

ALEXANDER OF APHRODISIAS ON MIXTURE AND GROWTH

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ANCIENT discussions of mixture and growth have to do with a broad range of philosophical issues, such as the nature of life, the boundary between living and not living, and the physical mechanisms operating in animate structures. Approaches to the solutions of these problems developed in antiquity seem to be earning more and more appreciation in the context of today's metaphysical discussions. Following the revival of interest in Aristotle's psychology welcomed by modern philosophers of mind as an alternative to both the excesses of Cartesian dualism and the deficiencies of numerous reductionist theories, there has been a new rise of interest in Aristotle's theory of natural substance, in its full rigging, including such dusty items as the concept of mixture, which has been recently rediscovered by philosophers as a promising model for an ontological description of the type of unity present in a multi-layered, hierarchical composite structure.¹

The discussion of mixture and growth by Alexander of Aphro-

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¹ In addition to the discussion and bibliography listed in R. K. Sorabji, *Matter, Space, and Motion: Theories in Antiquity and their Sequel* (London, 1988), see two recent collections of papers published by Blackwell, with bibliographies: F. A. Lewis and R. Bolton (eds.), *Form, Matter, and Mixture in Aristotle [Form, Matter, and Mixture]* (Oxford, 1996); D. S. Oderberg (ed.), *Form and Matter: Themes in Contemporary Metaphysics [Form and Matter]* (Oxford, 1999).

disias presents special interest in this respect, as he uses both topics in order to articulate the key concepts of Aristotelian metaphysics of hylomorphism, such as form and matter of individual substance, identity, and continuity through change.

The goal of this paper is to study these concepts as presented by Alexander in his polemic against the Stoic theory of mixture and in his elaboration of Aristotle's analysis of growth. The first part of the paper has to do with mixture. I show that Alexander's criticism of the Stoic theory of total pervasion is based on his idea that ingredient qualities cannot be individuated in a mixture because in a mixed state they lose their specific identities, on which their spatio-temporal continuity depends. The second part is devoted to Alexander's account of growth, which elaborates on the Aristotelian thesis of persistence of form by spelling out some ontological constraints on the concept of 'flowing matter' in the account of material continuants. Both discussions have a bearing on the concept of individual substance construed in terms of Aristotelian hylomorphic theory, and show differences between treatments of the individual in the Stoic and Aristotelian systems.

1. Alexander against the Stoic theory of mixture: *De mixtione*

Alexander rightly considers the theory of mixture to be at the root of the most important doctrines of Stoic physics. Many Stoic claims which sound paradoxical to an unschooled ear receive their technical explanations in this theory, and any criticism which does not want to remain superficial has to deal with those explanations.² This theory spells out, in particular, the manner of presence of the cosmic active principle in the inert matter of the cosmos: the cosmos itself and all its parts have their unity and cohesion due to the mechanism of 'total blending' which is described in the Stoic classification of mixture. This classification includes juxtaposition (*παράθεσις*), where the ingredients are not changed, and the whole is an aggregate; fusion (*σύνχυσις*), where the ingredients are mutually destroyed and an altogether new quality of the whole is formed;

² Alexander regards his own project in the *De mixtione* as being well above the elementary level. *De mixt.* 3, 216. 1-4 Bruns: *μετέβημεν δὲ ἐπὶ τοῖς κοινῶς ἠνωσθεὶ τὴν ἄληθιν λέγουσιν καὶ μίαν πάντας τοὺς γινόμενους καὶ τὴν αὐτὴν ὑποβάλλοντας, ὧν καὶ αὐτῶν παρατηρούμενοι τὰ ἐπιπολαιώτερον εἰρημένα τὰς μάλαστα δοκούσας ἔχουσαι τύπος λόγου δόξας ἐξετάσαμεν προχειρισόμενοι.*

and blending (*κρᾶσις*), a very special case where the ingredients fuse their volumes while preserving intact all their qualities.³ Two key assumptions made by the Stoics about the process of blending will be disputed by Alexander: the complete coextension of the ingredient volumes (*ἀντιπαρέκτασις*), and the complete persistence of the all the qualities of the ingredients in the blend.⁴ In respect of the latter assumption, Alexander develops two arguments: against the co-persistence of qualities within what the Stoics call 'blending'; and against the recovery of numerically identical qualities upon the dissolution of a blending.

1.1. Coextension

The mutual coextension of some two or even more bodies in their entirety with one another so that each of them preserves their own substance and its qualities in such a mixture—this, he [Chrysippus] says, alone of the mixtures is blending; for it is a peculiarity of bodies that have been blended that they can be separated again from one another, and this only occurs through the blended bodies preserving their own natures in the mixture. (*De mixt.* 3, 216. 28-217. 2 Bruns, trans. Todd)

The physical mechanism of this process falls under the causal pattern that involves 'co-operant causes'.⁵ Alexander cites several Stoic examples of such causation where a physical action is made possible

³ *De mixt.* 3, 216. 14-217. 2 Bruns. On the attribution of the classification to the Stoics, see F. Rex, *Chrysippos Mischungslehre und die an ihr geübte Kritik in Alexander von Aphrodisias De mixtione* (diss. Frankfurt a.M., 1966), 39-42; R. B. Todd, 'The Stoic Common Notions: A Re-examination and Re-interpretation' ['Common Notions'], *Symbolae Osloenses*, 48 (1973), 47-75; id., *Alexander of Aphrodisias on Stoic Physics* [*Alexander of Aphrodisias*] (Leiden, 1976), 71-2, with reviews by F. H. Sandbach in *Classical Review*, ns 28/2 (1978), 362-3; P. Moraux in *Gnomon*, 53 (1981), 641-6; and J. Mansfeld in *Mnemosyne*, 35/3-4 (1982), 388-92. Cf. J. Mansfeld, 'Zeno and Aristotle on Mixture', *Mnemosyne*, 36/3-4 (1983), 306-10.

⁴ For an insightful discussion of the concept of *ἀντιπαρέκτασις*, see E. Lewis, 'Diogenes Laertius and the Stoic Theory of Mixture' [*Diogenes Laertius*], *Bulletin of the Institute of Classical Studies*, 35 (1988), 84-90.

⁵ *συνάτριάς*, also translated as 'joint' (A. A. Long and D. N. Sedley, *The Hellenistic Philosophers* [LS] 2 vols.; Cambridge, 1987), i. 336) and 'cooperative' (R. J. Hankinson, *Cause and Explanation in Ancient Greek Thought* [*Cause and Explanation*] (Oxford, 1998), 243-4. Alexander at this point does not use Stoic descriptive terms for causes, and does not draw the distinction between co-operant and auxiliary (*συνεργή*) causes drawn by the Stoics (cf. Clem. *Strom.* 8, 9. 33. 1-9 Stählin = SVF ii. 351 = 55 I LS; S.E. PH 3, 15). For discussions see Todd, *Alexander of Aphrodisias*, 39-40 and ad loc.; M. Frede, 'The Original Notion of Cause', in M. Schofield, M. Burnyeat, and J. Barnes (eds.), *Doubt and Dogmatism: Studies in Hellenistic Epistemology* (Oxford, 1980), 217-49 at 237-9; LS i. 342; Hankinson, *Cause and Explanation*, 238-52.

or facilitated by collective action of the parts of an aggregate: increase preserving its smell when thinly spread over a large volume of air; gold easily melted in the presence of some catalysts; human cooperation achieving results which it would have been impossible to achieve for the same individuals acting solo.⁶ The idea is that the interaction produces a special type of cohesive power between the parts of the interacting substances which does not destroy the internal cohesion of each of them, but activates the inert parts of substances and raises their elasticity to such an extent that they are able to coexist in the same volume.

Since this is the case, they say that there is nothing remarkable in the fact that certain bodies when helped by one another are in this way united together in their entirety so that being preserved along with their own qualities they have a complete mutual coextension through one another, even if some of them are rather small in bulk and in themselves unable to spread to such an extent, while at the same time preserving their own qualities. For in this way also the cup of wine is mixed with a large amount of water and helped by it to such a great extension. (*De mixt.* 4, 217. 26–32 Bruns, trans. Todd, lightly modified)

The example of a cupful of wine goes back to Aristotle, who uses it to illustrate his theory of mixture: a cupful of wine adds its volume to the sea, but its quality of wine is destroyed and turned into water.⁷ According to the Stoics, a cupful preserves its vinous quality, but it is now evenly extended over an overwhelming bulk of the sea.⁸ So although it is still present intact within this bulk, the intensity of its presence in any given part of the total volume which can be measured by the ratio 'cupful : sea', is arguably small enough to escape perception.⁹

⁶ *De mixt.* 4, 217. 13–26 Bruns. See discussion in Todd, *Alexander of Aphrodisias*, 38–42; cf. Mansfeld, review of Todd, 390.

⁷ *GC* 1. 10, 328^b26: *μετρίβεται γὰρ ἅτερον εἰς τὸ κρατῶν (διὸ συναλαγνὸς οὗτος μῦθος χωρῶν ὕδατος ὁ μύγυρα, λέγεται γὰρ τὸ εἶδος καὶ μεταβάλλεται εἰς τὸ πᾶν ὕδωρ).*

⁸ This example is attested as Chrysippian in D.L. 7. 151 and Plut. *Comm. nol.* 1078 E. See discussion of the Diogenes passage in E. Lewis, 'Diogenes Laertius'.

⁹ In the example of the cupful of wine, the Stoic thesis is perhaps deliberately presented in a paradoxical form. Its substance is much less provocative, being in line with traditional cosmology that assigns a crucial role in physical change to processes of expansion and contraction, condensation and evaporation. (For discussion, see D. E. Hahm, 'The Stoic Theory of Change', *Southern Journal of Philosophy*, 23, suppl. (1985), 39–56; cf. id., *The Origins of Stoic Cosmology* [Origins] (Columbus, Oh., 1977), 57–60.) Alexander's school treatise *Mantissa* 14 ('That it is impossible for a body to go through body') contains some evidence that the idea of different

The mechanism of blending is illustrated by many examples of the mutual inseparability of conceptually distinct corporeal agents:

They employ as clear evidence that this is the case the fact that the soul, which has its own subsistence [*ἰδίαν ὑπόστασιν ἔχουσαν*], just like the body that receives it, pervades the whole of the body while preserving its own substance [*τῆν οὐκείαν οὐσίαν*] (for there is nothing in the body possessing the soul that does not partake of the soul); and the same holds for the Nature of plants, as also for the State in bodies held together by their State. Also, they say that fire passes completely through iron with each of them preserving its own substance. And they say that two of the four elements, fire and air, being of fine structure, light and having tension [*λεπτομερῆ τε καὶ κοῦφα καὶ εὔρονα ὄντα*], completely pervade earth and water, which are dense and heavy and lack tension; and that each pair preserves its own nature and continuity. They think that drugs that are deleterious, and all such odours, are blended with the bodies affected by them in a total juxtaposition. Chrysippus also thinks that light is mixed with air. (*De mixt.* 217. 32–218. 9 Bruns, trans. Todd, lightly modified)

In his refutation, Alexander exposes inconsistencies and physical impossibilities involved in the concept of coextension, exploiting the ambiguities of formulation in the reports of the doctrine: 'total pervasion' as described by the Stoics is in conflict with the geometrical notion of addition;¹⁰ it may entail the existence of void within the world (something the Stoics officially deny);¹¹ the smaller of the two bodies, which is said to remain the same and yet occupy a greater place, turns out not equal to itself; nor is the greater one, which receives a smaller one in itself without undergoing an increase.¹² He uses the tactics standard in contemporary anti-Stoic polemic, criticizing Stoic doctrines in versions often already suitably adapted for such criticism.¹³

Yet Alexander differs from the main run of the critics in that in his arguments this tactic is normally subordinate to a strategic goal set in terms of blended qualities was possibly present in the Stoic original argument for coextension, when the author dismisses this as a possible defence of the Stoic position: *τὸ γὰρ λέγειν, ὅτι τῆ δουράται οὐκ ἴσων [sc. δ' ἰκάνους τῷ πελάγει], οὐδὲν πρὸς τὸν λόγον. ἀρκεῖ γὰρ εἰς τῆν τοῦ προαιρεμένου δεξιῶν τὸ κατὰ τὸ ποσὸν ἴσα ἀντὶ πρὸς ἐκείναι* (*Mant.* 14, 140. 23–5 Bruns).

¹⁰ *De mixt.* 6, 219. 9–21 Bruns; cf. Alex. *Mant.* 14, 140. 10–25; 141. 9–22 Bruns.

¹¹ *De mixt.* 6, 219. 22–7 Bruns; cf. Alex. *Mant.* 14, 141. 4–8 Bruns.

¹² *De mixt.* 6, 219. 28–220. 2 Bruns; cf. Alex. *Mant.* 14, 140. 20–3 Bruns.

¹³ Cf. [Galen], *De qualitibus incorporatis* 109–18 Giusta (assuming the actual infinity of parts on the basis of infinite divisibility); 134–61 (multiple occupancy of one place—geometrical paradoxes); 162–81 (reconstructed cosmological scheme).

by the task of establishing a more general doctrinal point within the Aristotelian system.¹⁴ Therefore it is important for him not merely to state the criticism and register a disagreement, but also to point out what he believes to be the conceptual basis of the position with which he disagrees. This special feature of his attitude towards the Stoics is explained by some shared tenets,¹⁵ and possibly also by the fact that some of his audience might have been exposed either to the Stoicizing critique of Peripatetic school doctrines, or to the Stoicizing interpretation of these doctrines, or to both.¹⁶

Alexander's own explanation of a kinetic mechanism operating within a mixture invokes the concept of reciprocal replacement (*ἀντιπερίσπασσις*). The concept (although not the term) goes back to Plato, *Tim.* 79 B–80 c, where it is used to explain the phenomena of respiration, magnetic attraction, and electricity on the basis of necessity operating in the natural world.¹⁷ Aristotle uses this term in several different meanings. (i) In *Phys.* 8. 10 it refers to the Platonic explanation of projectile movements.¹⁸ In *Meteorology*, the verb *ἀντιπερίσπασθαι* (and derivatives) is used in the meaning (ii) 'to be compressed', as a technical term in the description of the movement of mutual replacement between the cold and hot parts of a

¹⁴ On this feature of Alexander's argumentative technique, cf. J. Mansfeld, 'Dialectic: The Argument of Alexander', *De Fato Chs.* 1–2, *Phronesis*, 33/2 (1988), 181–207; R. W. Sharples, 'Alexander of Aphrodisias: Scholasticism and Innovation', in *Aufstieg und Niedergang der römischen Welt* II.36.2 (Berlin, 1987), 1176–243 at 1180.

¹⁵ Such as the unity of matter, in our case: see *De mixt.* 1–2, on the 'monist' camp, see *De mixt.* 3, 216. 1–14 Bruns, with Todd's notes ad loc.

¹⁶ Cf. *De mixt.* 3, 216. 6–14 Bruns and Todd ad loc. It has been aptly pointed out by many scholars that Alexander is influenced by the Stoics in his theories and terminology (see e.g. T. H. Irwin, 'Aristotelian Substances and Stoic Subjects', *Revue internationale de philosophie*, 201/3 (1997), 397–415; R. B. Todd, *Alexander of Aphrodisias*, 27–9). But I think it is equally important to emphasize that in his case, 'influence' means not an uncritical emulation, but rather a mobilization of technical resources of the Aristotelian system to tackle the problems raised by the Stoic system. The common features of intellectual background such as acceptance of a physicalist version of rationalism (vs. Plato) and teleology (vs. Epicurus) provide an additional stimulus to engage in a technical discussion.

¹⁷ Plato's term in the *Timaeus* is *περίσπασσις*, the emphasis being on the propulsive character of motion. See F. M. Cornford, *Plato's Cosmology: The Timaeus of Plato* (London, 1935; repr. Indianapolis, 1997), 306–27. For a recent illuminating discussion, see J. Opsomer, 'ANTIPERISTASIS: A Platonic Theory', in A. Pérez Jiménez, J. García López, and R. M^a Aguilar (eds.), *Plutarco, Platón y Aristóteles* (Madrid, 1999), 417–29.

¹⁸ *Phys.* 8. 10, 267^a 15–20 (cf. *Phys.* 4. 8, 215^a 15); cf. F. Solmsen, *Aristotle's System of the Physical World: A Comparison with his Predecessors [Aristotle's System]* (Ithaca, NY, 1960), 136–43; Todd, *Alexander of Aphrodisias*, 201 (ad 250. 12 Bruns).

body in the process of contracting;¹⁹ and in the meaning (iii) 'to be replaced', denoting the character of internal displacements in 'hard' (*σκληρά*) substances as opposed to soft ones, where internal displacement is accompanied with 'yielding inwards'.²⁰ Alexander's concept of *ἀντιπερίσπασσις* as mutual replacement, which he develops in his polemic against the Stoic theory of *ἀντιπερίσπασσις*, incorporates some aspects of all three Aristotelian meanings.²¹ According to Alexander's account, in the course of such replacement, ingredients first become juxtaposed in a particulate structure, which makes it easy for the differently qualified parts of the volume to interact, and then the moist, inherent in them, makes the structure continuous.²²

The disagreement between the two systems, although stated in narrow terms of physical theory, bears strongly on some cardinal

¹⁹ See H. D. P. Lee's note to *Meteor.* 1. 12, 348^b 2 in the Loeb edition; Solmsen, *Aristotle's System*, 412–15.

²⁰ *Meteor.* 2. 4, 360^b 5; 4. 4, 382^a 11–14; cf. H. D. P. Lee cited in the previous note; D. J. Furley, 'The Mechanics of *Meteorologica* IV: A Prolegomenon to Biology', in *id.*, *Cosmic Problems* (Cambridge, 1978), 132–48 at 145.

²¹ Cf. H. D. P. Lee cited in n. 19 above. I discuss Alexander's theory in greater detail in 'Aristotelian Dynamics in Second Century School Debates: Galen and Alexander of Aphrodisias on Organic Powers and Motions', in P. Adamson, H. Baltussen, and M. E. Stone (eds.), *Philosophy, Science and Exegesis in the Greek, Arabic and Latin Commentary Tradition*, forthcoming (London, 2004).

²² *De mixt.* 14, 231. 1–4 Bruns: *ὅταν δὴ τοῖς κατὰ ἄλλην διὰ τὴν ὑπόληψιν κατὰ τὴν παρόληψιν ἐνομησίου σώμασιν προσῆ καὶ τὸ ἐναντιώσων ἔξεν ἰσομοσῶν πρὸς ἀλληλα, γίνεται αὐτοῖς κατὰ τὰς ποσότητάς τε καὶ δυνάμεις ἔνωσις, ὅταν ἐστὶν ἡ κρῆσις. It has to be noted that the fact that Alexander here mentions *ὑπόληψις* does not mean, as Joachim thought, that the state of *κρῆσις* is restricted to liquids only (H. H. Joachim, 'Aristotle's Conception of Chemical Combination', *Journal of Philology*, 29 (1904), 72–86 at 73). Alexander has in mind the elemental *ὑπόληψις* present even in the solid bodies as a part of their elemental ingredients. This is the meaning of his remark *καὶ γὰρ ἡ ἐν τοῖς ἔργοις γίνεσθαι δοκοῦσα κρῆσις οὐ γίνεται χωρὶς ὑπόληψις. ἐνοῦνται γὰρ τὰ ὑγρὰ συνθιθέμενα καὶ οὐ φύλασσαι τὰς οὐκείας ἐπιφανείας, ἐν μὴ ἢ γλυκῶν.**

Joachim's point, however, is valuable in that it draws attention to the problem of relation between Alexander and doxographical tradition. The distinction between *κρῆσις* and *μίξις* spotted by Joachim in Alexander is actually attributed to Chrysippus in Stob. *Ecl.* 1. 17. 4, 153. 24–155. 14 Wachsmuth (= *SVF* ii. 471, 153. 6–18 von Armin), where *μίξις* (the coextension of dry substances) is exemplified by heated iron, soul in a body 'in us', and *κρῆσις* (the coextension of liquids) by mixtures of wine, honey, water, vinegar, and similar'. Alexander's explanation of mixture is, in my view, in good agreement with Aristotelian physics. However, the anomaly sensed in the exposition by Joachim (who does not cite the Stobaeus passage) probably has to do with Alexander's tendency to set out the explanandum in conformity with the terms of both Stoic and Peripatetic physical doctrines. What is common in this case is the *task* of explanation, not the explanation itself.

A further parallel between Alexander and the doxographical tradition has to do with the presentation of the difference between the Stoics and the Peripatetics on the problem of mixture (cf. Galen, *Methodi med.* 1. 2, x. 15 Kühn = *SVF* ii. 411).

metaphysical issues. The point of Alexander's theory of 'mutual replacement' is to rule out the idea that propagation of physical qualities involves corporeal agents other than the sensible substances in which these qualities reside. According to Alexander, qualities and states have no separate existence outside the material individuals in which they inhere. Therefore a composite quality arising in a mixture as a result of the coming together of several qualified individuals cannot be regarded as an immediate product of ingredient qualities, as the Stoic picture suggests, so that both the old ingredient qualities and the new resultant quality would now be present in a mixture. Rather, when a new (composite) quality comes to be, the old qualities must in some sense cease to exist.

The Stoic picture of blending distorts the relation of inherence not so much because of paradoxical claims about coextension (although Alexander makes full use of that too in his polemic), but more importantly because it allows a quality which is numerically the same to inhere in several different bodies (when it is in a 'free' and 'bound' state, respectively). The cause of this distortion, according to Alexander, is that the Stoic theory of blending steps over its proper limits:

How can the common preconception about blending be maintained if it is claimed that even the State itself is mixed with the things that have it, and that their Nature is mixed with plants, light with air, and the soul with the body, if it is precisely the preconception about the things that are blended that they are capable of existing individually before the blend? For this reason, at any rate, they themselves say that bodies that have been blended can be separated again, and that they can thereby distinguish blending from fusion and destruction. But no State is separable from what has it so as to be capable of independent existence, nor could the nature of plants exist apart from them. How could one conceive of light as separable from transparent bodies? Neither could soul be like this, as they think, since the enmattered form cannot be without matter and body. (*De mixt.* 9, 222. 26–35 Bruns, trans. Todd)

Because the idea that *pneuma* in its states (State, Nature, and Soul) is mixed with the bodies of individual substances is unacceptable, evidence from the theory of blending adduced by the Stoics in its support must be revised. Alexander discusses in detail two of the Stoic 'inductive' arguments for the persistence of qualities, based on such facts as they believe can validate the concept of blending

as 'total pervasion'.²³ The first argument involves the example of 'heated iron', a standard Stoic illustration of a co-presence of two different qualities (of iron and fire) in a blending, in the course of which none of the qualities is affected by another.

The second argument has to do with the already mentioned claim that the ingredients can be recovered from a mixture intact. It involves several examples illustrating a recovery of ingredients from a mixture with the help of a catalyst.²⁴

1.2. Co-presence of blended qualities: 'heated iron'

'Heated iron' is a Stoic stock example of blending.²⁵ The Stoic author Hierocles, Alexander's near contemporary, uses it to illustrate the manner of soul's inherence in body:

Secondly, in addition to this it should be taken into account that soul is not enclosed in body as in a vessel, as are liquids contained in jars, but rather it is miraculously kneaded in and blended with the whole, so that not even the smallest part of a mix is left without a share in participating in either of them. For the blending is most similar to the components of heated iron. For in this case, as in that one, the juxtaposition is by wholes.²⁶ (*Elem. eth.* 4, 3–10 Bastianini–Long)

Alexander directs his criticism against the main point of the Stoic analogy. The concept of total pervasion adduced by the Stoics as an explanation of the interactions within the world does not work on the level of the physical mixtures.

But neither is fire mixed with iron, as they say, nor yet with fluids nor wood. For it is generally absurd to say that matter is mixed with form. For the

²³ On the structure of Stoic proofs and Alexander's refutation, see Todd, 'Common Notions', 48–60; cf. id., *Alexander of Aphrodisias*, 40–5, 195, with reviews cited above in n. 3.

²⁴ For they say that blending and fusion differ in that with fusion a unity emerges from the bodies that are fused, while none of the bodies in the fusion is preserved either in substance or in qualities; while with blending each of the bodies in the mixture is preserved both in substance and qualities, though the bodies have been blended with one another in their entirety. They say this because they also want to preserve the capacity of the blended bodies to be separated again from one another. Were this account impossible, it would be impossible, according to them, for blending to be complete, or for the bodies that have been blended to be capable of separation' (*De mixt.* 7, 220. 29–37 Bruns, trans. Todd).

²⁵ Stob. *Ecl.* 1. 17. 4, 153. ²⁶ Wachsmuth = SVP ii. 471.

²⁶ [ἐ]κεῖ τε γ(έν)εσις κεντραβήθη δι' ἄλλ(ων) (ἐόντι) ἢ παράλλεσις. Note the use of the term παράλλεσις δι' ἄλλων for the description of blending, here and in Alexander, *De mixt.* 4, 218. 8 Bruns (ἐθα δι' ἄλλου παραρβέμενα).

matter of fire is all things combustible and susceptible to heating, but some of it is indestructible,²⁷ while the other is not. For this reason some things which have been extinguished quite considerably preserve the same form as they had from the beginning, and yet they are not totally undiminished. For in them, too, something is wasted and destroyed by fire. For which reason these, too, after staying in it longer, are finally destroyed and leave their proper form. (*De mixt.* 9, 222. 35–223. 6 Bruns)

Alexander here rejects the idea that in the case of heated iron, fire and iron might be mixed without any material losses on either side. In the Stoic argument, the case of heated iron is taken to be of a different phenomenological order compared with other cases of burning. Ordinary combustion involves change and destruction, whereas heated iron illustrates how the quality of heat can spread itself over the whole volume taken up by another quality, that of iron-ness, without destroying any of the latter.²⁸ Alexander's tactic here is to demote the case of heated iron from its paradigmatic status in the Stoic theory of blended qualities to the rank of ordinary phenomena of burning which play no part in that theory. The fact that there is less destruction in the case of heated iron than, for example, in the case of burning wood is due to the special material constitution of iron. Iron has more 'indestructible' matter than wood has. But this does not mean that all the matter of iron is indestructible. Some of the heated iron does in fact get destroyed,

²⁷ 223. 2 *ἀβλαβρός*. The meaning is difficult. Todd explains the distinction as the one between the primary (indestructible) and proximate (destructible) matter. This does not, I think, square well with the following sentence, intended as an illustration of the distinction, where the persistence of form is presumably accounted for by the presence of some 'indestructible' matter. Perhaps we might understand 'indestructible' not in a metaphysical sense but as referring specifically to destruction by fire. The destructible matter will then be the one that is destroyed by fire, the 'indestructible', the one that persists. In any case *ἀβλαβρός* will have to be taken in a rare meaning 'not easily destroyed' (cf. Arist. *De caelo* 1. 11, 280^b35: λέγεται δ' ἀβλαβρόν καὶ τὸ μὴ ῥαδίως φθειρόμενον). I take the example of things 'extinguished' (lit. 'dried up', *σθενεσμένα τῶνα*) as referring, in the sense just explained, to the cases like that of heated iron, where form persists for a long time in the process of heating.

²⁸ That qualities are intact is a characteristic property of 'blending' (*εἰσότης*), in the report of Chrysippean doctrine: 'The third type of mixture he says occurs through certain substances and their qualities being mutually coextended in their entirety and preserving their original substance and qualities in such a mixture: this mixture is blending in the strict sense of the term' (*De mixt.* 3, 216. 25–8 Bruns, trans. Todd); cf. *De mixt.* 3, 216. 28–217. 2, cited at 299 above. In this *εἰσότης* differs from fusion (*σύνχυσσις*), where 'both the substances and their qualities are destroyed together [*συνφθειρομένην ἀλλήλους*], as he says happens with medical drugs in the joint destruction of the constituents and the production of some other body from them' (*De mixt.* 3, 216. 22–5 Bruns, trans. Todd, lightly modified).

and if left in the fire long enough, it would have lost its proper form. Thus, where the Stoics emphasize the moment of stability and persistence, Alexander is inclined by his theoretical background to see a weak mode of destruction. The process may be slow and not easy to notice, but it is there none the less.²⁹

The next point that Alexander makes in his discussion of 'heated iron' has to do with the question whether the fire which is used to kindle the iron is identical with the fire which resides in the heated iron after it has been kindled. According to the Stoic account, as presented by Alexander, the fire is the same, preserving its identity and thus being a true continuant. According to Alexander, this is not the case.

In general, since the iron is kindled by a particular fire which depends on specific matter, then, if the fire goes through the iron, it must go through it whilst protecting the matter on which it depended when it was adjacent to the iron; but neither pieces of wood, nor coal, nor any other matter supporting the fire which burns the iron come to be within the iron. So we are left with the fact that fire must come to be in the iron when separated from its matter. But if it is separated, it must acquire new matter in the change, and there is none except the iron itself. For to the extent that there is moisture in it, it becomes matter for the fire. Certainly the iron that is heated becomes harder after its extinction than before, since the moisture in it is expended by the fire, and it is kindled as long as there is some moisture in it—as also with pieces of wood. (*De mixt.* 12, 227. 26–228. 6 Bruns, trans. Todd)

Alexander's alternative explanation of the example of 'heated iron' is based on his theory of elemental constitution of natural sub-

²⁹ The wording of this passage might suggest that Alexander has in mind something like a complete extinction of metals in fire, a notion which might be problematic in view of the actual temperatures available to ancient metallurgy. Alexander might, perhaps, think of some such processes as burning off the slag from the ore, where the diminution of 'metallic' substance is obvious. But most likely we are dealing here, as often in Alexander, not with an empirically based concept, but with a certain theoretical claim. In *De mixt.* 12, 227. 26–228. 6 Bruns, quoted in the next paragraph of the main text, Alexander says that fire consumes the moist constituent of its matter: the conclusion that things staying in fire long enough would lose all their moisture and to that extent also their form can be derived from this principle with little empirical backing. Presumably, metals whose moist has been extinguished by fire completely will not be able to receive fire in an ordinary mode of melting—which will mean for them to lose their proper form. Cf. Philop. *In De anima* 282. 6–11 Hayduck: ὅτι γὰρ ὄδωται πρέφεται τὸ πῦρ, δὴλον ὄντων γὰρ πρέφεται. τὸ γὰρ ἔλαστον ὄδωται ἐστὶ περὶ τοῦδ' τι καὶ ὁ κηρὸς καὶ τὸ ταύτα καὶ τὰ ξύλα δὲ καὶ τὰ ὄμοια τῶν μετέχειν ὑγρότητος αὐτῶν ὕλη πορὸς γίνεται, ὄθεν τὰ πάντα καταξυραμμένα ξύλα ὄντων τὰ σεσηπῶτα ἢ ἡ πέφρα οὐδὲ κατεσθαι δύνανται, διὰ τὸ πάντη ἀμορφεῖν ὑγρότητος.

stances, according to which the heat of fire is to be construed as a property resulting from a mixture of the elements in a hylomorphic compound, rather than as a relatively unattached 'power' or corporeal reality that can subsist *quia* numerically the same in different combustible stuffs.³⁰ On the Stoic view (in Alexander's reconstruction), when the iron is heated by a fire that is burning, say, in charcoal, the fire-in-charcoal, being a corporeal quality, extends itself and mixes with the body of an iron bar, so that we can talk about the fire-in-the-iron as of the fire-in-charcoal-and-in-the-iron. On Alexander's view, there can be no such joint monadic properties. Fire cannot have continuous existence on its own, always needing matter in which to subsist, and such matter can only be construed as a constitutive part of some hylomorphic compound. In so far as it resides in the iron, then, it uses the moist within the iron as its matter, so strictly speaking it is not the same fire as in the charcoal. The fire in the charcoal is a quality of the charcoal; the fire in the iron is a quality of the iron. There is no substantial continuity between the two 'fires'; the breach is along the border between the two material substances. The physical gap may be elusive, but the logical and ontological gap is there.

1.3. *Recovery of qualities: separation of ingredients from mixtures*

Alexander's criticism of the Stoic example of the ingredients recovered from blending sets out the difference between the two positions in a particularly clear way. The Stoics illustrated their principle of the persistence of qualities with a procedure of collecting the ingredients from the mixture of water and wine (*σύνκρασιν*) with the help of a sponge soaked in olive oil.³¹ The explanation they

³⁰ Alexander treats the elements themselves as compounds of prime matter and elemental qualities, the latter playing the role of form (*De anima* 3, 21–7, 8 Bruns; P. Accattino and P. L. Donini (trans.), *Alessandro di Aphrodisia: L'anima* (Rome and Bari, 1996), ad loc.). He distinguishes between the 'heavenly' elements, i.e. the elements in their natural places, and the elements in their earthly state, which are mixed with each other in the natural compounds (*Quaest.* 2, 17 with Sharples's notes). 'Earthy' fire is the excess of heat in a compound, and depends for its existence on matter other than prime matter (namely the one that contains the moist). So hylomorphic analysis 'here on earth' serves to account for elemental transformations, i.e. has a causally rather than phenomenologically descriptive function.

³¹ Philo, *Coif.* 185–7, 265, 1–9 Wendland: *κράσις δ' οὐ παράθεσις, ἀλλὰ τῶν ἀνομοίων μερῶν εἰς ἄλληλα εἰσδυομένων δι' ὄλων ἀντιπαρέτασις, ἐν δυναμένῳ ἐπιτεχνήσει τὴν διακρίεσθαι τῶν ποιότητων, ὡς ἐπὶ οἴνου καὶ ὕδατος φασὶ γίνεσθαι. συνελθοῦσας μὲν γὰρ τὰς οὐσίας ἀποτελεῖν· κράσις, τὸ δὲ κραθεῖν οὐδὲν ἕττον ἀναπλοῦσθαι πάλιν εἰς τὰς εἰς ὧν*

gave of this experiment was that wine and water are really present in a mixture, and slight help from a catalyst is sufficient to separate them from it.³²

Alexander offers an alternative explanation, building on Aristotle's account of mixture in *GC* 1. 10, according to which mixture in a strict sense is the state of co-present ingredients in which their own 'powers' have been tempered, but not completely annihilated by mutual action.³³ In this case, the original powers of the ingredients are said to be present 'potentially' in a mixture, while the actual power of the whole is a new property, resultant from this mutual action. Alexander adopts this definition, restating it in his own terms.³⁴

Alexander does not specify, in the *De mixtionis*, which degree of potentiality the ingredients have, out of the two distinguished by Aristotle.³⁵ He probably feels the pressure of this question. It cannot be a 'first potentiality', for the process of reconstitution of the ingredients from mixture does not amount to a full-scale generation. Nor is it a 'second potentiality' because the actualization of the latter involves no real process of change at all; whereas here, as Alexander indicates, some process of change is involved.³⁶ Re-

ἀπετελεῖται ποιότητος· σπόγγῳ γὰρ ἠλασμένῳ τὸ μὲν ὕδωρ ἀναλαμβάνεσθαι, τὸ δ' οἶνον ὑπολείπεσθαι, μήποτε ἐπειδήπερ ἐξ ὕδατος ἡ σπογγίως γένεσις ἐστὶ, τὸ μὲν οἰκτεῖον, ὕδωρ, πρῶτον ἀναλαμβάνεσθαι πρὸς αὐτῆς ἐκ τοῦ κράματος, τὸ δ' ἄλλοτρίον ὑπολείπεσθαι, ὁ οἶνος. Cf. Stob. 1. 17. 4, 155. 5–11 Wachsmuth: ὅτι δ' ἐπὶ ποσούτων κράσεων διαμένουσιν αἱ ποιότητες τῶν συνκραθεῖσιν, πρὸς ἄλλων ἐκ τοῦ πολλοῦ εἰς ἐπιτεχνήσεως ἀποχρησίζεσθαι πάντα ἀπ' ἀλλήλων. ἐν γούν σπόγγῳ ἠλασμένῳ καλῆ τις εἰς οἶνον ὕδατι κεραιμένην, ἀποχρησίσαι τὸ ὕδωρ τοῦ οἴνου ἀναδραμόντος τοῦ ὕδατος εἰς τὸν σπόγγον.

³² I have not been able to find a clear explanation of this effect. On a recent empirical confirmation, see R. K. Sorabji, 'The Greek Origins of the Idea of Chemical Combination', in J. Cleary (ed.), *Proceedings of the Boston Area Colloquium in Ancient Philosophy*, 4 (Boston, 1989), 35–63 at 48 and n. 46.

³³ *GC* 1. 10, 327^b22–31; 328^b17–22.

³⁴ *De mixt.* 14, 231. 10–12 Bruns: *καὶ τοῦτ' ἐστὶν ἡ κράσις· ἡ γὰρ διὰ τοῦ ποιεῖν καὶ πτόχειν τῶν παρακευαμένων ἀλλήλους σωματίων διὰ μεταβολῆς χωρὶς φθορᾶς αὐτῶν τυπὸς ἐνῶσις.*

³⁵ As Todd aptly points out, *Alexander of Aphrodisias*, 238–41. F. de Haas in a recent paper has plausibly suggested that Philoponus' view of the ontological status of ingredients in a mixture, according to which the ingredients possess a special third kind of potentiality, intermediate between Aristotle's first and second, is influenced by Alexander's *GC* commentary: F. de Haas, 'Mixture in Philoponus: An Encounter with a Third Kind of Potentiality', in H. A. G. Braakhuis and J. M. H. Thijssen (eds.), *The Commentary Tradition on Aristotle's De generatione et corruptione: Ancient, Medieval and Early Modern* (Turnhout, 1999), 21–46 at 38–40.

³⁶ *De mixt.* 15, 232. 20–31 Bruns: 'And what is termed the separation of blended bodies themselves [σ] that involving bodies juxtaposed together, nor again

constitution is facilitated by physical properties of the mixture, most being the factor which provides for both cohesion and faster movement of ingredients within a mixture. So the reconstitution of components will require less effort than the generation of the same components anew. Alexander describes the process as 'a superficial generation of something'.³⁷

Alexander says that components recovered from mixture in this way are not *numerically* the same ingredients as were used to make it, but only the ingredients with the *same kind* of quality:

Thus when certain things are added to them which can contribute to such an actualization, they easily recede to their own nature, not because the original water and wine are separated out again (they were not, that is, preserved in their original state in the mixture, since that would just be juxtaposition and not blending; for where the bodies have been blended the whole product of the blend is one and uniform), but because such a blend is easily able to change into water and does change into that which has not been originally mixed, from such [constituents], with such a quality. (*De mixt.* 15, 231. 22–30 Bruins, trans. Todd, modified)

Thus with Alexander we have the following picture. Mix a volume of water (H_2O) with a volume of wine (O_2), producing a uniform blend. Now restore both ingredients in their original volumes. The resulting volumes of water H_2O and wine O_2 will not be identical with H_2O and O_2 , respectively. They will be the same in form; their matter, however, will not be continuous with the matter of the original ingredients. For that reason, they will not have complete identity with these latter, although they will be entities of the same

[θ] that involving bodies dissociated in corruption and generation and the change into the opposite (as we see when air is separated from water), but the process lies between these. For neither are ingredients present in actuality dissociated, nor are they separated by changing to the opposite of the subject. In these cases [(α) and (β)] the residue [$\tau\acute{o}$ *proteron*] after the dissociation stays the same in form [*κατὰ τὸ εἶδος*] as before and is only decreased in quantity, but [ζ] with the bodies that have been blended the difference is that each of the things in potentiality in the body produced from the blend is separated out, changing into the actuality of which it was deprived, because they are mutually acted upon to an equal extent' (trans. Todd, modified). (α) and (β) here can be taken as corresponding to the second and first potentiality: the condition of actualization of (α) is a removing of impediment, of (β), an actual change into the contrary, described in terms of generation and corruption.

³⁷ *De mixt.* 15, 232. 13–18 Bruins: *ὡς γὰρ ἐπ' ἐκείνων ἐπιπόλαιός τινος γένεως γίνεται (οὐ γὰρ τὸ γάλακτος εἰς ἐλαιτίας τινάς, αἷς ἔχει, μεταβλητότος ποιότητος τὸ μὲν ὄρος τὸ δὲ πυρὸς γίνεται, ἀλλὰ τὰ υπέρχοντα αὐτῶν δυνάμει οὕτως, ὡς ὀλίγης τιμῆς πρὸς τὸ ἐνεργεία εἶναι δεῖσθαι βοληθείας, εἰς τὸ ἐνεργεία εἶναι γίνεται), οὕτως μεταβολῆν ἡγητέον γίνεσθαι καὶ ἐπὶ τῶν κεραιμάτων.*

kind, with exceedingly many features of resemblance, and with spatio-temporal characteristics which might suggest identity, if it were not for the gap in continuity created by the state of mixture. Because in the mixture their identities were lost, the recovery is to be taken as a process of generation rather than any sort of accidental change.³⁸ We shall see in the next section that this approach to the problem of mixture is fully consistent with Alexander's solution to the problem of the continuant.

Again, as in the case of heated iron, Alexander wants to deflate the paradigmatic force of the Stoic example by putting it on a par with several other cases, where ostensibly there is no recovery of the ingredients from mixture yet the causal mechanism, Alexander claims, is the same as he described for the case of separating wine from water. The cases Alexander cites as parallel are the separation of curds and whey from milk into which a heated stone is cast; and the action in fermented must as conducive to a separation of wine from air.³⁹ In each case, Alexander says, the resultant parts

³⁸ So Alexander would disagree with Kit Fine's ingenious reconstruction of the hylomorphic theory of mixture, according to which the qualities of the ingredients are all preserved in the qualitative structure of the mixture by virtue of being effectively constitutive of this structure *qua* qualitative (K. Fine, 'The Problem of Mixture', in Lewis and Bolton, *Form, Matter, and Mixture*, 82–182; for a shorter version of this argument, see his 'Mixing Matters', in Oderberg, *Form and Matter*, 65–75). Fine argues against what he terms the 'ascent' version of hylomorphic theory (the view that mixtures are at a higher level of hylomorphic complexity than the elements: see Fine, 'The Problem of Mixture', 115), for the 'levelling' version (the view that they are at the same level), pointing out that the hylomorphic level of complexity of the unmixed elements is the same as the hylomorphic level of mixture. Alexander probably would not see a problem with the argument for 'levelling' in so far as it involves the acknowledgement of the hylomorphic constitution of the elements (cf. *De anima* 3. 21 ff., and n. 30 above). But he might object to Fine's conclusions concerning the identity, according to which because the elements have the nature of 'potencies', the elements antecedent to mixture are the same as the ones resultant from it and concurrent with it (Fine, 'The Problem of Mixture', 132). The reason we have already seen: in a mixture whose product is a uniform body, the ingredients lose their original identities. This is not a complete loss, in the sense that in this special case things of *the same kind* can be recovered. But those things will still be new individuals. (The position of J. Bogen, 'Fire in the Belly: Aristotelian Elements, Organisms, and Chemical Compounds', in Lewis and Bolton, *Form, Matter, and Mixture*, 183–216, who argues that elements are present in mixture 'with respect to the ability', seems closer to Alexander's view of mixture.) I am very grateful to Prof. Kit Fine for a discussion of this issue.

³⁹ Both come from Aristotle, *Meteor.* 4. 3. 380^b31; 384^a22–4. In his commentary on both passages Alexander uses the terminology of change and generation. Cf. *In Meteor.* 193. 9–14 Hayduck: *λέγεται γὰρ ταῦτα τότε ἡψηθῆναι, ὅταν ὁ ἐν αὐτοῖς ὑγροῖς οὐσι χυμῶς, οὐκείως ὦν αὐτῶν καὶ οὐχὶ ἀλλότριος, πεφθῆναι καὶ εἰς τι εἶδος μεταβληθῆναι ἀπὸ τοῦ κύβητος περιεικμένον καὶ ἐξῶθεν πυρὸς θερμαινόμενον γὰρ τοῦ ὀπίστου*

(wine and water; curds and whey; air and wine) are not contained as separate parts in a mixture. Rather, the power of a catalyst produces each of the two resultant components from *each* part of a blend.⁴⁰

Alexander's analysis may produce the impression that he makes the concept of identity dependent upon spatio-temporal continuity (since he says that separated ingredients are not identical with the incoming ones because of the interruption of continuity), in which case the difference between his position and the Stoic one might indeed become vague and elusive. Therefore it may be worth emphasizing that the point of his objection to the Stoics is precisely that spatio-temporal continuity without qualification is not sufficient to determine individual identity. His view of the relation between identity and continuity in this case is not unlike that of D. Wiggins, who has argued that individual identity cannot be properly construed without 'identity under a sortal concept'.⁴¹ Alexander would agree with this. When the incoming water and wine H₁ and O₁ get mixed they lose their identities under their respective sortal concepts, to use Wiggins's terms, (a 1 : 1 mixture of water and Bordeaux, say, is neither one nor the other in a strict sense), and at that time there is no point in talking about their individual identities either, despite the fact that there have been no spatio-temporal disruptions in their unqualified (mass-like) physical existence. So, the relation between 'sortal' and 'spatio-temporal' identity in Alexander's theory is best understood in terms of constraints laid down by the former on the latter. The requirement of continuity of the subject (which is not satisfied by the ingredients of the mixture in his analysed example) is just such a constraint. Without this continuity under a sortal concept, two otherwise identical states are not really identical, but only 'similar'. We shall now look at the elaboration of this idea in Alexander's discussion of growth.

⁴⁰ ἐν ἀπορίᾳ ἢ ὑδατοῦδος, ὡς τοῦ ὄρου ἐπὶ τοῦ γάλακτος, ἢ πιεσματιῶδους, ὡς ἐπὶ τοῦ γλακέου, ἢ τοῦ υποκεκμηίου πέφης τε καὶ εἰς εἶδος τι μεταβολῆ γιέεται.

⁴¹ *De mixt.* 15, 231. 30–232. 3 Bruns: ὡς γὰρ ἐπὶ τοῦ γάλακτος ὄρους ὁμοιομεροῦς σώματος ἔχοντος δὲ ἐν αὐτῷ δυναμεία καὶ ὕγραν τι καὶ στερεόν, ὁ περιωρισμένος ἐφθλοβηθεῖς ἄλλος ἐκότερον αὐτῶν ἐξ αὐτοῦ διέκρινε γεννήσας τρέπον τινά, καὶ τὸ μὲν αὐτοῦ τρυφὴν ἐποίησε, τὸ δὲ ὄραν, οὐ μένος τι ἐνωπίαρον αὐτῷ ἐνεργεία χυλίσιας, ἀλλ' ἐπὶ παντός μορίου γεννήσας αὐτῶν ἐκότερον, οὕτως ὑποληπτέον ποιεῖν καὶ τὴν κατιεμένην ἀπορχίαν εἰς τὸ ἀγγεῖον τὸ ἔχον ἐν αὐτῷ κεκρήμενον οἶνον ὕδατι.

⁴² D. Wiggins, *Sameness and Substance Renewed* (Cambridge, 2001), *passim*.

2. Alexander on form and matter in the process of growth

According to Aristotle, the persistence of the subject is one of the three fundamental facts (*πρώχοντα*) about the process of growth to be accounted for by a sound theory,⁴² the other two being the influx of nourishment from outside and equal increase of a growing thing in all its parts.⁴³ In his solution to the puzzle of persistence, Aristotle distinguishes between the uniform and non-uniform parts of the organism, and says that non-uniform parts grow by the increment in uniform parts.⁴⁴ Growth in uniform parts, the most basic growing structure, is explained by a distinction between form and matter of uniform parts analogous to the same distinction in non-uniform parts. A growing uniform part, i.e. the part constituent of growth in a non-uniform part, grows in respect of form, but not matter. For matter is never the same, but constantly comes and goes.⁴⁵ Aristotle illustrates this by an example of water-measuring: form is like a measuring vessel which remains the same in the course of the process, and matter is like water that comes and goes in the process of evacuation and repletion.⁴⁶

It is to be noted that in this general solution Aristotle uses the concept of 'flux' only as an illustration, without explaining its meaning more precisely. This concept has a wide range of possible interpretations, from Cratylean⁴⁷ to a variety of restricted versions.⁴⁸

⁴² On Aristotle's method of setting out the main 'facts' constitutive of the subject of science, see G. E. L. Owen, 'Títhēnai ta phainomena', in J. Barnes, M. Schofield, and R. Sorabji (eds.), *Aristoteles on Aristotle*, i. *Science* (London, 1975), 113–26.

⁴³ *GC* 1. 5, 321^a18–26, 321^b10–16; cf. 321^a1–5.

⁴⁴ *GC* 1. 5, 321^b17–19; τὸ ὁμοιομερῆ ἀξάνεται τῷ τὸ ὁμοιομερῆ ἀξάνεσθαι (σὺγκεσαι γὰρ ἐκ τούτων ἕκαστον).

⁴⁵ *GC* 1. 5, 321^b19–24: ἀρχὴ καὶ ὄρου καὶ ἕκαστον τῶν τούτων μορίων ἐστὶ διατόν, ὡς περ καὶ τῶν ἄλλων τῶν ἐν ὕλῃ εἶδος ἐχόντων· καὶ γὰρ ἡ ὕλη λέγεται καὶ τὸ εἶδος ἀρχὴ καὶ ὄρου· τὸ αὖν ὄρου μέρους ἀξάνεσθαι καὶ προσάϊτος τυπὸς κατὰ μὲν τὸ εἶδος ἐστὶν ἐνδεχόμενον, κατὰ δὲ τὴν ὕλην οὐκ ἐστίν.

⁴⁶ *GC* 1. 5, 321^b24–8: δεῖ γὰρ νοῆσαι ὡς περ εἰ τις μετροῖ τῷ αὐτῷ μέτρῳ ὕδωρ· αἰετὶ γὰρ ἄλλο καὶ ἄλλο τὸ γινόμενον· αὐτῷ δ' ἀξάνεται ἡ ὕλη τῆς σαρκὸς, καὶ οὐχ ὄρου· παντὶ προσγίνεσθαι, ἀλλὰ τὸ μὲν ὑπερκεῖ, τὸ δὲ προσέρχεται, τοῦ δὲ ἀρχήματος καὶ τοῦ εἶδους ὄρου μορίῳ. Discussed in G. E. M. Anscombe, 'The Principle of Individuation', in ead., *The Collected Philosophical Papers* (3 vols.; Oxford, 1981), i. 57–65 at 64–5; S. M. Cohen, *Aristotle on Nature and Incomplete Substance* (Cambridge, 1990), 149–52.

⁴⁷ Cf. Arist. *Metaph.* I 5, 1010^a10–15 on ἀπορχίαν δόξα.
⁴⁸ For a profound and amply documented analysis of the concept of flux in the descriptions of matter in the Platonic tradition, see F. Decleva Caizzi, 'La "materia scorrevole": sulle tracce di un dibattito perduto' ['Materia'], in J. Barnes and M.

The constraints on the concept of flowing matter are particularly important for Alexander, given his doctrine of the incorporeal status of form and its inseparability from matter.⁴⁹ If the radical version of 'flux' is adopted in conjunction with these assumptions, he may face a dilemma of either admitting that form vanishes and comes about anew every moment, following upon matter; or, if it is not affected by the flowing state of matter in this way, having to explain in what sense, if at all, it can still be described as 'enmattered'. In either case, there are serious problems with accounting for the substantial status of the hylomorphic compound. These problems seem to have been worrying Alexander in his work on the interpretation of Aristotle's account of growth in *GC* 1. 5.

2.1. *Alexander on GC* 1. 5: some problems with the sources

The Greek text of Alexander's commentary on Aristotle's treatise *On Generation and Corruption* is lost.⁵⁰ Our secondary sources for this commentary include the *De mixtione*, where the last chapter is devoted to the Aristotelian theory of growth; *quaestio* 1. 5, a short treatise in the collection of *quaestiones* attributed to Alexander; which has been transmitted under the title 'Why growth is in form and not in matter';⁵¹ an Arabic treatise on the same subject which may be regarded as a modified version of this treatise;⁵² extensive, often anonymous, quotations in Philoponus' *GC* commentary; and quotations in Averroes' *Epitome* of and *Middle Commentary* on *GC*.

Philoponus often paraphrases considerable parts of Alexander's Mignucci (eds.), *Matter and Metaphysics* (Naples, 1988), 425–70 at 432–3, 443, who draws a useful distinction between the 'radical' concept of flux *qua* metaphysical principle and a more moderate concept which is used in physical theories of the sensible world.

⁴⁹ For discussion of Alexander's arguments against corporealism, see my 'Qualities and Bodies: Alexander against the Stoics', *Oxford Studies in Ancient Philosophy*, 25 (2003), 297–344.

⁵⁰ For the fragments of Alexander's commentary on *GC* 2. 2–5 preserved in Arabic (in Jābir b. Hayyān, *Kīrāb al-Tasrif*), see E. Gannagé (trans.), *Alexander of Aphrodisias on Aristotle On Coming to Be and Perishing* 2. 2–5, *Lost in Greek, Found in Arabic*, forthcoming (London, 2004).

⁵¹ *Quaest.* 1. 5, 13. 9–32 Bruns. English translation and commentary in R. W. Sharples, *Alexander of Aphrodisias: Quaestiones* 1. 1–2. 15 [*Quaestiones* 1. 1–2. 15] (London, 1992), 36–7. The discussions in the Greek *Quaestio* 1. 5 and its Arabic version are paralleled in the aporia stated in Philoponus' commentary at 106. 3–11 Vitelli. Cf. Sharples, *Quaestiones* 1. 1–2. 15. 36 n. 85.

⁵² See Appendix.

commentary, without explicit acknowledgement.⁵³ There are, in particular, a number of indications that part of his discussion of form and matter in the process of growth is a paraphrase of Alexander's commentary. These include: doctrinal and terminological parallels with other works of Alexander;⁵⁴ an explicit textual marker of a boundary between Philoponus' text and his Aristotelian source;⁵⁵ the fact that several statements from this passage are attributed to Alexander by Averroes, in the *Middle Commentary* and *Epitome* (on which below). These facts provide cumulative evidence that Alexander's text underlies the discussion in Philoponus' passage in question.

Averroes' *Middle Commentary* and *Epitome* contain several references to Alexander's commentary. The character of these references does not allow us to decide whether Averroes consulted Alexander's commentary directly.⁵⁶ At the end of his presentation of Alexander's

⁵³ See E. Gannagé, 'Alexandre d'Aphrodise *In De generatione et corruptione* apud Gābir b. Hayyān, *K. al-Tasrif*' [Alexandre d'Aphrodise], *Documenti e studi sulla tradizione filosofica medievale*, 9 (1998), 35–86; on this practice cf. also L. G. Westerink, 'Deux commentaires sur Nicomaque: Asclépius et Jean Philopon', *Revue des études grecques*, 77 (1964), 26–32; R. B. Todd, 'Galenic Medical Ideas in the Greek Aristotelian Commentators' [Galenic Medical Ideas], *Symbolae Osloenses, 52* (1972), 117–34; recently C. Luna, *Trois études sur la tradition des commentaires anciens à la Méaphysique d'Aristote* (Leiden, Boston, and Cologne, 2001).

⁵⁴ Cf. Philop. *In GC* 105. 2–9 Vitelli with Alex. *De mixt.* 16, 235. 21–34 Bruns; Philop. *In GC* 106. 3–11 Vitelli with Alex. *Quaest.* 1. 5, 13. 11–17 Bruns, and Arabic 51. 9–12 Badawī. Cf. Sharples, *Quaestiones* 1. 1–2. 15, 36 n. 85. A striking parallel is the use of the example of *ωαύρη* in the illustration of the process of growth at 105. 21–6 Vitelli. The word does not occur in Aristotle, but is present in Alex. *De mixt.* 16, 237. 28, 32; 238. 6, 9 Bruns (see Todd ad locc.).

⁵⁵ Philoponus says at *In GC* 108. 18 Vitelli: *τί μὲν οὖν ἐστὶ τὸ αὐξόμενον καὶ πᾶς ἡ αὐξήσις γίναται κατὰ ἀφρορορέην, ἐπίφυρα*. He then goes on to expose the weaknesses of the Aristotelian theory, and concludes in effect that some of the difficulties cannot be resolved on the basis of Aristotelian assumptions (110. 23–111. 14 Vitelli). The attack is directed against Alexander's interpretation of the mechanism of growth.

⁵⁶ The question of Averroes' sources for both *Epitome* and *Middle Commentary* clearly needs further study. Both texts have some parallels with Philoponus: the text of Aristotle, e.g. at 320^a34^b–3, 320^b17–21; presentation of the theory of 'moist' (*υγίθιαι*) dispersed in the limbs, which provides for the mechanism of propulsion (Averroes, *Epitome* 11. 2–12. 4 Puig; *Middle Commentary* 50. 10–51. 3 Al-Alawī; Philop. *In GC* 117. 5–119. 14 Vitelli); illustration of form and matter by the simile of a shadow over a river (Averroes, *Epitome* 13. 4–12 Puig; Philop. *In GC* 106. 12–17 Vitelli). But these parallels can be due to either a common source (such as Alexander) or a secondary source. For a recent useful discussion of Averroes' sources, see H. Eichner, 'Ibn Rušd's Middle Commentary and Alexander's Commentary in their Relationship to the Arab Commentary Tradition on the *De generatione et corruptione*' [Middle Commentary], in C. D'Ancona and G. Serra (eds.), *Aristotele e Alessandro di Afrodisia nella tradizione araba* (Padua, 2002), 281–98. Eichner (292–3) (a) states

der's theory of the mechanism of growth in the *Middle Commentary*, Averroes says that this is not a verbatim statement of Alexander's doctrine, but the gist of it.⁵⁷ It is not clear whether the gist is extracted by him from Alexander's commentary, or taken from a secondary source. On the other hand, there are certain points in his references to Alexander which could not be derived from Philoponus' commentary.⁵⁸ So direct use by Averroes of Alexander's commentary cannot be ruled out.⁵⁹

The school works and secondary tradition signal something peculiar about Alexander's interpretation of Aristotle's theory of growth. Averroes in his *Middle Commentary* says that Alexander had some misgivings about Aristotle's solution to the problem of growth, according to which growth is in the form, not the matter, of a growing thing:

Alexander, the commentator on this book, says that Aristotle's statements on this subject were made merely by way of persuasion and conciliation [*alā jihātī l-iqānā'ī wa sukūmī l-naṣīḥī*]. For the matter [*al-mādātāhī*] in the growing thing does not disappear entirely nor is it completely dissolved, but some part of it remains as persistent; otherwise it would be possible for form to be separated. And if there is in matter some part that persists, this part necessarily grows. (*Middle Comm.* 52. 12–16 Al-'Alawī = 34 Kurland, trans. Kurland, modified)⁶⁰

some due misgivings concerning Averroes' direct use of Philoponus and (b) argues on their basis that Averroes does not depend on Philoponus. While (a) is in itself plausible, it does not entail (b); Eichner's main arguments for (b) seem to be *ex silentio*, and a possibility of intermediary sources between Averroes and the circle of Ammonius (where Philoponus' commentary is compiled) is not considered. The whole issue is extremely complex, and a close study of the sources is needed before any reliable conclusions about later reception can be reached.

⁵⁷ 51. 2–3 Al-'Alawī: *haqāq huraqa ma'nā mā qālahu fī haqāq l-ma'nā, wa in lam tabnu al-fāzihū bi-aiyihī*.

⁵⁸ These include the report that Alexander criticized Aristotle's lack of demonstrative force (*Middle Comm.* 50. 10–14 Al-'Alawī, where Alexander is referred to as 'the commentator of this book', *al-muḥaṣṣir li-haqāq l-ḥitāb*); the attribution to Alexander of the theory of the mechanism of growth (*Middle Comm.* 50. 10–51. 3 Al-'Alawī); and the attribution to Alexander of the claim that the scars are evidence for the fact that some matter persists (*Epit.* 13. 10–12 Paug; cf. Philop. *In GC* 107. 10–13 Vitelli, where this argument is cited without attribution, although in the 'Aristotelian' part of Philoponus' exposition).

⁵⁹ At least some parts of the Arabic version of Alexander's commentary were in circulation in Averroes' time. See E. Gannagé, 'Alexandre d'Aphrodise', 65 n. 63; Eichner, 'Middle Commentary', 292.

⁶⁰ Kurland reports a comment by the anonymous Hebrew Supercommentator on Averroes' text (180^v. 14–20), according to which Alexander saw two objections

According to Averroes, Alexander says that not only form, but matter too persists in growth. Averroes' report is embedded in his criticism of Alexander's physiological account of growth, which he apparently takes to stem from Alexander's criticism of Aristotle. But it is interesting that in the course of his own critique of Alexander, Averroes tries to play down the corrective force of the claim that he initially attributes to him, namely that matter persists as well as form. He says that Aristotle never intended to say that growth is in form to the exclusion of matter, but that the distinction has to do with a more specific problem of growth in every part.⁶¹ From this we can infer that Alexander probably said this much in his commentary: in some sense, growth happens in both form and matter.

On the other hand, the title and some of the vocabulary used in the Greek *Quaestio* 1. 5 might produce the impression that Alexander is an advocate of the thesis that form, not matter, is the proper subject of growth.⁶² But we may notice that in the Greek *Quae-*

to Aristotle's view that growth is in form: '(1) Form is a substance. According to *Categories* 5: 3b36–7, "no single substance admits of varying degrees within itself". Therefore, if we say that it is the form *qua* form that grows, it will follow that there will be variations of degree of the same form, i.e. the same substance. (2) Form comes under the category of quality whereas growth occurs in the category of quantity. It was these objections that led Alexander to comment that Aristotle set forth his view merely by way of rhetorical or persuasive argument and not by way of strict demonstrative argument. It is impossible to say whether this is based on another witness to Alexander's commentary; but if so, it would confirm Alexander's tendency to derive the hylomorphic theory from the ontology implicit in the *Categories*. (cf. Alex. *In Sens.* 3. 73. 4–12 Wendland, with my discussion in 'Qualities and Bodies', 309–15).

⁶¹ It is necessary that the words of the Sage should be interpreted in this way, not in the way Alexander interpreted them, when he wanted to explain that growth is in form not in matter in the sense that matter is changing, and growth persistent, and this, as he said, is destroyed by the fact that in the bones there is found persistent matter, so it must be that it is the growing thing. For the Sage did not mean that growth is in form without matter, but only meant that growth in each part of a growing thing is in respect of form and not in respect of matter [*wa lam yurid al-ḥāḍimū 'anna l-mumta'a fī l-ṣirātī dhna l-mādātī wa tā fī l-mādātī dhna l-ṣirātī wa 'inamā arāda 'anna l-mumta'a fī jamū'ī 'ajzā'ī l-nāwiyī min jihātī l-ṣirātī lā min jihātī l-mādātī*] (*Middle Comm.* 53. 3–9 Al-'Alawī). Averroes says here that Aristotle's claim that growth is in form not matter is not to be taken as referring to the problem of persistence, but only to the problem of equal growth. As for persistence, there is persistence in both form and matter. But this is as much as Alexander claims, according to Averroes' report and other sources. So the discrepancy between Averroes and Alexander at this point is not doctrinal, but purely exegetical.

⁶² The title is *ḍā' ṭī ḥ' aḥḥayyas karā' rō' ḥōḥos mō'or, ḍāḥḥ' oḥḥ' kāi karā' ṭīp' ḥḥp'* (13. 9–10 Bruns). The description of the state of matter as *ḥōḥos* and *ḥō'or*, in conjunction with

stio, the notion that matter persists is contained in the premisses of the statement of the problem; and it is not dismissed by a subsequent discussion.⁶³ The conclusion can be regarded as a qualifying statement with respect to both claims, i.e. that growth is in form, and that matter persists as well as form. The author explains that the reason why it is said that matter does not persist is that matter stands for quantity, and form for quality. Because the quantity of a growing thing in the process of growth constantly changes, it cannot be said to persist; hence matter cannot be said to persist in flux, even though some of it in fact does remain. So it seems that the author of the *Quaestio* agrees with the thesis that some matter persists in the process of growth, and the point of the *Quaestio* is to show that this thesis is also in agreement with Aristotle's claim that growth is in form.⁶⁴

The Arabic treatise in particular has a number of features which might suggest that the author defends the thesis that growth is exclusively in form. In the opening paragraph, which has no parallel in the Greek text, we find a mention of 'some' who claimed that growth is with respect to both form and matter, to whom Aristotle replies.⁶⁵ Alexander is presented as arguing against them for the 'orthodox' Aristotelian thesis that growth is with respect to form alone. This impression is strengthened by the final paragraph, also absent in the Greek version, which adds a conclusion along the same lines: matter is flux, but form is stable and persistent; so growth is with respect to form.⁶⁶ These emphases are rather at odds with the main argument of the treatise, which assumes that matter does persist, and is replaced only gradually, and follows the Greek

the title, might suggest a standard dichotomy between the functions of stability and change, similar to that proposed by the Stoic solution of the 'Growing Argument' (cf. *Plat. Comm. not.* 1083 A-1084 A). But cf. the same language at *De mixt.* 16. 235. 14-34 Bruns.

⁶³ 'If the substrate of a thing which is said to grow grows (and the matter persists, too, not just the form; for not all of the matter changes), why is growth only in form and not also in matter? For not all the matter in things that grow changes, but some of it remains, while some is added. For otherwise it would not have been preserved to begin with, nor would the form of the pre-existent matter have remained' (*Quaest.* 1. 5. 13. 11-16 Bruns, trans. Sharples, lightly modified).

⁶⁴ Thus, *Quaest.* 1. 5 apparently presents yet another instance of discrepancy between title and content characteristic of a number of treatises in Alexander's *Quaestiones* collections (cf. Sharples, *Quaestiones* 1. 1-2. 15, 3 and n. 11, and R. W. Sharples (trans.), *Alexander of Aphrodisias: Questiones* 2. 10-3. 15 (London, 1994), 2 and n. 12).

⁶⁵ See Appendix at 51. 4.

Quaestio in explaining that form persists in the principal sense in so far as matter is taken to refer to quantity. It seems possible to explain the 'double focus' of the discourse by a redaction of the Arabic text in the course of which the mentioned textual and stylistic additions were made.

F. W. Zimmermann has shown recently that the 'some' emerge in our treatise (and in a number of other texts translated from Greek into Arabic) as a result of editorial recourse to the technique (which he calls 'animation') that involves a presentation of a philosophical discussion of a problem as a piece of real polemic, where the two divergent conceptual points figure as a thesis and an objection maintained by real opponents.⁶⁷ In our case, the editor, perhaps misled by the Greek title, chose the claim that growth is in form, not in matter, to be the 'thesis' of Aristotle, defended by him and by Alexander against the 'objection' put forward by the obscure 'some'. The substance of this 'objection' is in fact none other than the view most of our sources attribute to Alexander himself. The final paragraph of the Arabic text, which has no parallel in the Greek, would also fit well in this 'animated' structure: it claims firmly that growth is in form, not in matter, thus suggesting that the purpose of the discussion is to pit this claim against the view that growth in some sense is in both form and matter, rather than showing how the two can be true together.

Now, if these editorial elements are bracketed out for a moment, we can see that the doctrinal points on which the discussion in the Greek *Quaestio* is based are all retained, if in a somewhat convoluted form, in the Arabic version. To this extent, then, the thesis that form and matter both persist is found in this source too.

2.2. Constraints on flowing matter

The idea that not only form, but matter too, persists in the process of growth, can be found in Alexander's presentation of Aristotle's theory of growth in the *De mixtione*. Where Aristotle, in his account of growth in *GC* 1. 5, introduced no constraints on the notion of

⁶⁷ F. W. Zimmermann, 'Proclus Arabus Rides Again', *Arabic Sciences and Philosophy*, 4 (1994), 9-51 at 20-37 (our passage is printed under E at 21-2); cf. H.-J. Ruland, 'Die arabische Übersetzung der Schrift des Alexander von Aphrodisias über das Wachstum (Quaestio 1.5) ["Wachstum"]', *Nachrichten der Akademie der Wissenschaften in Göttingen*, phil.-hist. Kl. (1981), no. 2, 51-74 at 60-1, on the relation of this kind of technique to the Arabic quotation system.

flux, Alexander pauses to spell out more precisely the distinction between the concepts 'form' and 'matter':

When we say that flesh is in flux and in a state of continuous addition and subtraction, we say that flesh is affected in this way in so far as it is matter; when, on the other hand, we say that flesh remains the same, it is by taking 'the same' with respect to form and flesh *qua* form that we ascribe it these [properties].⁶⁸ (*De mixt.* 16, 235. 21–5 Bruns)

The sameness and numerical unity of a hylomorphic compound depend on the sameness and numerical unity of form, taken as essence or as a specific formula of a given kind.⁶⁹ But Alexander adds some conditions which have to do with the persistence of matter. He explains that in the case of flesh,

Even though some of the matter underlying it flows out, and some flows in, as long as there is something of it that remains in it,⁷⁰ it preserves the form of flesh, preventing total destruction by its persistence in transmission [*τῆ κατὰ διάδοσιν μόνῃ*]. For 'being flesh' is not in 'so big a magnitude' [*ἐν τῷ τσῶδε μεγέθει*], which does not remain the same throughout the flow of matter, but in 'such a form' [*ἐν τῷ εἶδει τῷ τσῶδει*], which does remain the same as long as something of the flesh is preserved. (*De mixt.* 16, 235. 29–34 Bruns)

Because in physical things form is inseparable from matter, and because, as Alexander has argued elsewhere, form by itself is incorporeal, some sort of material persistence must be involved in the persistence of form. He described this as 'persistence by way of transmission' (*τῆ κατὰ διάδοσιν μόνῃ*).⁷¹ This type of persistence involves two claims about the process: matter must be replaced not

⁶⁸ At 235. 24 Bruns, reading *ἀντὶ τὸ εἶδος καὶ τῆν κατὰ τὸ εἶδος ἀρκεα λαβόντες* with Parisin. 1848, the Aldine, Rodier, and Todd, against *ἀπο τοῦ εἶδους* of Bruns and other manuscripts.

⁶⁹ *De mixt.* 16, 235. 25–9 Bruns: *πάντα γὰρ τὰ ἐν ὕλῃ τὸ εἶναι ἔχοντα κατὰ μὲν τῆν ὕλην ἄλλοτε ἄλλα γίνονται, διὰ τὸ μὴ μένειν ταύτην κατὰ τοῦ ἀριθμοῦ μίαν, συνεχῶς κατὰ τὰ μέρη μεταβάλλουσάν τε καὶ γινόμενῃ ἄλλοτε ἄλλην, κατὰ δὲ τὸ εἶδος ἐν αὐτῷ κατ' ἀριθμὸν ἑκαστον μένει. κατὰ γὰρ τὸ εἶδος ἢ σάξῃ ἢ ἀντῆ κατ' ἀριθμὸν μένει.*

⁷⁰ At 235. 30 reading with Bruns and Todd *εἶναι τὴν μὲν*.

⁷¹ In the Aristotelian corpus the verb *διαδοῖναι* occurs in physical and physiological contexts as referring to the natural processes of transmission and distribution of substances, organic and inorganic (see Bonitz, *Index*, s.v.). The noun form occurs just once, at *HA* 705^a.32, referring to the process of distribution of nourishment (in the sense of give-away rather than a gradual procedure). Alexander uses the verb in physical contexts, as Aristotle does, but he emphasizes the meaning of transmission by contact of successive parts (cf. *In Meteor.* 2. 6 Hayduck: *οὐ διαδόμενον τὸ πῦρ ἄλλου ἐξ ἄλλου ἀπορρομένου, ἀλλὰ τὸ πρόωτον ἀφ'ἑνὲν φερόμενον*; 2. 7 Hayduck:

all at once but bit by bit (gradual replacement), and some matter must somehow persist in the process. In Philoponus' report of what he calls the 'Aristotelian' account of growth, we find a more detailed discussion of both claims.

2.2.1. Gradual replacement One condition of 'persistence by transmission' is that matter should not be replaced all at once, but gradually. Philoponus' comment on 321^b10 contains a discussion of an aporia which most probably goes back to Alexander:

Someone might wonder whether perhaps it is not only the matter of growing things that is not always the same because of influx and outflow, but also the form itself. For if the form has its being in matter as its subject, and it is impossible that when the underlying matter perishes that which has being in it is preserved (for in this way it would have been separable rather than inseparable from matter), then it necessarily follows that neither should the form of a growing thing be preserved the same. (*In GC* 106. 3–8 Vitelli)

The difficulty arises from the juxtaposition of the following claims about form and matter: (a) 'enmattered form' is always in the matter; (b) matter by definition is never stable, so some of it may be destroyed *qua* matter before the destruction of the composite (e.g. in the process of evacuation). If that is the case, how can the claim that form persists and remains the same throughout the process of growth hold true? The problem is stated by Philoponus, but the main points of the solutions that follow can be taken as Alexander's with a good degree of certainty. The solution reported by Philoponus is based on the idea of gradual replacement:

Solving this problem we say that, if all of the matter were destroyed at once, then the stated argument would have been correct. But in fact it flows [*ἀναθυμιάσεως*] κατὰ τὸ ἐξῆς διαδομένης]. In addition, he uses the term in his theory of sense-perception to refer to the passage of the objects of the senses through the medium which involves succession, as opposed to instantaneous propagation. The noun form is used 15 times: of these, 12 describing the process of sense-perception (*In Sens.* 25. 15; 128. 22; 129. 12; 131. 15, 22; 132. 15; 133. 7 Wendland; *De anima* 41. 5; 48. 15, 20; 63. 16 Bruns; *Quaest.* 3. 9, 97.12 Bruns); once in *In Meteor.* 21. 33 Hayduck, describing the quick descent of fire; once in *Quaest.* 2. 3. 48. 7 Bruns, notably, describing the distribution of divine power from the divine body; and once in our text. Because in our text the nature of transmission involves influx and outflow of matter, it is possible to suppose that by *μὲν κατὰ διάδοσιν* Alexander means a continuous mode of persistence, where at each moment something flows out, but something persists.

out gradually, part by part, and something else is immediately brought in [instead of the part flowing out]: for which reason the form remains one and the same numerically. (*In GC* 106. 8–11 Vitelli)

Compare the text of the Greek *Quaest.* I. 5:

... not all matter in the growing things gets replaced, but while some of it remains, some is added [ἀλλὰ μέντοι τῶς τῶος ἐξ αὐτῆς ἄλλη προσθήεται]; for [otherwise the growing thing] would not have been preserved from the beginning, nor would the form of the previous matter have persisted. (*Quaest.* I. 5, 13. 13–16 Bruns)⁷⁵

It has to be noticed that the continuity of gradual replacement does not, strictly speaking, involve a doctrine of physical continuum, or any other special assumption about the physical structure of matter.⁷⁶ The meaning of 'continuity constraint' is ontological rather than physical. Continuity and cohesion are recognized as properties of material substances in Stoic physics, as well. But the source of this cohesion, for the Stoics, is the single corporeal active principle, and the way in which it imparts this cohesion to matter is that of corporeal pervasion. Any special provisions for the continuity of matter in individual substances are, on this view, redundant.⁷⁷ On

⁷⁵ The Arabic version: 'Alexander says: We want to solve this problem and we say that in a growing thing matter, i.e. the substrate of that thing, changes gradually [*qalīlān qalīlān*]. For some of it remains, whereas some comes from outside, so that matter does not pass away as a whole; for if all of it did pass away, the form would not remain in its state' (62. 5–14 Ruland = 51. 9–12 Badawī).

⁷⁶ It could conceivably be realized in a discrete material system, provided that there is a mechanism synchronizing the processes of destruction and replacement. Cf. e.g. Aristotle's argument against the assumption that everything in nature is subject to motion in *Physics*, 8, 3, 253^b13–23: οὐτε γὰρ αὐξάνεσθαι οὐτε φθίνεν οὐδ' τε συνεχῶς, ἀλλ' ἔστι καὶ τὸ μέσον. ἔστι δ' ὁμοίως ὁ λόγος τῷ περὶ τοῦ τὸν σταλαγμῶν καταρτίζεσθαι καὶ τὸ ἐκφθίμενα τοῦς ἄλλοις διαπερῖν. οὐ γὰρ εἰ τοσούδε ἐξέωσεν ἢ ἀφείλεν ὁ σταλαγμῶς, καὶ τὸ ἦμισυ ἐν ἡμίσει χρόνῳ πρότερον. ἀλλ' ὥσπερ ἡ νεωλεία, καὶ οἱ στρατηγῶν οἱ τοσούτ' ἰσοσυνετὴ κινουμένων, τὸ δὲ μέρος αὐτῶν ἐν οὐδενὶ χρόνῳ τοσοῦτον. διαπερῖται μὲν οὖν τὸ ἀφαιεθῆναι εἰς πλείον, ἀλλ' οὐδὲν αὐτῶν ἐκωλύθη χωρὶς, ἀλλ' ἅμα. φανερόν οὖν ὅς οὐκ ἀναγκαῖον αἰετὶ τι ἀμείναι, ὅτι διαπερῖται ἢ φθίσις εἰς ἀνεργία, ἀλλ' ἄλλο ποτὲ ἀμείναι. Aristotelian physics rejects atomism, because it cannot come to terms with the assumption of anything indestructible and unchangeable in the physical realm. S. Berryman is right in pointing out that Philoponus' passage can be interpreted in two distinct ways. C. J. F. Williams (trans.), *Philoponus on Aristotle On Coming-to-Be and Perishing*, I. I–5, introduction and supplementary notes by S. Berryman (London, 1999), 180 n. 309.

⁷⁷ The Stoics did accept some version of the 'Cratylean' assumption of the 'Growing Argument': cf. Plut. *Comm. not.* 1083 b. Decleva Caizzi points out that this is the sole place where such an admission by the Stoics is recorded ('Materia', 447), but the idea that cohesion is imparted to matter by the active principle is well attested

Alexander's view, the universal cause of continuity of matter is the uninterrupted movement of heavenly spheres.⁷⁸ This provides for the recurrence of *kind*s in the sublunary world—and so for the fact that this world is arranged in terms of species each of which is 'covered' by a sortal concept. The continuity of matter is a common feature across species, but this does not mean that it has the same ontological and physical parameters in each species. In each particular case, the continuity of matter has a specific pattern set by its form. This form, unlike the Stoic active principle, is incorporeal, and it cannot be construed as a separately existing entity of any sort—neither, obviously, as a thing, nor indeed as a corporeal causal factor operating across a variety of individuals. Thus special provisions for the matter of individual substances must be specified in terms of a given kind.

Gradual replacement provides for a continuity of matter over any given period of time. If this were the only constraint on matter as flux, there would be no reason why material substances could not be eternal, given a persistent form and a virtually infinite supply of matter, along with the 'gradual replacement' mechanism.⁷⁹ But Alexander's enmattered form (unlike the soul-model of Cebeus' 'tailor' example at *Phaedo* 86 E 6–88 C 7) is entitled to only one round of existence, within a particular hylomorphic compound which it does not survive. To account for the destruction of things in nature, he introduces another postulate, according to which some matter of an individual has to persist over the whole lifespan of the individual.

2.2.2. *Persistence of matter* The argument for persistence of matter has been mentioned above in Averroes' report: some part of matter

in the Stoic sources. In the extant fragments, we find a report of Mnesarchus, who argued for a distinction between the 'peculiarly qualified' and 'substance', saying that Socrates' substance can exist both before and after the existence of Socrates (*Stob. Ed.* I. 20. 7, 179. 6–17 Wachsmuth = 28D LS, part). The discussion of the mode of existence of Socrates' substance in the absence of Socrates is not preserved, but even if we assume that it exists as a quasi-aggregate dispersed in the cosmos in whatever manner, no special condition need be applied to it when it is a part of Socrates, other than being pervaded by the active quality-setting body.

⁷⁸ Alexander discusses the difference between the Peripatetic and Stoic explanations of continuity in *De mixt.* 10, 223. 6–17 Bruns.

⁷⁹ This is suggested by a paraphrase of the same idea in Philoponus' commentary (*In GC* 107. 11–17 Vitelli), where the persistence of form over material change is compared to the persistence of a shadow over flowing water (the simile repeated by Averroes in the *Epitome*, 117 Kurland = 13. 4–12 Puig).

remains because otherwise it would be possible for form to exist separately from matter.⁷⁷ It is cited in a fuller form by Philoponus:

[i] But neither should one think that all of the matter is replaced by turns as a whole in the course of time, flowing out part by part, so that in our old age nothing would remain in us of the body that was underlying us from the beginning, from the original structure. [ii] If this were the case, it would have been possible for animals to be immortal, matter always being in its prime. [iii] For as things stand now, matter cannot preserve form throughout because of wearing out over time, since the harmonized [components] being affected by the opposite powers cannot retain the *harmonia* and blending throughout.

[iv] Hence it should be understood that not all of it gets dispersed, but the more solid parts of it always remain numerically the same. This is why the scars from injuries which happened perhaps in youth can be seen remaining in flesh and bones till death. So for this reason too form must necessarily remain numerically the same. (*In GC* 107. 3–14 Vitelli)

This report may well be contaminated. Alexander is not mentioned, and the accuracy of Averroes' report is not exempt from question. The idea that solid matter persists while soft parts get replaced may come from anatomical observations which have nothing to do with the metaphysics ofhylomorphism.⁷⁸ None the less, the main concern, stated in two different ways in Philoponus (ii) and Averroes—that if matter did not persist, form could exist without matter, and animals could be immortal—most likely goes back to Alexander, who was the proponent of the theory of 'enmattered form', and the right kind of person to entertain such worries. A parallel with (iii) is found in Alexander's school treatise *Quaestio* 2. 20, where the processes of perishing in living substances are explained by the inability of the elements to retain in due proportion the powers on which the functioning of a living being depends.⁷⁹

⁷⁷ See above, sect. 2.1 and n. 60. This report occurs also in the *Építouche*: 'But this is not possible in all parts of matter, for otherwise it would be possible for the enmattered form [*al-sūrah al-haywāniyah*] to exist separately [from matter], but only in some of its parts. Alexander brings evidence that in the animal there are parts which persist from its coming to be to its passing away, from the traces of some wounds which remain in it throughout its life's span' (*Épít.* 13. 10–12 Puig)

⁷⁸ I am grateful to Richard Sorabji for this point and for discussion of this problem.

⁷⁹ '[But] when this proportioning [*συμμερσία*] is dissolved, since the things from which [the living beings] came to be change and do not preserve the powers in regard to which the proportioning [took place], there comes about a dissolution and breaking up [of the living beings], not into the things, which are no longer

In Philoponus' commentary, the replacement of matter counteracts and slows down this process of perishing, while not being able to cancel it out completely. In Alexander's *Quaest.* 2. 20, the amortizing effect of replacement on perishing is not mentioned (but the main problem of the treatise is rather specific). Thus, although we cannot be absolutely certain that the whole solution to the problem offered in Philoponus' commentary is by Alexander, we may note that the main theoretical components of this solution (the account of perishing, the compensatory role of replacement) are found in the works of Alexander, and the problem itself can be most naturally thought of as arising in the context of his hylomorphic theory of growth: some provision for the non-token persistence of matter has to be made lest the theory of 'enmattered form' lose its ground.

This kind of reasoning can be easily misconstrued as saying that matter is, after all, the subject of growth, in some way. As both the discussion of the aporia in Philoponus' commentary at 106. 3 Vitelli and *Quaest.* 1. 5 show, the possibility of such misinterpretation was well realized in Alexander's circle. *Quaest.* 1. 5 is an attempt to address this difficulty. The claim that matter is preserved in the course of growth is one of the assumptions; the task is to show that this claim is compatible with the Aristotelian thesis that growth is with respect to form. The solution of the problem appears to be that matter does not persist in the process of growth in so far as it is taken to represent the quantitative characteristics of a body, 'form' standing for quality. But this method of distinguishing between matter and form is not the only one, and perhaps even not the principal one, the author says:

It is not in the being of such-and-such a size that matter has its being matter, just as this is not the case for flesh. (*Quaest.* 1. 5, 13. 16–17 Bruus)

preserved in them, like the menses (for these themselves too were composite, and this composition [took place] after the first mixing and joining together [*μετά τῆς πρώτης μίξης τε καὶ ἀφαιρέσεως*] of the [ingredients] from which the bodies of living beings are composed). But, when there is a change in the things from which these bodies [were composed] (and these were the elements, which were preserved [in the compounds]), they are dissolved apart from one another, when a disproportion is brought about between them by the one of them that gains the upper hand (since they do not have the power to keep this proportioning indefinitely), and the perishing of living beings and other composite bodies leads to the dissolution of those elements from which their coming to be and composition [took place] in accordance with a certain proportioning of the elements to one another' (*Quaest.* 2. 20, 64. 31–05. 7 Bruus, trans. Sharples, lightly modified).

There is something else, other than magnitude, which constitutes the material substrate of a qualitative structure of a thing. Matter *qua* magnitude is a material aggregate constantly in the process of change. In order to provide a substrate for a persistent structure, the matter of individual substance must possess some degree of unity.

The force of the claim is rather ontological. It says (a) that it is not the case that all of the original material structure is eroded in the living processes; and (b) it is not the case that all of it is being reconstituted as the process goes on.

Alexander's constraints on the notion of matter do not involve any significant discrepancy with the Stoic model of persistence so far as the description of the phenomena as such is concerned. The Stoics would deny neither the continual character of reconstitution nor the persistence of some of a living body throughout the process. What differs is their interpretation of these phenomena in terms of ontology. For Alexander, continuity and persistence are characteristics of proximate matter; for the Stoics, they are properties of corporeal qualitative structure which pervades matter.⁸⁰ One might wonder whether the difference between Alexander's and the Stoics' account has any real philosophical import, and whether it is not sufficiently accounted for by the difference of terminology, as well as by the highly fragmentary state of the Stoic sources.

I think that the answers to these two questions are, respectively, 'yes' and 'no'. There is a difference, and it is not merely terminological or circumstantial. It seems to have to do with the problem of individuality and also with the concept of the individual at work in two systems. On both Alexander's and the Stoics' view, one individual form (peculiar quality) picks out exactly one material object. But for Alexander, the numerical unity and sameness of this object *qua* this also have as their condition the continuity and persistence of its particular material substrate; whereas for the Stoics, the category of 'substance', the Stoic equivalent of Peripatetic matter, does not play the same role: *οὐσα*, we are told by the sources, is that aspect of an individual which is in a constant process of change.⁸¹

⁸⁰ In the *De mixtionē* Alexander makes it clear on a number of occasions that he regards the Aristotelian theory of form and matter as an alternative to the Stoic theory of *πνευμα*. Cf. *De mixt.* 9, 223. 6–13 Bruns.

⁸¹ The sources tell us that two peculiarly qualified individuals cannot occupy the same substance; but this principle seems to be based on the ontological properties of the peculiarly qualified rather than those of 'substance': Plut. *Comm. nat.* 1077 C–E (280 LS); Philo, *Aet.* 47–51 (28r LS); discussion in D. Sedley, 'The Stoic Criterion

This difference has been anticipated already in the discussion of mixture. For Alexander, the discontinuity of material substrate accounted for the numerical distinction between the qualitatively equivalent ingredients. On the Stoic view, the numerical identity of an ingredient before and after the mixture is sufficiently determined by its qualitative identity. In Alexander's discussion of growth we have the same principle of material continuity and persistence spelt out in a more detailed way. This principle is invoked again in his discussion of the Stoic doctrine of everlasting recurrence.⁸²

In his commentary on *GC* 2. 11, Philoponus reports an aporia whose proponents suggest that the everlasting recurrence of individuals should follow from the sameness of both efficient cause and matter in sublunary cycles.⁸³ It is not clear whether the aporia had the form of an objection to the Aristotelian theory or, perhaps no less likely, we are dealing with a Stoicizing interpretation of Aristotle's chapter. Alexander's reply is that even the coming to be of individuals with exactly similar properties would not be a recurrence of numerically identical individuals, but only of the individuals which are the same in kind, however much resemblance they might bear to their past counterparts:

To this it should be said that even had it been granted that Socrates comes to be again, the Socrates that has come to be later would not have been one and the same with the first Socrates. For one and the same thing cannot be divided by an interval [διαλειπέτω]. For a numerical unity comes about not due to being made up by the same things, but due to the fact that it remains the same before and after [τῷ τῆ αὐτῆ διαμέεω προέροω καὶ ὑστεροῶ]. For this reason, the sun is numerically one, but Socrates, as he said,

of Identity', *Phronesis*, 27/3 (1982), 255–75 at 265–70. The whole question clearly needs further investigation.

⁸² On the Stoic doctrine, for evidence and discussions see LS 52; J. Mansfeld, 'Providence and the Destruction of the Universe in Early Stoic Thought. With Some Remarks on the "Mysteries of Philosophy"', in M. J. Vermaseren (ed.), *Studies in Hellenistic Religions* (Leiden, 1979), 129–88; J. Barnes, 'La doctrine de retour éternel' [The doctrine], in J. Brunschwig (ed.), *Les Stoiciens et leur logique* (Paris, 1978), 3–20. Cf. A. A. Long 'The Stoics on World-Conflagration and Everlasting Recurrence', *Southern Journal of Philosophy*, 23, suppl. (1985), 13–38.

⁸³ ἀπορήσειε δ' ἂν τις, ὡς φησὶν Ἀλέξανδρος, πρὸς Ἀριστοτέλην· εἰ γὰρ ἡ ὕλη ἢ αὐτῆ ἀεί διαμέεω, ἔστι δὲ καὶ τὸ ποικιλικὸν αἴτιον τὸ αὐτὸ ἀεί, διὰ ποίων αἰτίων οὐκ κατὰ περιόδον τινα πλεόντος χρόνου ἐκ τῆς αὐτῆς ὕλης τὰ αὐτὰ πάντα κατ' ἀριθμὸν ὑπὸ τῶν αὐτῶν ἔσται; ὅσοι πινέσθαι κατὰ τὴν παλαιογενεσίαν καὶ τὸν μέγαν ἑναυτὸν συμβάθην, ἐν φ' πάντων τῶν αὐτῶν ἀποκατάστασις γίνεται (Philop. In *GC* 314. 9–16 Vitelli).

is not one numerically. For the undivided form [$\tau\acute{o}$ ἀτομόν εἶδος] does not remain, even if matter remains. (Philop. *In GC* 314. 16–22 Vitelli)⁸⁴

Alexander's claim that 'one and the same thing cannot be divided by an interval' reflects his understanding of the concept of the individual in the Stoic theory of everlasting recurrence. The time during which a 'token'-individual does not exist in a given cosmos is regarded as a time when a Stoic individual preserves spatio-temporal continuity without preserving continuity in kind.⁸⁵ Such an 'ontological pause' in an individual history is not licensed in Alexander's theory, as we have seen.

Thus, in Alexander's analysis, matter does play the role of the principle of individuation, although in a much weaker sense than intended by the scholastic formula. Alexander's claim does not mean that matter, however understood, makes a thing what it is—form does. But in so far as form corresponds to a sortal concept, form alone is not sufficient to determine the identity of a given thing with respect to its existence; 'whatness' does not entail 'thisness'. The condition of 'thisness', although not available independently of 'whatness', has to be stated separately, in order not to face the possible loss of the concept of form. In Alexander's doctrine this condition is stated by means of constraints on the concept of proximate matter.

It remains to say that Alexander is a biased writer, and therefore we should take his invectives against Stoic metaphysics with due caution. The examples we have looked at have not featured the Stoic distinction between 'qualified' and 'peculiarly qualified', which might be instrumental in their solutions to the problems of

⁸⁴ This has been taken by Barnes ('La doctrine', 10) and Long ('The Stoics on World-Conflagration', 27–8) to be a report of a mitigating version of the 'recurrence' theory, according to which the individual counterparts in subsequent *kosmoi* are not identical, but only indiscernible (cf. Origen, *Cels.* 468–*SVP* ii. 626). I do not think there is anything in Alexander's text that indicates that what he grants for the sake of his argument corresponds to anyone's real claim. The claim that the assumed indiscernible counterparts are not identical is his own; it is consistent with his overall position on the problem of continuant, which I have tried to outline in this essay; and as such it does not need to be derived from the Stoic source. So this passage provides no conclusive specific evidence that some *Stoics* introduced non-identical indiscernibles. But it does provide some general evidence for the way in which such a notion could have been introduced as a result of revisions of the recurrence theory faced with criticisms on the issue of identity.

⁸⁵ Alexander's analysis of recurrence at *In An. Pr.* 1. 15 provides more evidence for his interpretation of the Stoic individuals; this evidence cannot be treated here, but I hope to discuss it elsewhere.

identity and persistence through change. None the less, Alexander's polemic, with its distinct theoretical preferences and biases, can prove useful for the analysis and assessment of historical alternatives.

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APPENDIX

Treatise of Alexander of Aphrodisias (stating that) growth and augmentation indeed have to do with form and not matter⁸⁶

Edition⁸⁷ by Abū 'Uthmān al-Dimashqī

51. 5: [Alexander said]: Aristotle in the book 'On coming to be and passing away' mentions that growth and augmentation are in form, not in matter. Some⁸⁸ denied that, saying: the body,⁸⁹ and whatever admits of growth, only grows in both its form and its material.⁹⁰ And⁹¹ the Philosopher said: Growth happens in form, not in matter.

51. 9: [Alexander said]: we want to solve this problem, and we say: the matter, i.e. the material of a given thing, changes gradually in the course of growth. For some of it persists⁹² and some comes from without, so that the matter does not disappear altogether. For if all of it were to pass away, then the form would not persist the way it is.

⁸⁶ This translation (appended only for the sake of illustrating the argument) is based on the edition by A. Badawī, *Shurūḥ alā Aristū: commentaires sur Aristote péritus en grec et autres épîtres* (Beirut, 1971), 51–2. For critical edition with German translation see Ruland, 'Wachstum'. See also Zimmermann, 'Proclus Arabus', 20–37; Sharples, *Quaestiones* 1. 1–2. 15; H. V. Brown and F. W. Zimmermann, 'Neue arabische Übersetzungstexte aus dem Bereich der spätantiken griechischen Philosophie' [BZ], *Der Islam*, 50/2 (1973), 313–24. I am particularly grateful to Dr. Heidrun Eichner and Dr. Fritz Zimmermann for discussion of this text and checking my translation. I am responsible for any errors that may remain and any misuse of their advice.

⁸⁷ *ihbrj*: See BZ 319; A. Hasnawi, 'Alexandre d'Aphrodise et Jean Philopon: notes sur quelques traités d'Alexandre "perdus" en grec, conservés en arabe', *Arabic Sciences and Philosophy*, 4 (1994), 53–109 at 60 and n. 18.

⁸⁸ 51. 7: 'Some': the invented addressees of Aristotle's and Alexander's polemic. See above, 318–19.

⁸⁹ 51. 6: *jirm*. Ruland suggests that it might stand for *ἀρρξ*.

⁹⁰ *unur*: a more archaic term for matter than *hanyūā*, with which it is used interchangeably in this text. The use of two terms might be evidence of two redactions (cf. 51. 9 below, where *unur* is glossed with *hanyūā*), but could also be an attempt to use two different terms to render a distinction drawn in Greek between 'matter' and 'substrate' (cf. *Quaest.* 1. 5, 13. 11–12 Bruns).

⁹¹ Reading *fa-minma qāla* with T (*fa-fina fa-qāla E ut vid.*; *fa-qāla* Ruland; *fa-thumma qāla* Badawī; *fa-himma qāla* ('to this') Zimmermann, 'Proclus Arabus', 21).

⁹² Reading with E and Ruland, *yabqā*.

51. 12: Again: The form of something and its matter grow together, matter being like quantity and form like quality. And the quantity of a thing moves and alters, and does not stay as it was before. Its quality, on the other hand, which is [its] form, persists and stays as it was before. Since the quality of a thing, i.e. its form, is persistent, while [its] quantity is changeable, and not persistent, the cause of its change and fragility⁹³ being in the flux of matter—therefore the Sage said: the things that grow do not grow⁹⁴ in matter, but they grow in form.⁹⁵ For form persists in its initial state without change; but movement and growth happen in respect of something subsistent and stable.

51. 19. Again: even though a growing thing grows in both its matter and its form, yet because of the state⁹⁶ of flux of matter, i.e. the material, growth is not to be predicated⁹⁷ of the material, because the material, as we said, changes and does not persist in the same state. So if a predication were to be made with respect to it,⁹⁸ only changeability and mutability of matter would be predicated of it. For we cannot find in a growing thing the material (which is persistent throughout, not divided, but it changes with respect to quantity, i.e. every part of the matter of a growing thing)⁹⁹ flows and changes¹⁰⁰ so that none of it remains in its initial state. On the other hand, the form of that which grows remains constant as long as the growing thing subsists without undergoing destruction.

52. 4. ¹⁰¹ Again: growth is a kind of movement, and movement only comes about in respect of something that is at rest.¹⁰² And we have said that form

⁹³ 51. 16: reading *ingisām* with the manuscripts. Ruland emends to *tabaddul*, on the basis of meaning and conformity with the Greek text. I think the received reading can stand until we get better textual grounds for emendation. For the meaning, cf. Greek *ῥευστόν*. (Our Greek text has merely *τοῦ μὴ μένειν αὐτὸ ταύτόν*, 13. 22 Bruns).

⁹⁴ 51. 17: reading with E and Ruland *tanšihū* for *tatašawawāqū* Bad. T.

⁹⁵ 51. 16–17 Badawī = 64. 22 Ruland. This corresponds to the Greek sentence *διὰ τοῦτο κατὰ μὲν τῆν ὕλην οὐκ αἰξέται τὰ αἰξόμενα, κατὰ δὲ τὸ εἶδος* (13. 22–3 Bruns), which does not have an attribution to Aristotle supplied in the Arabic.

⁹⁶ 51. 19: reading with T and Ruland *bi-hāl* instead of Badawī's *kamāl*.

⁹⁷ 51. 20: reading *yaw'atū* with Ruland, who indicates that this must be a reading in T instead of *yub'atū* of Badawī and Esc.

⁹⁸ Reading in *mā'īta bihi* with Ruland against *bi'īlha* of the manuscripts.

⁹⁹ The part missing in the Arabic manuscripts, supplied by Ruland from the Latin version: 'in res cretente fixam semper impermutabilem, set permutatur per quantitatem, scilicet omnis pars ex partibus materie crescentis fluit et permutatur'. On *permutatur* see the next note.

¹⁰⁰ 52. 1: *yatabaddaltu* or *yantaqiltu* Ruland (*μεταβάλλεται* Gr.); *yanyfshu* (sensu *yatalhalihi*) Badawī; *yanyqshu* E (؟) T: *et expirat vel exprimitur* codd. lat.

¹⁰¹ 52. 4–7 Badawī: the passage absent in the text of the Greek *quæstio*. See above, 318–19.

¹⁰² 52. 5: *sākin*: corresponds probably to *ὑποκείμεν* rather than *δεπρός* suggested by Ruland in his analysis ('Wachstum', 57; cf. *hāqin*, suggested by Ruland himself ad loc.).

persists even though matter changes. And therefore growth only happens in the form of something alone.

Hereby is clearly explained the saying of the Philosopher that growth happens in form but not in matter.

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