THE cornerstone of Epicurus’ physics is atomism: Epicurus follows Democritus1 in maintaining that our world is ultimately composed of atoms and the void. It is, then, somewhat surprising that the demonstration of the atomist thesis is apparently confined to three sentences in the Letter to Herodotus, our main source on Epicurus’ physics. These are the three sentences that I shall focus on in this paper. First, I shall argue that the standard interpretation, which takes the argument to be based on the impossibility of sizeless parts, is not the correct one. Then, I shall examine the alternative reconstruction of the atomist argument that focuses on the body–void distinction. Finally, I shall try to show that Epicurus’ defence of atomism is based on the unalterability of the atoms.

1. The text and its standard interpretation

It will be useful to summarize briefly what we can learn from the Letter before it gets to the argument for atomism. All the more so as commentators have often stressed that Epicurus develops his system in a linear manner and tries to avoid using undemonstrated premisses for his arguments. Let us see, then, what we can take as known for the argument for atomism.

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I presented versions of this paper at the University of Pécs, at the Central European University, Budapest, at the Bibliotheca Classica, St Petersburg, at the University of Rijeka, and at the Humboldt University, Berlin. Remarks by Howard Robinson, Katalin Farkas, István Bodnár, László Bene, Péter Lautner, Judit Horváth, and Christof Rapp were particularly helpful. I am especially grateful to Myles Burnyeat and David Sedley for detailed comments on the written version.

1 In this paper I shall not make a distinction between Democritus and Leucippus. By the name ‘Democritus’ I mean Abderitan atomism in general.
Epicurus starts the *Letter* by giving his reasons for epitomizing his monumental work *On Nature*. One can understand that such a summary was needed: *On Nature* comprised 37 books and was apparently about double the size of Plato’s entire corpus.\(^2\) Epicurus says that the *Letter* should help those who have no immediate access either to *On Nature* or even to its most important parts. Yet the *Letter* in itself cannot serve as a primary source for learning—it is only a reminder for those who have already internalized the doctrines of Epicureanism, either through studying Epicurus’ full-size written works or by receiving teaching from their Epicurean teachers.

In the next step we learn the foundations of Epicurus’ epistemology: primary concepts (πρῶτα ἐννοήματα), sensations (αἰσθήσεις), and feelings (πάθη) are epistemologically prior and serve as the criteria of truth.

The metaphysical and physical doctrines come next. Epicurus starts off by establishing three principles of conservation: first, that nothing comes into existence from nothing, for otherwise things could spring into being spontaneously, with no regard for the general regularity of nature, which requires that particular outcomes can be delivered only by particular initial conditions. Generation, in general, must originate from ‘seeds’.\(^3\)

The second principle, which will be of central importance for us, states that the destruction of a thing cannot mean perishing into sheer nothing. For if this were possible, all things would have already passed into not-being, and nothing would exist at all. The proof for the second principle of conservation already relies on the first principle. For without the first principle, it would theoretically be possible that even though things do perish into non-existence, other things come into existence from nothing, and hence the stock of existing things will never become empty. Moreover, the argument will go through only if we assume that physical processes in the world have been going on for an infinitely long period of time.\(^4\) For


\(^3\) There is some uncertainty whether ‘seeds’ are meant to be taken here only in the ordinary biological sense of the word or are already pointing towards the technical sense of atoms. The parallel passage in Lucretius elaborates on the conditions for biological generation in great detail, but also refers to atoms as ‘seeds’ of things (1. 176, 185, 221).

\(^4\) The parallel passage in Lucretius (1. 225–37) makes this premiss explicit.
otherwise it would be conceivable that the world starts out full of beings, and then things gradually go out of existence; eventually there will be nothing at all, but we live in an intermediate period when there is still a considerable number of beings. To rule out such an option, Epicurus has to assume that the history of the universe had no beginning.\footnote{Even the fulfilment of this condition is not sufficient to render Epicurus’ argument conclusive. Even if there is perishing into non-existence, and the process of annihilation has been going on for an infinitely long time, it would still be possible that there is still something in the universe if the initial stock was infinite.}

The principles of conservation in a third move are applied to the totality of things, stating that nothing can be added to or subtracted from what there is in the universe now. This is supported by further arguments which establish that the universe cannot pass into something else and thereby change qualitatively, nor is it possible that something should enter it from the outside and thereby produce a quantitative change by addition.\footnote{For the reconstruction of the argument, see J. Brunschwig, ‘L’argument d’Épicure sur l’immutabilité du tout’, in *Permanence de la philosophie: mélanges offerts à Joseph Moreau* (Neuchâtel, 1977), 127–50, repr. as ‘Epicurus’ Argument on the Immutability of the All’, in J. Brunschwig, *Papers in Hellenistic Philosophy* (Cambridge, 1994), 1–20, with refinements in A. A. Long and D. N. Sedley, *The Hellenistic Philosophers* [LS] (2 vols.; Cambridge, 1987), ii. 18.}

The next step is to establish that bodies and the void are the only *per se* existents. Sensation tells us that bodies exist. The existence of void, on the other hand, is necessary, for if there were no void, bodies could not be in something and could not move.\footnote{I shall not embark now on the well-known problem of the Epicurean conflation of empty and occupied space.}

The argument is rounded off by showing that nothing else exists in its own right, but must belong to a body or to the void as a property. Epicurus mentions already at this point, without further elaboration, that there are different kinds of properties: ‘accidents’ (συμπτώματα) form a subclass of attributes (συμβεβηκότα).\footnote{Epicurus’ language at this point is somewhat confusing, and has in fact caused some confusion. The question is whether we are supposed to take συμβεβηκότα and συμπτώματα as mutually exclusive (when συμβεβηκότα would refer to permanent or inseparable properties) or συμπτώματα should be understood as a subclass of συμβεβηκότα. I am following LS here in opting for the second alternative. For arguments see LS i. 36 and, more fully, D. Sedley, ‘Epicurean Anti-Reductionism’ [‘Anti-Reductionism’], in J. Barnes and M. Mignucci (eds.), *Matter and Metaphysics* (Naples, 1988), 295–327 at 304–11.} The fact that this distinction is introduced already at this point, before the atomist argument is introduced, will prove to be important for us.
This is the point at which Epicurus turns to establishing that the ultimate building-blocks of bodies are atomic. The argument runs as follows:

καὶ μὴ καὶ τῶν σωμάτων τὰ μὲν ἐστί συγκρίσεις, τὰ δὲ ἐξ ὧν ἀι συγκρίσεις πεποίηται. ταῦτα δὲ ἐστίν ἄτομα καὶ ἀμετάβλητα, εἶπερ μὴ μέλλει πάντα εἰς τὸ μὴ ὁν φθαρῆσθαι, ἀλλ’ ἵκεοντα ὑπομένειν ἐν ταῖς διαλύσεις τῶν συγκρίσεων, πληρὴ τὴν φύσιν ὃντα καὶ οὐκ ἔχοντα ὅπη ὅπως διαλυθήσεται. ὡστε τὰς ἀρχὰς ἀτόμους ἀναγκαῖον εἶναι σωμάτων φύσεις. (Ep. Hdt. 40–1)

Moreover, among bodies some are compounds, others are those from which compounds are formed. These latter are uncuttable and unalterable—if indeed all things are not going to be destroyed into not-being—but are strong enough to stand fast when compounds are decomposed, being full in nature and unable to be decomposed at any point or in any way. Therefore the primary entities are necessarily those among bodies which are atomic.

I shall call this stretch of text ‘the argument for atomism’. The passage is very compact and cannot yield an indubitable, obvious interpretation. It seems that, in accordance with the general purpose of the Letter, this short passage was meant to be no more than a compressed reminder for those who were already familiar with

9 Editors have suggested different emendations to replace ἵκεοντα, found in all manuscripts (Usener: ἵκεον τί; Bailey and Bignore: ἵκον τί). I agree with Hicks and LS that there is no need to alter the received text, but I do not follow their constructions. LS translate ‘The latter must be atomic [literally “uncuttable”] and unalterable—if all things are not going to be destroyed into the non-existent but be strong enough to survive the dissolution of the compounds—full in nature, and incapable of dissolution at any point or in any way.’ I take it that the subject of ἵκεοντα is ταῦτα, and not πάντα, and thus put the second dash after not-being. In so far as πάντα includes both types of bodies (compounds and their components), Epicurus cannot say that all things, including compounds, will survive the dissolution of compounds. The things that are strong enough to survive the dissolution of compounds are their atomic and unalterable components referred to by ταὐτά and described further in the last two participle clauses after the ἵκεοντα clause. The ἵκεω + infinitive construction becomes frequent in later Greek and receives the meaning ‘being able to’ (cf. Lampe s.v.). For relatively close parallels, see e.g. Diod. Sic. 14. 27. 6 ὡστε μηδὲν τῶν ὅπλων ἵκεως τὴν βίαν αὐτῶν [sc. τῶν ἑλέων] ὑπομένειν, and Philo, Spec. 4. 112. 8 ἢ δ’ εἴς οὐρανὸν ἀγεῖ τοὺς μή προκαμοῦσας ἀθανατίζουσα, τὸ τραχύ καὶ ὄσπυρόρευτον αὐτῆς ἰκέσαντας ὑπομείναι.

10 It is not entirely evident how these last two participle clauses are related to what precedes. Moreover, the connection between the two clauses is rendered problematic by textual difficulties. Hicks takes the two participles to be explanatory of the ‘strength’ of the ultimate components: ‘because they possess a solid nature and are incapable of being anywhere or anyhow dissolved’. LS separate the last two clauses from ἵκεοντα (see previous note). I am closer to Hicks, but do not take the participles to be straightforwardly explanatory of ἵκεοντα, but rather specifying the physical conditions of ‘being strong’.
Epicurus’ Argument for Atomism

the argument in its extended form. This is also indicated by a scholiolion inserted in the first sentence of the text quoted above: ‘This [is explained] also in the first book of On Nature, and also in books 14 and 15, and in the Great Epitome.’ Alas, the relevant parts of these texts are not available to help us understand this passage.

The argument, however, is not only dense but quite problematic, too. What seems clear at any rate is that at least some part of it is based on the second principle of conservation. If the ultimate components of compound bodies were not atomic, everything would pass into not-being. But why would it be so? Standard interpretations of the argument take it that Epicurus refers here to an infinite series of divisions resulting in sheer nothing, or thinks that if bodies were not composed of atoms then their decomposition would lead to pulverization into sizeless parts, i.e. nothing. Versions of this reading of the argument can be found in various summaries of Epicurus’ philosophy. This is, for example, the way Cyril Bailey paraphrased the argument in his classic work on ancient atomism: ‘The idea is that if it were possible to go on dividing and dividing you would ultimately find that matter had disappeared and you had reached “nothing”.’ As Bailey himself admits, the argument in this form is evidently fallacious. The continuous dissolution or division of compound bodies will never yield ‘nothing’ itself. If division continued for ever, the ensuing bodies would be increasingly tiny at each stage—but in no way less existing. Bailey finds the argument unworthy of Epicurus and even suggests that ‘it is improbable that Epicurus would seriously have maintained the point: it is rather a popular way of putting what he meant’. Even if one does not think that the argument as reconstructed by Bailey is so

11 C. Bailey, The Greek Atomists and Epicurus [Greek Atomists] (Oxford, 1928), 282. For more recent formulations, see e.g. D. Sedley, ‘Hellenistic Physics and Metaphysics’ ['Hellenistic Physics'], in K. Algra, J. Barnes, J. Mansfeld, and M. Schofield (eds.), The Cambridge History of Hellenistic Philosophy (Cambridge, 1999), 353–411 at 372: ‘[From the idea that compounds are formed from component parts] it follows in Epicurus’ view that there are ultimate components which do not themselves have components. If they did, real destruction would be the compound’s separation into those. And if they too had components, and so on ad infinitum, a thing’s destruction would be pulverization into sizeless bits, i.e. into nothing’; and T. O’Keefe’s ‘Epicurus’ entry in the Internet Encyclopaedia of Philosophy: ‘the ordinary bodies that we see are compound bodies—that is, bodies which are made up of further bodies, which is shown by the fact that they can be broken down into smaller pieces. However, Epicurus thinks that this process of division cannot go on indefinitely, because otherwise bodies would dissolve away into nothing.’

12 Bailey, Greek Atomists, 282.
catastrophically bad—after all, it is hardly more problematic than some Zenonian arguments we shall consider later—it is not at all certain that we need to impose it on Epicurus. For, indeed, the text itself does not mention either sizeless bits or an endless series of divisions. What is more, Epicurus’ doctrine of theoretical minima, his major addition to Abderitan atomism, rules out not only the physical realization of an endless series of cuts, but also the type of thought-experiment required by the standard interpretation of Epicurus’ argument for atomism. As we shall see, the argument for theoretical minima does not depend on the argument for atomism, and even if Epicurus has not as yet introduced the doctrine of minimal parts, it would considerably weaken the force of the argument for atomism if it turned out that it was based on an assumption (i.e. that we can divide a magnitude into infinitely small parts at least hypothetically and in thought) that Epicurus later explicitly rules out. Let us see, then, whether we can find an alternative reconstruction of Epicurus’ argument for atomism, one that does not involve an infinite series of cuts and infinitely small parts.

2. The Democritean argument

The main reason for understanding Epicurus’ argument the way the standard interpretation understands it is its supposed Democritean pedigree. Commentators tend to assume that Epicurus took over not only Democritus’ atomism, but also Democritus’ argument for atomism. Or even if he did not borrow the argument itself, that he was at least following Democritus in trying to argue for atomism on the basis of an Eleatic or Zenonian type of reasoning.

Democritus’ argument, as reported in its fullest form at Arist. GC 1. 2, 316a23–34, indeed turns on the impossibility of sizeless parts.13 Without going now into the details of the interpretation, let me sketch out its structure. Formally, the argument is a *reductio* by which Democritus intends to show that we arrive at impossible

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consequences if we accept that a body, or any magnitude, is divisible at every point. Therefore the opposite thesis—that bodies are divisible at some but not all points—must be true. And this is exactly what atomism claims. The atomist conclusion is reached through the following steps:

(1) **Hypothesis**: Bodies are divisible at every point.
(2) Now suppose that the body is simultaneously divided at every point.
(3) The resulting parts can have no extension, for if they had, it would mean that the body has not yet been divided at every point.
(4) The resulting sizeless bits are either points or nothing at all.
(5) If the body can be divided into sizeless bits, it means that it can be recomposed from the resulting sizeless points or from sheer nothing—but this is impossible.
(6) Therefore the hypothesis in (1) cannot hold: a body cannot be divisible at every point.
(7) Therefore bodies are not divisible at every point, so the atomist thesis must be true.

The most problematic part of this argument is the step between (1) and (2), because it presupposes a free transition between the following two statements:

(a) A body is divisible at every point.
(b) It is possible that the body is simultaneously divided at every point.

That the transition from (a) to (b) involves an invalid shift of the modal operator becomes even clearer when formalized:

(a) \( (x)(P(x, b) \rightarrow \Diamond (D(x, b)) \)
(b) \( \Diamond (x)(P(x, b) \rightarrow D(x, b)) \)

(where \( P(x, b) \) abbreviates ‘\( x \) is a point of body \( b \)’, and \( D(x, b) \) abbreviates ‘body \( b \) is divided at \( x \)’). Now who else would see more clearly that this is an invalid move than Aristotle himself, who in his theory on the divisibility of magnitudes accepts (a) but does not accept (b)? For, according to the well-known Aristotelian doctrine, a physical or mathematical magnitude is potentially infinitely divisible—that is, there is no point at which the magnitude is not divisible—but
it is impossible simultaneously to actualize the divisions at every point.\textsuperscript{14} In other words, \((a)\) is true but \((b)\) is false.

Remarkably, Aristotle does not assail the Democritean argument by pointing out that its first step is already invalid. For some reason or other, he provisionally concedes to Democritus that the possibility of a simultaneous exhaustive division follows from the hypothesis of divisibility at every point. Why is Aristotle so lenient? Perhaps he wants to show that Democritus’ argument will not go through even if we grant him that initial invalid step. Moreover, this gesture could also be part of the anti-Platonic dialectic of the whole chapter: Democritus’ atomism is to be taken seriously, whereas Plato is just fooling around with his triangles.\textsuperscript{15}

Yet even if we allow the transition from \((a)\) to \((b)\), we still have to face a ‘practical’ problem: how can we reach the envisaged state where the body is actually divided at every point? Aristotle includes a sentence which specifies that these two problems have to be temporarily bracketed if we want the Democritean argument to move on:

For if it [i.e. the body] is divisible everywhere, and this is possible, then it could also be divided everywhere simultaneously even if it did not get divided simultaneously; and if this did happen, there would be nothing impossible in it. (GC I. 2, 316\textsuperscript{a}17–19)

The clause ‘and this is possible’ indicates that we have to allow the move from \((a)\) to \((b)\). The clause ‘even if it did not get divided simultaneously’ seems to say, on the other hand, that how we have arrived at the state of simultaneous exhaustive division is of course problematic, but let us ignore this problem for the time being, and suppose that we have already reached that state, no matter how: at a stroke or at the end of an infinite process or in some other way. If we are charitable enough to grant all this to Democritus, the argument from sizeless parts can go on—but only if we grant at least these two points.

An additional problem with Epicurus’ argument as understood by the standard interpretation is that it completely ignores these

\textsuperscript{14} Cf. Phys. 8. 8, 263\textsuperscript{a}4–\textsuperscript{b}9.

\textsuperscript{15} This has been suggested by Sedley, ‘On GC I 2’, 85–8. In Sedley’s interpretation this is, however, not the main motivation behind Aristotle’s generosity. Sedley’s main argument is that in what he calls the ‘Neo-Democritean argument’ Aristotle voluntarily drops his insistence on there being potentialities that can never be actualized.
complications. It does not, with Aristotle, choose to skip the problems surrounding the actualization of the division at every point and jump to the end-state at which, *ex hypothesi*, the body is already divided at every point. Moreover, the Democritean argument is based on a Zenonian type of thought-experiment: let us imagine that the body gets divided everywhere.\(^\text{16}\) As opposed to this, and very much in tune with Epicurus’ overall methodology, the argument in the *Letter to Herodotus* seems to concentrate on natural physical processes.\(^\text{17}\) Remember that the principles of conservation were already based on an argument from the regularity of natural processes, and our empirical experience about them, and not on an Eleatic type of *a priori* reasoning. But, clearly, the natural process of dissolution of a body is a gradual physical progression, so it is even more difficult to see how it could yield in a finite time the hypothetically envisaged end-state of sizeless parts.

To sum up, if we understand Epicurus’ argument as referring to the impossibility of sizeless parts, it turns out to be not only problematic—or even distressing, as for Bailey—and in conflict with the doctrine of theoretical minima, but also a considerable step backwards compared with the Democritean argument as reported by Aristotle.

3. Atoms and theoretical minima

The contrast between the two types of argument will become even clearer if we remember that Epicurus does indeed use an Eleatic type of reasoning against infinite divisibility—though not in the argument for atomism, i.e. against infinite *physical* divisibility, but in the argument for minimal parts, i.e. against infinite divisibility *in thought*. Once the atomic nature of the ultimate constituents of bodies has been established, Epicurus goes on to argue that a

\(^{16}\) I am not claiming that the Democritean argument originates from Zeno’s arguments; my claim is the much more modest one that Democritus’ argument is based on the same methodology and strategy. On the question of the Eleatic inspiration of the Democritean argument, see D. Sedley, ‘The Eleatic Origins of Atomism’, in P. Curd and D. W. Graham (eds.), *The Oxford Handbook of Presocratic Philosophy* (Oxford, forthcoming).

\(^{17}\) The body in Epicurus’ argument does not get divided up (δαιρέσεις) or cut up (τοµέι), which would indicate an active external involvement as in a physical or thought-experiment, but it dissolves (διάλυσις). This term more readily describes a natural process than some kind of experimental manipulation by an agent.
finite body cannot be divided into infinitely many parts even in thought. Although the proof for minimal parts contains three distinct arguments, at least one of them is an application of a Zenonian argument:

πῶς τ᾿ ἂν ἔτι τοῦτο πεπερασµένον εἴη τὸ µέγεθος; πηλίκοι γάρ τινες δήλον ὡς οἱ ἀπειροί εἴσαι ὄγκοι καὶ οὕτος ἐξ ὧν, ἐξ ὧν καὶ τὸ µέγεθος. (Ep. Hdt. 57)

Moreover, how could this magnitude [i.e. the one we divided by infinitely many divisions in thought] be finite? For it is clear that even these infinitely many bits are of some size, and no matter how small they be, the magnitude composed of them would also be infinite.

This passage is remarkable from our point of view in several respects. First, it shows that Epicurus can be very clear when he wants to build an argument on infinitely many divisions and the size of the resulting parts. This is not what he did in the argument for atomism. Second, the first part of the second sentence stresses that the bits gained via infinitely many splits will always have some size. Thus, Epicurus does not even envisage the possibility that an infinite number of divisions will result in sizeless bits, points or sheer nothing—and in doing so he remains consistent with his insistence that we cannot even imagine that something is divided into infinitely small, or sizeless, bits.\(^\text{18}\)

It is interesting to see, by the way, that it would be possible to construct an argument for atomism on the basis of the thesis of minimal parts. Let us suppose that the thesis of theoretical minima has been established and thus can serve as a premiss in a further argument. Now, finite theoretical divisibility entails finite physical divisibility in so far as physical divisibility cannot go beyond the threshold of theoretical divisibility. Epicurus maintains, however, that independently existing bodies cannot be composed of a single theoretical minimum. There can be multiple justifications for this claim. First, it can be argued that if every atom consisted of one minimum only, atoms could not be different either in size or in shape, and such entirely similar atoms would be unable to account for the diversity of our world.\(^\text{19}\) But Epicurus goes further

\(^{18}\) Clearly, Zeno does both in 29 B 1–2 DK, but he is not committed to a doctrine of theoretical minima.

\(^{19}\) Lucretius explicitly uses this argument in 1. 628–34. Epicurus also says at Ep. Hdt. 55 that we should assume a great variety of atomic shapes in order to account for the great diversity of the phenomenal world.
and says that not even one kind of atom can consist in one theoretical minimum. The reasoning is very condensed, but Epicurus appears to accept Aristotle’s arguments to the effect that what is partless cannot move on its own. It is also possible, as David Konstan has suggested, that the impossibility of a single-minimum independent entity should be understood as an attempt to offer a solution to the problem of contact between atoms. Be that as it may, Epicurus explicitly claims that the limits of theoretical and physical divisibility have to be distinct in bodies. If so, physical division must necessarily reach a limit before reaching the limit of theoretical divisibility. This could be a formally valid argument for atomism on the basis of the theoretical minima. Yet Epicurus does not build his argument for atomism from the side of theoretical minima, but, in accordance with his empiricist methodology, starts from perceptible bodies and analyses them into atoms; only then does he introduce the thesis of theoretical minima.

Some might object, however, that the sentences introducing the argument for theoretical minima show that Epicurus conceived the argument for atoms and the argument for minima as analogous. The relevant part of the text runs as follows:

πρὸς δὲ τούτοις οὐ δεῖ νομίζειν ἐν τῷ ὑδρακύνω ὡρίστατον σώματι ἀπείρους ὄγκους εἶναι οὐδ’ ὑπηλίκους οὖν. ὥστε οὐ μόνον τὴν εἰς ἀπείρον τομὴν ἐπὶ τούλαθσιν ἀνακριτέον, ἵνα μὴ πάντα ἀνθρώπων ποιώμεν καὶ ταῖς περιλήψεσι τῶν ἀνθρώπων εἰς τὸ μή ὅν ἀναγκαζόμεθα τὰ ὄντα θλίβοντες καταναλίσκειν, ἀλλὰ καὶ τὴν μετάβασιν μὴ νομιστέον γίνεσθαι κτλ. (Ep. Hdt. 56)

Furthermore, we should not consider that within a limited body there are infinitely many bits, no matter how small they be. Therefore, not only do we have to reject the [possibility of] cutting into smaller and smaller ad infinitum, so that we do not make everything weak and become compelled by our conception of aggregates to waste existing things into not-being by

22 It seems to be that the thresholds of the two types of divisibility coincide in the case of the void. First, it is clear that the argument showing that it is impossible for a finite magnitude to contain infinitely many extended bits is applicable not only to bodies but to any finite part of the void as well. The view that Simplicius, In Phys. 934. 23–30 Diels=LS 116, ascribes to the Epicureans, that atoms move in space in jerks—i.e. that they cover a spatial minimum not gradually but at once—is entirely consistent with this tenet. The spatial difference between two consecutive positions of an atom is exactly one minimum; the movement of the atom divides, as it were, the void into one-minimum extensions.
rubbing them away. But we should not believe either . . . [there follows the argument for theoretical minima].

Bailey invokes this passage when he claims that the argument for atomism is based on the idea of an infinite series of cuts leading to not-being. There is no doubt that these sentences appear to refer back to the argument for atomism, and they do indeed speak of both cutting and the diminishing size of the resulting bits. It is also true that ἀσθενῆ in this passage refers back to the ἰσχύοντα of the argument for atomism. Yet, I would insist, this passage does not say either that by continuous cutting we can ever reach sizeless bits, or that things would pass into not-being because they become too small and thus fade away. For Epicurus clearly says here that even the infinitely many bits reached by infinitely many cuts will have some size, however small that may be—so no question of sizelessness.

Moreover, he does not say that the passage from existence to non-existence is a question of size; what he emphasizes instead is that the hypothesis of infinite divisibility would push beings into not-being by making them ‘weak’. But ‘strength’ and ‘weakness’ are not relative to size. Indeed, Epicurus’ central claim, as we shall shortly see, is exactly that atoms, although smaller, are ‘stronger’ than composite bodies. The hypothesis of infinite physical divisibility would make everything ‘weak’, in so far as, on that hypothesis, everything could be subject to decomposition and hence would behave as Epicurean aggregates do. Aggregates are ‘weak’ because they can decompose, but atoms are ‘strong’ because they resist dissolution. Thus, Epicurus’ argument centres on the concepts of ‘strength’ and ‘weakness’, but these concepts are not relative to size.

4. Atomicity and ‘fullness’

A more promising route for the reconstruction of Epicurus’ argument for atomism, preferred by some interpreters, is to understand it as based on the distinction between body and void.\textsuperscript{23} On this interpretation one crucial premiss of the argument establishes that

body and void have opposing characteristics and are therefore mutually exclusive, whereas another crucial premiss specifies the criterion of physical divisibility. As recent studies of atomist physics have emphasized, the atomists accepted the argument going back to Parmenides according to which a continuous, homogeneous being with no internal gaps is not divisible.\(^{24}\) The atomists could claim on this basis that a body is physically divisible only where void interrupts the internal continuity of body, while a chunk of body with no void articulating it internally is indivisible. The reconstruction of the argument along these lines can in fact gain immediate textual support from the central sentence of the argument for atomism, where Epicurus speaks about the ‘fullness’ of those bodies which resist decomposition. The ‘strength’ of such bodies means, then, that they do not decompose because they are ‘full’. Their ‘fullness’ in turn means that they do not contain any void, and, because they do not contain any void, they are not divisible at all.\(^{25}\)

Even though I agree that this is the correct interpretation of the last clauses of the sentence, I disagree on the status of this part of the sentence. For it seems to me that in this text the fullness of the ‘strong’ bodies is not the argument for the existence of such bodies, but is rather their physical description: what it takes for a body to be resistant to cutting and decomposition. Epicurus’ argument in this sentence is not that there necessarily exist bodies which do not contain any void and are therefore uncuttable, but rather that there necessarily exist such bodies that are resistant to decomposition and destruction, because otherwise everything would be destroyed into not-being. The reason given for the necessary existence of such bodies is metaphysical (without atoms things would be annihilated) supported by empirical evidence (we see that things still exist) and takes the form of a \textit{reductio}. The last clauses then explain how it is physically possible to have such ‘strong’ indivisible bodies which prevent total annihilation.

We can see even more clearly the difference between the two ar-


\(^{25}\) See n. 10 above. The ‘fullness’ of the atom as opposed to the ‘empty’, i.e. the void, is present also in early atomism. See e.g. Arist. \textit{Metaph.} A 4, 985\(^{5}\)5, for the use of τὸ πλήρες as a synonym for atoms.
argumentative strategies when we contrast the argument in the *Letter* with a different argument that indeed argues for the existence of bodies that do not contain any void and are therefore uncuttable. This argument is known to us not from Epicurus, but from Lucretius (1. 503–39). The starting-point of the demonstration is that bodies and the void exist, and only these two exist *per se*. On the basis of the body–void dualism, Lucretius can now go on to argue that body and void are mutually exclusive: that is, that where there is body, there cannot be void in the sense of actually empty space. It is true that visible bodies will always contain a measure of void, for this is needed for their observable differences in relative weight and the observable permeability of even the hardest stuffs. But, because the basic characteristics of body and void are contradictory (‘duplex natura duarum | dissimilis rerum’, 1. 502–3), body and void cannot form a complete mixture. Therefore, if you keep analysing a visible body, you will necessarily arrive at a level where you will find portions of void unmixed with body and chunks of body unmixed with void. But because without void nothing can be divided or decomposed, these bodies unmixed with void are uncuttable and will never decompose. These bodies are therefore everlasting (*aeterna*).

We can set out the argument in the following form:

1. Only bodies and the void exist *per se*.
2. Body and void have contradictory characteristics.
3. Therefore they cannot completely interpenetrate each other.
4. If so, there are bits of body unmixed with void.
5. A body can be cut or can decompose only at those points where it has void.
6. Bits of body containing no void cannot be cut and cannot decompose.
7. Bits of body containing no void, the existence of which has been shown in (1)–(4), are everlasting.

There are a number of problems with this argument. It can be objected, for example, that (2) cannot yield (3), and that the move either assumes atomism itself—which would result in a *petitio*—or requires the theory of minima, or some other implicit premiss. Indeed, I doubt that the argument as it stands in Lucretius could impress a Stoic adherent of the theory of ‘blending through-and-through’ (*κράσις δι’ ὅλου*), according to which essentially different components of an entity can totally interpenetrate each other while
at the same time retaining their own opposing characteristics.\footnote{On ‘blending through-and-through’, see e.g. Alex. Aphr. De mixt. 216. 14–218. 16 Bruns and Stob. 1. 155. 5–11 (= LS 48c and 48d on 1. 290–1).}

Even apart from this problem, it is no accident that commentators cite only Lucretius for this argument, for there seems to be no way of reading this reasoning into the text of Epicurus’ *Letter to Herodotus* 40–1. The argument for atomism in the *Letter* does not say anything about the mutual exclusivity of body and void, which is, after all, the most important premiss in establishing the existence of bits of bodies unmixed with void, and leaves implicit that a body is divisible only where void articulates it.

More importantly, the crucial move in the argument in the *Letter* is that all things would perish into not-being if there were no atoms, and this is why atomic bodies must exist. Yet the argument based on the mutual exclusivity of body and void and the condition of physical divisibility does not say anything about the question of the passage from being to not-being. So even though this argument is a *bona fide* Epicurean argument, and Epicurus may very well refer to it in the last participial clauses of the central sentence of the argument in the *Letter*, it still cannot be the main argument which operates with the passage from being to not-being through decomposition.\footnote{The closest parallel in Lucretius to the argument in the *Letter* comes after the argument based on the fullness of the atom and is introduced as an independent argument by a *praeterea* in 1. 540.}

Before concluding this section, let me briefly refer to an argument Aristotle attributes to some unnamed monists (surely Eleatics) in *De generatione et corruptione* 1. 8. Similarly to the Epicurean argument we have just seen, this argument is built on the premiss that the void is the condition of divisibility. The argument is one horn of a *reductio* based on a disjunction defending monism. The disjunction states that if what-is is many, then it is divided either everywhere or at some points only. The reasoning can be paraphrased as follows:

1. What-is is many if it is divided (διαιρετόν).
2. If it is divided, it is divided either (a) everywhere or (b) only at some points.
3. What-is is divided if void articulates it.

Let us first examine horn (a):
(4) Now if it is divided everywhere, there must be void at every point.
(5) But if there is void at every point, what-is is neither one, nor many, but the whole is void.

The monists then go on to argue that (b) is just as impossible because the hypothesis that what-is is divisible at some points but not at others would violate the principle of indifference. Thus, if neither (a) nor (b) is open, then what-is cannot be many, and therefore it must be one.

As so often, the ambiguity of the -τόν suffix might cause some trouble. Authoritative translations of De generatione et corruptione, such as Joachim’s and Mugler’s, render διαιρετόν by ‘divisible’ in this passage. It seems to me, however, that the context clearly requires the sense of ‘divided’; what-is is many if it is actually divided, and not if it is merely divisible. Yet the standard way of rendering διαιρετόν as ‘divisible’ is not entirely incorrect. For if the condition of divisibility is the presence of void at the division point, as the Eleatics and the Abderites seem to maintain, then divisibility in fact coincides with the state of being divided. A body is divisible only at those points where there is actual division between chunks of it by the presence of a layer of void—even if this division is not directly perceptible at the macro-level.

This consideration, by the way, might shed some new light on the modal operator shift problem in Democritus’ argument as reported by Aristotle in an earlier chapter of De generatione et corruptione, which I discussed in Section 2 above. If we understand ‘divisibility’ as implying the actual presence of a layer of void, then there is safe sailing from (a) ‘A body is divisible at every point’ to (b) ‘It is possible that the body is simultaneously divided at every point’. We do not even need the modal operator in (b): if a body is divisible at every point, it is actually divided at every point—even if the division is not perceptible at the macro-level. The only remaining problem is that such an infinitely divisible body turns out to be no longer a body, but mere void.

Now given that Democritean atomists equated the void with not-being,28 one could give such a turn to the argument reported by Aristotle that the hypothesis of the total divisibility of a body leads

to the absurd consequence that the body is sheer void—that is, sheer not-being. Total divisibility would thus lead to total annihilation. Yet this route is not open to Epicurus because, in contradistinction to Democritus, he defines the void not as not-being, but as a type of being, and calls it ‘intangible nature’ (ἀναφής φύσις). 29

Let us take stock of what we have seen thus far. The ‘standard interpretation’ correctly assumes that the argument in the Letter is based on the connection between decomposition and the passage from being to not-being. Yet, as I have argued, it mistakenly interprets perishing into not-being as fading away by becoming infinitely small. The alternative interpretation, which takes the argument to be based on the existence of ‘full’ bodies, picks up a good Epicurean argument which provides us with ‘strong’ or, as Lucretius puts it, eternal bodies—exactly what the Epicurean needs in order to stop universal perishing into not-being. Yet this interpretation does not explain why the Epicurean needs such ‘strong’ or eternal bodies in the first place, because it does not offer an account of what it means that the decomposition of bodies leads to not-being. What we need in order to understand the argument as it stands in the Letter is a better grasp of the connection between the decomposition of a compound body and its perishing into not-being.

5. Atomicity and unalterability

I have said quite enough of what I think Epicurus’ argument in the Letter is not about. It is high time to come up finally with some positive suggestions. When we now consider the crucial second sentence of the argument with fresh eyes, we notice at once that Epicurus’ demonstrandum is double. The claim at the beginning of the second sentence states that the ultimate ingredients of compounds are uncuttable and unalterable. Even though the conclusion stated in the last sentence speaks only about atoms, i.e. ‘uncuttables’, the formulation of the sentence as a whole strongly suggests that the justification serves for both uncuttableness and unalterability.

The text of the Letter provides clear support for this interpretation. Epicurus explicitly discusses the unalterability of atoms at a later point of the Letter when he argues for the list of the qualities of atoms:

29 Cf. e.g. Ep. Hdt. 40.
Moreover, one should hold that the atoms do not exhibit any of the qualities of the observable things, except shape, weight, size, and the necessary concomitants of shape. For all qualities change; but the atoms do not change in any respect, since something solid and indissoluble must persist when compounds are dissolved, which can make it so that the changes are not to and not from not-being, but happen through transpositions in many things, certain things also being added, and certain others subtracted. Hence those things which do not admit transpositions are necessarily indestructible, and do not have the nature of the changing, but their peculiar masses and shapes must persist—for this is necessary as well.

The claim in the second sentence of the passage that atoms do not change their qualities functions as a premiss for the thesis of atomic qualities. However, the premiss of atomic unalterability gets its own justification, which is the very same as the argument for atomism in Ep. Hdt. 40–1: if there were no unchangeable ultimate constituents that we call atoms, the decomposition of compound bodies would lead to universal not-being. This shows clearly that the reference to the principles of conservation in Ep. Hdt. 40–1 is indeed meant to be sufficient to prove not only uncuttability but also unalterability. Now, clearly, unalterability is the stronger claim, because unalterability implies uncuttability, but not vice versa. A body cannot remain unchanged when it is cut, but it can change many of its qualities without being cut. At least this is so if one does not accept the atomist theory of qualitative change in advance. But Epicurus cannot take atomism for granted, because he is just about to argue for it. The last sentence of the above quotation further strengthens this conclusion. It states that the ultimate constituents of compound bodies must necessarily retain their masses and shapes. This is a recognition of the fact that for the atomist argument the uncuttability of the atom is not sufficient: the atoms must retain their
shapes as well—that is, it cannot be that atoms retain their masses but, say, are moulded into another shape.

Two questions emerge from these considerations. First, what is the scope of the unalterability requirement? Second, what does it mean that the changes of non-atomic things are to and from non-being?

As to the first question, it is evident that the unalterability claim must receive certain qualifications. For, clearly, atoms can change in respect of their relational and dispositional properties. There are an absolute up and down in the Epicurean universe, and atoms are oriented with respect to this absolute directionality. And they are certainly able to change their directionality. Moreover, atoms enter into certain arrangements with other atoms in forming compound bodies. There seems to be no problem in changing these relations either—indeed, Epicurus explains phenomenal processes as the modification of these very relations. And, obviously, ‘mere Cambridge change’ for atoms is unproblematic. It follows, then, that the unalterability claim is restricted to intrinsic properties of atoms.30

The difference between Democritus and Epicurus on the ontology of phenomenal qualities becomes notable at this juncture. Democritus claimed that only intrinsic properties of atoms are real, and phenomenal properties of bodies are nothing over and above the physical states of atomic aggregates. Epicurus, by contrast, maintained that phenomenal properties of observable bodies are just as real as the intrinsic properties of atoms.31 Thus, Democritus claimed that all the qualities that really exist—i.e. the intrinsic properties of atoms—are unchanging. As opposed to this, when Epicurus also allowed into his ontology the phenomenal properties of bodies (colours, smells, etc.), he had to accept that all the properties of bodies can change; and he then needs to argue that there is an important exception to the general changeability of per se existing things: the intrinsic properties of atoms do not change.32

30 The Greek term for ‘unalterable’ (ἀμετάβλητος) could in itself include changes with respect to relational properties; indeed, the etymology of μεταβάλλω implies change of position rather than intrinsic change.


32 On this ontological difference between Democritus and Epicurus, see D. Furley,
And this is exactly the point that leads us to our second question, that of the relationship between change and passage to and from not-being. The clue in this respect, I suggest, is the metaphysical analysis of bodies in the atomist theory. As Epicurus himself tries to explain in Ep. Hdt. 68–71, a body can be analysed in two parallel ways. In physical or material terms, an Epicurean body can be analysed into its material constituents or parts; a compound body can thus be analysed into its constituent atoms and an atom into its minimal parts. From a metaphysical point of view, however, an Epicurean body can be analysed only into its properties. Here the distinction between accidents and permanent properties becomes crucial. As Epicurus puts it, permanent properties are not constitutive parts as material parts are, yet conceptually a body is the complex (ἀθρόον) of its properties. In other words, an Epicurean body from a metaphysical point of view is nothing over and above its properties, while the permanent nature of an Epicurean body is nothing over and above its permanent properties. Indeed, this is entirely consistent with Epicurean ontology, which does not include a material substrate (or bare particular) to act as the bearer of properties. In contemporary jargon, Epicurus is, then, best described as a bundle theorist.33

Yet one objection to an unrestricted bundle theory is that it makes identity through change problematic. For, if a thing is composed of its properties (or, to put it another way, is a mereological sum of its properties), then if any of its properties changes, the thing


33 The central text is still Ep. Hdt. 68–71. The Greek is characteristically difficult, and the interpretation is not self-evident. As I see it, Epicurus is struggling to explain the difference between physical parts on the one hand, and conceptual or metaphysical parts on the other. LS understand the passage along the same lines without using the bundle terminology (see i. 36–7). See the helpful explanatory note by Brunschwig and Pellegrin on p. 78 in the French translation of LS, and also Sedley, ‘Anti-Reductionism’, 313–15, and ‘Hellenistic Physics’, 381. The fact that our Epicurean sources do not discuss the question of what the ‘matter’ of the atoms is might well be related to the point that bodies are not to be analysed into properties plus some underlying matter, but are conceived of as complexes of their properties. On the point that it is misguided to ask ‘What is the constitutive stuff or matter of atoms?’, see now A. P. D. Mourelatos, ‘Intrinsic and Relational Properties of Atoms in the Democritean Ontology’, in R. Salles (ed.), Metaphysics, Soul, and Ethics in Ancient Thought: Themes from the Work of Richard Sorabji (Oxford, 2005), 39–63 at 46–8.
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ceases to exist. If \( a \) is the sum of properties FGH, then when H is changed into K, we have FGK instead of FGH, and so \( a \) has perished. Therefore, a thing, on this view, cannot change.\(^{34}\)

Had Epicurus accepted an unrestricted bundle theory, he would have been forced to concede that phenomenal bodies perish each time they lose any of their phenomenal properties. Such a radical view would be too high a price for Epicurus—and, surely, had he had such a radical stance, his ancient opponents would have made some nasty remarks about it. Finding a more balanced view, I suggest, might very well be a major motivation for Epicurus in introducing the distinction between permanent attributes (δὲὶ συμβεβηκότα or ἀίδιον παρακολουθοῦντα) and accidents (συμπτόματα), a distinction that corresponds to the well-known distinction between essential and accidental properties.\(^{35}\) The ensuing view is that a thing can change with respect to its accidental properties without ceasing to exist, while it loses its nature and ceases to exist when it loses any of its essential properties.\(^{36}\)

Note that this is not so much a problem for Democritus. For, as Democritus famously claimed, only atoms and the void exist in reality (ἐτε/etasubiῆ, see e.g. S.E. M. 7. 135). Now given that none of them changes with respect to any of their intrinsic properties, none of the ἐτε/etasubiῆ existents will be subject to perishing through qualitative

\(^{34}\) For a succinct formulation of this objection, see J. Van Cleve, ‘Three Versions of the Bundle Theory’, Philosophical Studies, 14 (1985), 95–107.


\(^{36}\) The trouble is that neither Epicurus nor—as far as I am aware—any of our ancient Epicurean sources provides us with a complete list of essential properties, nor any hint about how one could arrive at such a list. Lucretius does give some examples of both essential properties and accidents: tangibility is essential to body, intangibility to void, heat to fire, liquidity to water, weight to stones. Slavery, poverty, wealth, freedom, war, and peace, on the other hand, are accidents (De rerum natura 1. 449–63). The examples offered for accidental properties are relational, and not absolute, properties. Yet, surely, some absolute properties, such as the colour of the house, can be accidental properties. It is also clear that, for example, a visible object \( o \) will essentially have the property of ‘having colour’, but it is not certain how far a specific colour can be an essential property of a body. Indeed, it seems to be a daunting task to fix the set of essential properties in a non-circular way and without introducing something like Aristotle’s secondary substances. I would suggest, without, however, pursuing the question in this paper, that the clue might be found in the theory of preconceptions (προλήψεις). Preconceptions seem to exhibit recurrent complexes of properties as constitutive of natural classes of bodies. We can fix the essential properties of a house on the basis of our preconception of ‘house’. It is crucial in this respect that preconceptions have a criterial role and must therefore be anchored in reality.
Epicurus, by contrast, accepted not only the reality of phenomenal properties of composite bodies, but also the \textit{per se} existence of composite bodies. Yet surely such composite bodies can lose their permanent attributes and thereby cease to exist. That Epicurus recognized the connection between qualitative change and the passage into not-being is shown by his remark at \textit{Ep. Hdt.} 54 that we saw earlier: ‘For all qualities change; but the atoms do not change in any respect, since something solid and indissoluble must persist when compounds are decomposed, which can make it \textit{so that the changes} [\textit{μεταβολάς} \textit{are not to and not from not-being}]. Qualitative change (\textit{μεταβολή}) can lead to not-being, and this is why the ultimate ingredients must be unalterable (\textit{ἀμετάβλητα}) in order to guarantee that not all things pass into not-being.

To sum up, from the Epicurean ontology of bodies and properties it follows that even \textit{per se} existents of the world can go out of existence by qualitative change. Yet such a view could easily jeopardize the principles of conservation as set out at the beginning of the \textit{Letter}. What Epicurus wants to guarantee by the unalterability of atoms is not that there is no destruction of existing things at all, and not even that none of the \textit{per se} existing things can cease to exist, but that, even though compounds \textit{qua} compounds do cease to exist, their ultimate components do not admit any qualitative change of their intrinsic properties, and therefore resist dissolution and other forms of destruction;\textsuperscript{38} or, as Lucretius puts it, that these bodies are eternal. And in so far as the ultimate components of compound bodies are like that, even if compounds \textit{qua} compounds do cease to exist, the sum total of the universe remains constant. The ‘fullness’ of the atom, on the other hand, provides a physical account of these ‘strong’ bodies, and the analysis of qualitative change in terms of transposition, addition, and subtraction explains how a compound body can go through qualitative changes in such a way that its ultimate ingredients do not change at all with respect to any of their intrinsic properties.

Let me finally remark that this way of construing Epicurus’ conception of atoms might be able to solve another problem of Epicurean physics.\textsuperscript{37} The ontological status of macroscopic objects is debated. Based on Plutarch, \textit{Adv. Colot.} 1110\textit{E–F}, R. B. B. Wardy, ‘Eleatic Pluralism’, \textit{Archiv für Geschichte der Philosophie}, 70 (1988), 125–46, argues that the existence of compounds is ‘by convention’, just like the existence of sensible qualities. At any rate, the Democritean dictum does not include compounds \textit{qua} compounds among the \textit{ἐτειγή} existents.\textsuperscript{38} Note that on this analysis, void too is ‘strong’.
Epicurus’ Argument for Atomism

Interpreters have pointed out that if atomicity is justified merely by the lack of void within the atom (or in other words by the fullness of the atom), then it will remain unclear how atoms can retain their independence when they collide with each other.39 When atoms collide, they touch each other and hence there is no layer of void between them. If this is so, how come that they do not fuse and form one larger atom from that moment onwards, for at that moment they constitute one continuous extension without the void punctuating it? (The alternative interpretation, according to which there is always a layer of void between atoms, has its own difficulties that I cannot discuss here.) But if, as I have suggested, Epicurus’ principal claim is that the atoms are unalterable with respect to shape, size, and weight, and this claim is justified on the basis of independent reasons and not on the basis of the condition of the absence of void within these bits, then these reasons will yield not only uncuttability but also ‘inaugmentability’. In other words, Epicurus has a reason for maintaining not only that the ultimate physical components of phenomenal bodies are indivisible, but also that these bits will not lose their individuality by fusion when they collide.

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