by clarifying the Subject Requirement.

The Subject Requirement says that in (all) coming to be there must be a subject from which the change begins. Like the contraries, the concept of an underlying subject of change was not Aristotle's invention. At 189b5-6 Aristotle suggests that some of his predecessors already invoked the idea of a ὑποκείμενον as something different from the contraries, though they disagreed over what that underlying subject was. But how does Aristotle understand the concept? *Physics* I 7 offers plenty of examples of subjects including a human (190a17, b14, b20), a seed or embryo (190b5; cf. *GA* 724b14-18, 728b34-5;731a2-4), bronze, gold, stone (190a25, 190b16-17), and wood (191a7). We can shed some light on this motley crew of subjects by turning to *Metaphysics* VII 13, 1038b2-7:

Just as the underlying subject, the essence, and the composite of these are called substance, so too is the universal. We have already spoken about two of these, namely the essence and the underlying subject, and the latter we said underlies in two senses: either as a determinate individual, which is the way that an animal underlies its attributes, or as the matter underlies the complete actuality.⁹

Here Aristotle contrasts matter with the determinate individual (e.g. the individual human or horse) as two kinds of underlying subject. The latter is the more familiar sense of subject from the *Categories*. These primary subjects are independently-existing 'thises' (τὸδε τι) that remain numerically one and the same throughout their existence and stand as ultimate subjects of predication (*Cats.* 5). The other sense of subject is the proximate matter that underlies the form of the composite individual. In the case of living things, for example, the material subject is the living body whose organs have been specially adapted to realize the capacities of soul that make up its form (*DA* II 1,

⁹ See also *Metaphysics* IX 7, 1049a34-b1.

412a17-19).¹⁰

What I want to suggest is that these two senses of underlying subject — subject as individual determinate substance and subject as matter — track Aristotle’s distinction between qualified and unqualified coming to be, respectively. The underlying subject of qualified coming to be is always some determinate individual; for example, human is the subject in the change from an unmusical human to a musical human. By contrast, the subject of unqualified coming to be is always matter of some kind; for example, bronze is the subject in the production of a bronze statue. While Aristotle does not avail himself of this distinction in *Physics* I 7, it is clearly implicit in his account. For example, when he is enumerating the principles of naturally generated substances at the end of *Physics* I 7 he attempts to elucidate the concept of “the underlying nature” (ἡ ὑποκειμένη φύσις) by setting up a contrast between matter, on the one hand, and the individual substance, on the other (191a7-12), and stresses that the former underlies the change *but not* as a unified ‘this’ (191a12-13: οὐχ οὕτω μία οὐσα οὐδὲ οὕτως ὄν ὡς τὸ τόδε τι). Again at 190b13-14 (see below) he distinguishes bronze or stone from the human being as two kinds of underlying subject. So there is at least some recognition in *Physics* I 7 that when τὸ ὑποκείμενον is used for the material subject (e.g. bronze, gold, stone, wood) it is to be contrasted with those subjects that correspond to individual substances (e.g. human, horse).¹¹

According to the Subject Requirement, then, all coming to be requires an underlying subject from which the change proceeds. When a thing comes to be in the

¹⁰ Gill (1989, e.g. 31) argues that the aim of *Metaphysics* VII 3 is to refine the conditions on subjecthood so that matter actually turns out not to be a subject. On her reading, the refined concept only picks out the individual, i.e. what is separate and a ‘this’ (τὸδε τι). But that is not what *Metaphysics* VII 3 concludes. Aristotle says that being separate and a ‘this’ are characteristics of substance, not subject, and that for this reason matter fails to be a substance. Aristotle never retracts the original claim that matter is an underlying subject. And *Metaphysics* VII 13 presents that claim as something already established.

¹¹ Aristotle’s remarks at the beginning of *GC* I 5 also suggest that these two senses of underlying subject mark the distinction between qualified and unqualified coming to be. There he says that matter in its “most proper and strict sense” is the underlying subject of generation and destruction, though “in a certain way” it is also the subject of other changes (320a2-5). What he means, I take it, is that when the musical human comes to be musical, ‘man’ can be treated as the matter insofar as it stands in an *analogous* relation to the (un)musical human as bronze stands to the statue or wood to the bed (cf. *Physics* I 7, 190b20-3). Thus, in a way, matter is the subject even of non-substantial changes (including alteration, increase, and locomotion). But matter in the “proper and strict sense” (e.g. bronze, wood) is the subject only of unqualified coming to be and passing away.

qualified sense this will be a determinate individual (e.g. human). In cases of substantial generation the subject from which the change proceeds is always matter of some kind (e.g. bronze). The question is whether in *Physics* I 7 Aristotle thinks the subject must persist in all cases of change, including substantial generation, or whether this is true only for changes in the non-substantial categories.

Before turning to that question let us complete the basic model of coming to be by introducing the other core passage from *Physics* I 7:

From what has been said, it is clear that everything that comes into being (τὸ γιγνόμενον) is complex.¹² There is, on the one hand, what comes into being (τι γιγνόμενον) and, on the other, something that comes to be that (τι ὃ τοῦτο γίνεταί). And the latter in two senses: either the subject or the opposite. By ‘the opposite’ I mean the unmusical and by ‘the subject’ I mean the human. Likewise I call the absence of shape, form, or organization ‘the opposite’ and the bronze or stone or gold ‘the subject’. Clearly, then, if there are causes and principles of naturally existing things from which (ἐξ ὧν) they primarily are and have come to be (I mean what each is said to be according to its essence and not incidentally), then everything comes to be from both the subject and the form (ἐκ τε τοῦ ὑποκειμένου καὶ τῆς μορφῆς). For in a certain way the musical human is composed of human and musical, for you can analyze it into the account of each. It is clear, then, that things that come to be (τὰ γιγνόμενα) have come into being from these. (190b10-23)

Consider the generation of an animal. The thing that comes into being as a result of the change is the fully-developed animal that can be analyzed into a body, which is the underlying subject, and a soul, which is predicated of the body as its subject (*DA* II 1, 412a16-19). The soul is the form picked out by the definition specifying what comes to be

¹² I take τὸ γιγνόμενον here to refer to what results from the change (the *terminus ad quem*). For an alternative reading see Gill (1989, 102-8).

(τι γινόμενον)¹³, while the thing that comes to be that (τι ὃ τοῦτο γίγνεται) is either the embryo (*Physics* I 7, 190b1-5, b9-10) or the privation of the form (*Physics* I 5, 188b20; cf. *Phaedo* 70b10-72e2).

The remainder of the passage is meant to answer the central question of *Physics* I, What are the principles from which (ἐξ οὗ) naturally existing things primarily are and come to be? Aristotle's answer can be understood by drawing on a distinction he makes in *Metaphysics* XII 3 this time between two kinds of principles: "Since not only the elements that are present in a thing (τὰ ἐνυπάρχοντα) are its causes but also something external (ἐκτὸς) to it, viz. the moving cause, clearly while 'principle' (ἀρχή) and 'element' (στοιχείον) are different both are causes, and 'principle' is divided into these two kinds." (1070b21-5) The two kinds of principles here are (1) those that are present in a thing as its constituent elements and (2) those that are not constituents of the product but are external to it. Of the three principles listed in *Physics* I 7, the privation counts as a principle only in the sense that natural generation originates from it. But it is not a principle in the sense of an element of the thing that comes to be. For it does not remain in the finished product as a constituent (*Physics* I 8, 191b16: οὐκ ἐνυπάρχοντος γίγνεται τι) but is destroyed in the change. Only subject and form are principles in the sense of being constituent elements of naturally generated substances. This is what Aristotle means when he says that everything that comes into being is *composed from* subject and form (190b20: γίγνεται πᾶν ἔκ τε τοῦ ὑποκειμένου καὶ τῆς μορφῆς).¹⁴

Traditionally scholars have taken this as an argument for hylomorphism. But that

¹³ Compare *Metaphysics* VII 7, 1032a13-25 and *Metaphysics* XII 3, 1069b36-1070a2. In both places Aristotle uses the expression τι γινόμενον to pick out the form that tells us what it is that comes into being. While it is true that the *Metaphysics* VII 7 passage offers "human" and "plant" as its examples of τι γινόμενον, which look like composite substances, Aristotle insists that the same term can designate both the form and the composite (*Metaphysics* VIII 3, 1043a29-37). That he has the form of the product in mind here is confirmed by *GC* II 9, where he explicitly identifies the three principles of coming-to-be with the matter, form, and primary efficient cause. Of the first two he says: "This [sc. the capacity to be and not be] is a cause in the sense of matter for those things that are such as to come-to-be, while the cause in the sense of their end is their shape or form, which is also the account stating the substance of each of them." (335b4-7) Once again contrast Gill (1989, 121).

¹⁴ *Physics* I 7 does not list the primary moving cause among the principles of naturally generated substances. However, in *Physics* II we learn that form and matter are, in fact, both inner principles of change for naturally generated substance. The external efficient cause mentioned in the *Metaphysics* passage is the (form of the) generating parent (*Physics* II 7, 198a25-8; *Metaphysics* VII 7, 1032a20-5; *GA* II 1, 735a2-4; *PA* I 1, 640a19-26).

is not quite what Aristotle says here. While matter is certainly one kind of constitutive subject, we have seen that *Physics* I conceives of τὸ ὑποκείμενον in the broader sense that includes both matter (e.g. bronze) and the determinate individual (e.g. human). This is explicit even in the current passage; for “man” is there identified as the subject in the composite “the musical human”. So if there is an argument for hylomorphism in *Physics* I 7, it is not the explicit aim of this passage.

As we have seen most commentators assume that Aristotle’s concept of underlying subject already involves the idea of being a continuant of change, so that the Subject Requirement and the Survival Requirement collapse into a single condition imposed on all coming to be.¹⁵ In this section I reexamine that orthodoxy. We can carve up interpretative space into two broad readings. According to the orthodox view, Aristotle holds that all change requires a subject that persists through the change and remains as a constituent in the finished product, including substantial generation. We can call this the Inclusive Reading since it takes the Survival Requirement to be inclusive of all forms of coming to be.¹⁶ By contrast the Exclusive Reading takes the Survival Requirement to apply exclusively to coming to be in the qualified sense (change in the non-substantial categories).¹⁷ On this reading, while Aristotle thinks substantial generation requires a subject from which the change proceeds, he does not claim that this subject must

¹⁵ I suspect this reading gains a lot of its naturalness from the fact that most gloss τὸ ὑποκείμενον as “that which *underlies the change*”. To avoid begging the question I have adopted the more neutral expression “underlying subject”, without any assumptions about what this subject underlies (the form/privation or the change itself).

¹⁶ This reading is by far the most common. It is defended in some form or another by Broadie (1982, e.g. 46-7), Gill (1989, 6, 98-108), Code (1995, 415-17), Bostock (2006, 8-9), and Kelsey (2010, e.g. 112). Broadie (2004) seems to have changed her position on the matter. Broadie (1982) endorses the Inclusive Reading and takes the concept of underlying subject to entail the idea of persistence (e.g. 47). However Broadie (2004) takes the weaker view that *Physics* I 7 is actually silent on the issue, while *GC* I 3 positively rejects it in favour of the Exclusive Reading (129-30). (In light of this I take her remarks in her 2004 essay in favour of the Inclusive Reading to be offering reasons why one might be tempted by it without actually endorsing it.) Bostock defends the Inclusive Reading, but he is careful to restrict his defense to *Physics* I (p. 8). He does not speculate as to whether or not Aristotle endorsed the Survival Requirement outside *Physics* I, specifically, whether or not *GC* I 1-5 actually rejects it. Finally, Kelsey parses *Physics* 190a13-21 slightly differently so that the Survival Requirement is not actually at issue. On his reading Aristotle argues (1) that coming to be always requires an underlying subject and (2) that this subject must be “two in form”. He then takes the claim that one part survives and one part does not survive as evidence for (2). However, Kelsey counts himself among those who accept the Inclusive Reading (personal communication).

¹⁷ Charlton (1970, 77, 135), Jones (1974), Broadie (2004).

survive as a constituent of the substance that comes into being. What I want to argue is that the Exclusive Reading is more attractive as an interpretation of *Physics* I 7 than the more traditional Inclusive Reading. There are two reasons for this. First, although most commentators prefer the Inclusive Reading, the evidence from *Physics* I 7 is not conclusive enough to force that interpretation on us. As we shall see, it is possible to read that chapter in a way that is compatible with the Exclusive Reading. Second, there is evidence external to *Physics* I that strongly suggests Aristotle does not think substantial generation involves an enduring subject. This creates a strong presumption in favour of the Exclusive Reading as an interpretation of Aristotle's more general views about coming to be in the unqualified sense. In light of this I shall propose that *Physics* I 7 is best read as remaining silent on the question of whether or not substantial generation must meet the Survival Requirement. This conservative reading has the obvious virtue of avoiding a conflict among Aristotle's different discussions of change.

Traditionally *Physics* I 7 has been seen as the *locus classicus* for the Inclusive Reading. The most explicit piece of evidence for this reading is *Physics* 190a13-21 (translated above) where the Survival Requirement is first mentioned. Aristotle introduces that passage by saying: "one can grasp the following from *all the cases of coming to be*" (ἀπάντων τῶν γιγνομένων; cf. 189b30-1).¹⁸ Most take this as definitive evidence that coming to be in the unqualified sense is subject to the Survival Requirement. Bostock argues that *Physics* 190b10-23 also implies that some part of the subject remains even in cases of substantial generation:

The only ground Aristotle could have for saying that whatever comes into being is composite (*sunthetos*) is that we can distinguish in it two 'elements', one the persisting element (what underlies) and the other the acquired element (the form). If the element said to underlie did not persist in the end product there would be no ground whatever for saying that the end product was composite, and Aristotle explicitly claims that all products of becoming are composite.

Finally, scholars typically point to the example of a statue coming to be from bronze at

¹⁸ Bostock (2006, 8), cf. Broadie (2004, 129-30).

190a23-6 as a case of substantial generation. And there Aristotle definitely says that the bronze survives.¹⁹

The trouble starts for the Inclusive Reading when we turn to *Generation and Corruption*. The question of whether or not the subject persists through the change lies at the heart of *GC*'s distinction between qualified and unqualified coming to be. In *GC I 1* Aristotle tells us that the monists, who constructed all things out of a single element, were forced to reduce substantial generation to alteration precisely because they held that all change requires a persisting subject: "For they must affirm that the underlying subject (τὸ ὑποκείμενον) always remains one and the same: and *we* call this sort of thing 'being altered'." (314b3-4) On Aristotle's view, when a thing undergoes alteration (or growth or locomotion), the subject survives the change and simply exchanges one property for another. In substantial generation the subject does not survive the change but is completely transformed in the process (cf. 332a8-10). There are at least three passages where Aristotle makes his position explicit:

- T1. Coming to be and passing away in the unqualified sense are not effected by combination and disassociation but when a thing changes from this into that as a whole (μεταβάλλη ἐκ τοῦδε εἰς τόδε ὅλον). But they suppose that all such change is alteration whereas in fact there is a difference. For one component of the underlying subject corresponds to the form and the other the matter. There is coming to be and passing away when there is a change in these, but when the change is in its incidental properties it will be alteration. (*GC I 2*, 317a20-6)
- T2. Seeing that we distinguish between the underlying subject and the property whose nature it is to be predicated of that subject and that change occurs in each of these, it is alteration when the perceptible subject remains but changes in its own properties (the properties in question being either opposites or intermediates); for example, the body, although enduring as the same body, is now healthy and now ill, and the bronze is

¹⁹ For what is in my view an unsuccessful argument against the latter point see Jones (1974, 483-88).

now spherical and now angular and yet remains the same bronze. But when the thing is transformed as a whole (ὅλον μεταβάλλῃ) and nothing perceptible remains as its subject (e.g. when an embryo as a whole is changed into blood²⁰ or water into air or air as a whole into water) such an event is the coming to be of the one sort of thing and the passing away of the other, especially when the change proceeds from an imperceptible something to something perceptible (either to touch or to all the senses), as when water comes to be out of or passes away into air (for air is pretty imperceptible). (*GC I 4*, 319b8-21)

- T3. Our account of growth must preserve the features of the subjects that are growing and diminishing (τὰ ὑπάρχοντα τῷ αὐξανομένῳ καὶ φθίνοντι). And these are three: first, any and every part of the growing magnitude is made bigger (e.g. if flesh grows, every particle of flesh gets bigger); second, it gets bigger by the accession of something; and third, it does so in such a way that the growing thing is preserved (σωζομένου) and endures (ὑπομένοντος) the change. For, whereas a thing does not endure (οὐχ ὑπομένει) in the process of unqualified coming to be and passing away, in both growth and alteration the growing subject itself and the thing that undergoes alteration does endure (ὑπομένει), though in alteration the quality (τὸ πάθος) and in growth the size (τὸ μέγεθος) does not remain the same. (*GC I 5*, 321a17-26)

In each of these passages Aristotle uses the Survival Requirement as a means for distinguishing growth and alteration from generation. When the underlying subject persists through the change and simply exchanges one accident for another, it is growth/alteration. Generation occurs when the subject from which the change proceeds does not endure but is wholly transformed in the process of becoming a new substance,

²⁰ The example is peculiar and does not match anything in Aristotle's own account of animal generation. It would make better sense if 'embryo' and 'blood' were transposed or if 'blood' was replaced by (e.g.) 'animal'. As far as I know, there is no manuscript evidence for that. Nevertheless Aristotle's point is clear.

which Aristotle glosses in T1 as changing in both matter and form together.²¹

The other two *GC* passages offer further support for the Exclusive Reading. In T2 Aristotle again distinguishes between a subject and its accidents (πάθος here corresponds to the ‘incidental affections’ mentioned at the end of T1, 317a26). And again alteration is said to occur when the subject remains one and the same and changes in one of its accidents, while generation occurs when there is complete transformation (ὅλον μεταβάλλη) so that nothing remains of the original subject.²² T3 is even more explicit about this. Here Aristotle is discussing growth (coming to be in the category of quantity) rather than alteration (coming to be in the category of quality). He mentions three characteristics of genuine cases of growing. The last of these is that the subject is preserved (σωζομένου) and endures (ὑπομένοντος) the change just as in cases of alteration, “whereas it does not endure (οὐχ ὑπομένει) in the process of unqualified coming to be and passing away”.

Some commentators have tried to read the *GC* doctrine in a way that brings it in line with the Inclusive Reading. In T1 Aristotle tells us that the subject from which substantial generation proceeds is itself a complex of matter and form. For example, the subject from which animal generation proceeds is the embryo, which is a compound of menstrual blood form the female and form from the male. According to Gill when Aristotle says that the underlying subject “does not remain” (μὴ ὑπομένοντος), he means it does not remain *what it was* at the start of the change. For it loses the form that determined its original identity in the process of being transformed into something new.²³ But the subject does remain *qua* matter; the proximate matter of the underlying

²¹ For a similar reading of *GC* I see Broadie (2004). See also *Metaphysics Z* 7, 1033a20-3. There Aristotle says that the matter from which a thing comes to be *does not* persist (οὐχ ὑπομένοντος) but is transformed (μεταβάλλοντος) in the process of coming to be.

²² Defenders of the Inclusive Reading who take the continuant of substantial generation to be prime matter emphasize Aristotle’s reference to the destruction of a *perceptible* subject. To say that nothing *perceptible* remains (this reading holds) leaves it open that something *imperceptible* survives the change, namely, prime matter. In my view the focus on a distinction between a perceptible and an imperceptible subject is a red herring. If Aristotle meant that some *imperceptible* subject always endures, we would expect him to make that crucial point here. And yet nowhere in *GC* does he ever mention an imperceptible continuant. For more discussion of this point see Gill (1989, 42-53) and Broadie (2004, 126ff.).

²³ Gill develops this reading over the course of Chapters 2 and 3 of her book. For a precise statement see p. 62.

subject does not undergo a change. While this way of understanding the *GC* account would save the Inclusive Reading, that is not what Aristotle says in the above passages. T2 and T3 say nothing like that. In T1 Aristotle says that one component of the subject corresponds to form and the other matter and that generation occurs “when there is a change *in these*” (not “in *one* of these”). The most natural antecedent for the plural τούτοις here is the form *and* the matter (not the form alone). That, I take it, is what Aristotle means by saying that in generation and destruction the subject changes “as a whole”. If Aristotle meant to say that the subject of generation and destruction changes with respect to its form but not with respect to its matter, we should have expected him to make that crucial distinction here — especially since he has made it a point of emphasis that those who posit an enduring subject are committed the view that unqualified coming to be and passing way are just forms of alteration (*GC* I 1, 314b3-4).

According to *GC* I 1-5, then, what distinguishes substantial generation from changes in the non-substantial categories is precisely the fact that in the latter case the underlying subject persists and changes only in its incidental properties whereas in the former case the subject does not remain but is completely transformed in the process of becoming a new substance.

Another place to look for a defense of the Inclusive Reading is Aristotle’s mature theory of animal generation in the *GA*. If Aristotle had strong reasons for insisting that substantial generation must meet the Survival Requirement, then we would expect this to form an important part of that theory, especially since he treats animal generation as substantial generation *par excellens*. Unfortunately there is no evidence that Aristotle was concerned in the *GA* to show that the subject from which the process begins persists through the change to become a constituent of the mature animal. By contrast, much of the inquiry in *GA* is arguably motivated by a concern with the Subject Requirement. For example *GA* I 18-23 is about the nature of *sperma*, which is characterized as “that sort of thing from which naturally generated organisms first come into being” (724a18-20). Again in *GA* II 1 Aristotle investigates how the parts of the animal are formed. That inquiry takes as its starting-point the principle that “everything that comes to be by nature or by craft comes into being by the agency of something existing in actuality from

what is already potentially that sort of thing (ἐκ τοῦ δυνάμει τοιούτου)” (GA II 1, 734b20-2; see also 734b34-6). This reflects Aristotle’s general solution to the Eleatic challenge, defended in *Physics* I 8 and *GC* I 3, that coming to be in the unqualified sense proceeds from what exists in potentially and that this potential *F* is the proper referent of τὸ μὴ ὄν ἀπλῶς: “In one way things come to be from what is not in the unqualified sense, yet in another way they always come to be from what is. For there must be something existing beforehand (προυπάρχειν) that is potentially but not actually an *F*. And this is spoken of both as being and as not-being.” (317b14-18) Aristotle repeats this a few lines later: “If something comes to be <in the unqualified sense>, then clearly there will be some substance that exists potentially but not in complete actuality (ἐντελεχείᾳ) from which coming to be proceeds and into which the thing that is being destroyed necessarily changes.” (*GC* I 3, 317b23-25)

Freeland (1987) draws attention to Aristotle’s claim that blood serves as both the matter for the parts of the mature animal and the matter out of which the embryo is originally constructed (*PA* 650a32-b13; *GA* 725a21-8, 726b1-15, 740b34-5). She takes this as evidence that blood is the persisting substratum of biological generation, which satisfies the *Physics* I 7 requirement that all change requires an enduring subject. If Freeland is right, then Aristotle must have abandoned the *GC* distinction between growth and generation in the biological works. For the *GC* is categorical that in the case of growth the subject endures through the process but when a thing comes to be in the unqualified sense the subject does not endure but it is wholly transformed in the process (see T3 above).

But Aristotle did not develop this theory with the Survival Requirement in mind, and so by saying that “it is the same matter by which the <existing animal> grows (αὐξάνεται) and out of which it is first constructed” (*GA* II 4, 740b35-6) he does not mean to commit himself to any views about a persistence substratum. So we can’t take this claim as a defense of the Survival Requirement. More importantly, this claim does not entail that blood is a persistent substratum. Freeland simply helps herself to this by assuming the material from which generation begins must persist to become the

proximate matter out of which the adult animal is constituted.²⁴ But that does not follow. When Aristotle claims that the matter out of which the animal grows and the matter out of which it is first constituted are the same (*GA* II 4, 740b35-6), he need only be saying that growth and generation *begin* from the same material, i.e. that blood plays the role of (material) starting-point in each case. This does not commit him to the further claim that blood from which generation begins persists through the change to become the proximate matter out of which the adult animal is constituted. And there are good reasons to think that Aristotle wants to resist this conclusion. First, as we have seen, Aristotle treats growth and generation as two distinct kinds of change and insists that the only former involves a persistent subject: “For, whereas a thing does not endure (οὐχ ὑπομένει) in the process of unqualified coming to be and passing away, in both growth and alteration the growing subject itself and the thing that undergoes alteration does endure (ὑπομένει), though in alteration the quality (τὸ πᾶθος) and in growth the size (τὸ μέγεθος) does not remain the same.” Second, according to Aristotle’s mature theory of animal generation blood could not satisfy the Survival Requirement. To meet the Survival Requirement the blood from which generation begins must remain *numerically the same* throughout the change (“this, though always numerically one, is not one in form”). Yet Aristotle holds that the blood that is used to form the embryo is not even *specifically* the same blood that is later used to grow and maintain the parts of

²⁴ See Freeland (1987, 406).

the completed offspring (*GA* II 6, 744b32-745a4).²⁵

Defenders of the Exclusive Reading can use the evidence from *GC* I 1-5 and Aristotle's mature theory of animal generation as a reason to reconsider the standard account of *Physics* I 7. Consider first the passage at 190a13-21. It is possible to read the opening sentence of that passage as restricting its scope to those cases of coming to be that Aristotle has just been discussing (ἐάν τις ἐπιβλέψῃ ὡσπερ λέγομεν), namely, those where a thing comes to be in the qualified sense (189b32-190a12).²⁶ (Remember in *GC* Aristotle says in at least three places that when a thing comes to be in the unqualified sense the subject does not survive.) In support of this is the fact that *Physics* I 7 does not present any argument for the (surely controversial and not obvious) claim that even in substantial generation something persists through the change. Aristotle does argue that when a thing comes to be in the unqualified sense there must be some underlying subject from which the change proceeds (190b1-5). But he does not also say that this subject must persist through the change to remain as a constituent of the finished product.

Bostock claims that 190b10-23 implies that the subject persists through the change even in cases of substantial generation. But this is an interpretative move on his part. At

²⁵ Much of Freeland's argument depends on the claim that menstrual blood is the proper subject of animal generation in the *Physics* sense, which I think is incorrect. Aristotle associates the subject that serves as the starting-point of substantial generation with the potential *F* (e.g. *Physics* I 8, 191b27-9; *GC* I 3, 317b23-25). And according to *Metaphysics* IX 7 a thing counts as the potential *F* when it is in a state where nothing further must be added, removed, or changed before it can straightaway be transformed into an *F* (1049a10-11) and, in cases of natural generation, possesses the generative principle within itself so that it develops into an *F* through itself, if nothing external impedes it (1049a13-18). While Aristotle thinks that menstrual blood is the matter out of which the embryo is formed, and while he does say in *GA* that it is already potentially an animal of the same kind as the mother (*GA* 737a22-5, 738b3-4, 740b18-20, 741b7-8; cf. 729a32-3), there is good reason for thinking that it is not the subject (τὸ ὑποκείμενον) of generation in the *Physics* sense. It fails the conditions for being the starting-point of the change laid down in *Metaphysics* IX 7. For it is not yet in a state where it will straightaway change into a new organism "through its own principle" (διὰ τῆς αὐτοῦ ἀρχῆς). It still needs to undergo a further change before it is in that state, namely, it needs to be fertilised by the semen and then transformed into an embryo (cf. *GA* 728a26-30). When we apply the *Metaphysics* IX 7 test to the *GA*, it turns out that it is only when the embryo has been formed and has developed to the point where it has a rudimentary heart that can process nutriment that it is in a state where will immediately develop into a new animal when nothing external impedes it (*GA* II 1, 735a12-26; *GA* II 4, 735b33-740a13). This makes the primitive embryo the proper subject of animal generation. (This is confirmed by the fact that throughout the *GA* Aristotle refers to the embryo and not the menstrual blood as τὸ γινόμενον, which in the *Physics* account is synonymous with the underlying subject of change.) For a similar reading see Gill (1989, 228-33).

²⁶ This is the sense of the Oxford translation. Cf. Bostock (2006, 8).

190b10-23 Aristotle says that it is clear “from what has been said” that what comes into being is always complex. Now what has *just* been said is that all cases of coming to be involve a subject from which the change proceeds (190b9-10). Bostock simply assumes that the concept of “underlying subject” already includes the idea of persistence.²⁷ Thus he reads 190b10 as a straightforward inference from the claim that the subject persists to the claim that what comes into being is therefore complex. Moreover, he claims to be unable to see any other reason for drawing such a conclusion: “If the element said to underlie did not persist in the end product there would be no ground whatever for saying that the end product was composite, and Aristotle explicitly claims that all products of becoming are composite.” But this not the only way to read the passage. Aristotle had already made the point that what comes to be is complex back at 190a3-4 prior to introducing the idea that something might survive the change (190a17-21). So that point could hardly be said to depend on that idea. Instead Aristotle’s grounds for claiming that what comes to be is complex seem to be linguistic: it is implicit in the way we speak, for example, “when we say the non-musical human becomes a musical human” (190a3-4). The bulk of the chapter is an attempt to unpack this implication with more precision using his own distinction between subject and contrary. In light of this, “from what has been said” should be taken to refer to everything that precedes 190b10 (rather than just the immediately preceding lines as Bostock assumes) so that the whole passage can simply be read as a reiteration of the chapter’s central point.

Finally, while Aristotle does say at 190a23-6 that in cases where a statue comes to be from bronze the bronze survives the change, defenders of the Inclusive Reading take it for granted that he is using the example to make a point about substantial generation.²⁸ But there are good reasons for thinking he is not. First, Aristotle does not extend the argument of the chapter to substantial generation until 190b1. Prior to that he seems to be speaking only about changes in the non-substantial categories. Second, and more importantly, there is no evidence that Aristotle actually thinks of this as a case of genuine substantial generation. The only clear examples of substantial generation in

²⁷ Bostock (2006, 9).

²⁸ For instance Code (1976).

Physics I 7 are cases of biological generation (e.g. when an animal or plant comes to be from *sperma*, 190b4). And in T2 (*GC* I 4, 319b8-21) the case of a statue coming to be from bronze is explicitly treated as an alteration of the bronze, which Aristotle contrasts with coming to be in the unqualified sense.²⁹ At the very least *Physics* 190a23-6 should be read with caution. For Aristotle elsewhere says that we should not speak of a statue coming to be from bronze without qualification because that from which the change begins does not persist (οὐχ ὑπομένοντος) but gets transformed (μεταβάλλοντος) in the process of becoming a statue (*Metaphysics* VII 7, 1033a20-3).³⁰

The evidence from *Physics* I 7 is thus not strong enough to force the Inclusive Reading on us. In light of this I think Broadie (2004, 129-30) has it right when she says that the model of substantial generation on offer in *Physics* I 7 is at best undeveloped with respect to the Survival Requirement. While Aristotle is concerned to show that substantial generation must proceed from an existing subject (190b1-5) — a claim that forms the basis of his response to the Eleatic challenge in *Physics* I 8 (191a30-1) — he is not focused on the further issue of whether or not this subject also persists in altered form through the change. If this is right, then *Physics* I 7 is not incompatible with *GC* as it would be on the Inclusive Reading. For Aristotle did not mean to commit himself in the *Physics* to any particular view concerning the persistence of the subject of generation. When it came to substantial generation Aristotle's primary concern was simply to establish that substantial generation exists as a genuine type of change (cf. *GC* I 1, 314a4-6; I 2, 315a26-8). This only required defending the Subject Requirement (*Physics* I 7, 190b1-4). On the one hand, Aristotle must show that there are genuine cases of substantial generation where something new comes into being without committing himself to the possibility of generation *ex nihilo*.³¹ He meets this challenge by arguing that even in the case of substantial generation the change proceeds from

²⁹ Code (1976, 357-8, 365) claims that in *GC* Aristotle thinks we can describe the same change as either an alteration or substantial generation. This cannot be right. The central aim of *GC* I 1-5 is to establish that substantial generation exists. And the way Aristotle does this is by showing that it is distinct from and not reducible to changes in the non-substantial categories.

³⁰ For an interpretation of this passage that is consistent with the Inclusive Reading, see Code (1976, 363ff.).

³¹ Aristotle agrees with Parmenides that generation *ex nihilo* is impossible.

some pre-existing subject (*Physics* I 7, 190b1-4) and that this subject is the potential *F* (*GC* I 3, 317b14-25). This solution to Parmenides' challenge does not depend on the further claim that this subject also persists through the change to become a constituent of the finished product.³² On the other hand, Aristotle needs to show that when a new substance comes into being it is not reducible to a change in one of the non-substantial categories (*GC* I 1, 314a4-6). And this, we have seen, required him to reject the Survival Requirement.

If the arguments of this paper are reasonable, then we should be cautious about attributing to Aristotle in *Physics* I 5-7 the view that substantial generation involves a persistent subject. Not only is there a shortage of conclusive evidence in those chapters for the Inclusive Reading, the bulk of the evidence outside *Physics* I shows that Aristotle had little reason to endorse it and every reason to reject it.³³

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³² Some argue that Aristotle must take this subject to be persist through the change in order to avoid the idea that substantial generation involves sheer replacement (Gill 1989, 7; cf. Code 1995). If there were no persisting subject, the argument goes, then substantial generation would be a case where the pre-existing subject perishes into nothing and is replaced by a product that emerges out of nothing, which violates Eleatic principles that Aristotle accepts. I find this argument for the Survival Requirement unmotivated by the text. Even if there is a philosophical problem here (to me this sounds like a pseudo-problem), there is no suggestion that Aristotle was concerned with it in the works on natural science, let alone that he developed the Survival Requirement in response to it. Nor does positing a persistent subject solve that problem (cf. Ebrey 2007). It is also worth noting that in *GC* I 4 Aristotle actually characterizes substantial generation in a way that sounds like sheer replacement. In T2 he says that with substantial generation the thing "is transformed as a whole" so that "nothing perceptible remains as its subject". "Such an event," he says, "is the coming to be of one sort of thing and the passing away of the other".

³³ *Physics* I 9, 192a13-14 remains problematic for this reading. There Aristotle uses "what persists" as shorthand for matter. But this may just be a simplification of the *Physics* I 7 doctrine that ignores the difference between qualified and unqualified generation. As we have seen, when he is careful to distinguish the two, he does so by reference to the survival requirement (cf. *Metaphysics* I 3, 983b7-19).

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