Are Kinetic and Temporal Continuities Real for Aristotle?

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Abstract

Aristotle argues that time depends on soul to count it, but adds that motion, which makes time what it is, may be independent of soul. The claim that time depends on soul or mind implies that there is at least one measurable property of natural beings that exists because of the mind's activity. This paper argues that for Aristotle time depends partly on soul, but more importantly on motion, which defines a continuum. This argument offers a robust metaphysics of time. In contrast to modern philosophy of physics, for Aristotle the continuum of motion is prior in being to time, while time is a hybrid of the real continuum of motion and the activity of mind.

Keywords

1 Introduction

Toward the end of the chapters on time in *Physics* IV, Aristotle appears to argue that, without the soul to count numbers, time would not be. Aristotle's argument for time's dependence on soul in *Physics* (= *Phys.*) IV.14, 223a22–29 depends on two conditions: that a potency to be counted depends on the possibility of counting to actually occur, and that the possibility of actually counting

depends on a soul (specified at *Phys.* IV.14, 223a26 as mind or intellect, *nous*).[1] Yet he closes the argument by noting that motion, which he hints makes time what it is, might nevertheless exist without soul (*Phys.* IV.14, 223a27–8).[2]

The claim that time depends on mind (whether *nous* or a more modern concept) implies that there is at least one measurable property of natural beings that exists because of the mind's activity. The claim's basis, meaning, and consequences have not been as thoroughly examined as its strangeness might warrant. What is responsible for this perplexing ontological status of time for Aristotle, and how far does the dependence on mind go?

This paper argues that for Aristotle time depends more on movement than it does on mind. The view I aim to defend is this: the mind's contribution to the being of time consists in how it constitutes units by dividing motions, that is, by taking a motion that is continuous and thereby *potentially* divisible, and making *actual* divisions in it, which can *in turn* form units along a different continuity we call time, the way marking off distances creates a ruler. Since the mind's ability to divide a motion cannot exist without the motion's own continuity, the dependence of time on a mind is limited, though not rejected.

Underlying this argument is the claim that the nature of continuity is what determines what time is, which this paper aims to substantiate. This claim about continuity is based, ultimately, on a robust conception of potent beings as "real," not reducible to mere possibility, and not negations of actuality.

To rephrase the claim in more modern language, the question whether time is ideal (a mental object), transcendental (to borrow a term from Kant: an object generated by the interaction between mind and things) or empirically real (an "objective" reality or property) depends on the nature of its continuity. For Aristotle, we shall see, a continuity's ontological status is determined by its ground. In the case of time, I shall argue, its continuity is generated by a mind

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1   Aristotle could qualify the claim that time cannot exist without *nous* in several ways. First, the claim itself could be that without a particular mind's action time would remain possible but not actual, or that everything that goes uncounted by a mind will not rise to the level of time, or that only if mind (*nous*) of any kind did not exist at all would time not exist, or even that time could in some way be without mind, as long as there is motion (See Harry 2015, 59–61, and Sentesy 2018, 26, 40–42). Yet each of these readings indicates that time has some dependence on mind.

2   Note that the phrase in which Aristotle considers whether time could be without soul, *all' he touto ho pote on estin ho chronos, hoion ei endechetai kinesin einai aneu psuches*, is difficult to translate. See Brague 1982 on the ambiguity of the phrase. Ross (1936, 611) notes that *on* is left out of two manuscripts, and argues that, whether it is kept or not, the phrase must refer to the substratum of time. Lederman 2014 argues that Aristotle uses the phrase *ho pote on* to indicate ontological dependence of a thing on something that is not itself an *ousia*, which, in this case, would be motion.

making actual divisions within the continuity of motion. The ultimate basis of its continuity is real motion. Therefore, in Aristotle the mind-dependence of time is limited. This has implications for continuities in general, causal relationships between things that are not independent beings (*ousiai*), and the sort of being that moving things have.

What is at stake in the claim that motion is a source of real continuity is much larger than the subtle distinctions addressed in this paper might indicate. This may be made clear through a contrast: on a simplified view of modern physics, the fundamental continuities are space and time. This makes the continuity and being of motion unimportant both from an explanatory and ontological point of view. Descartes, for example, defied anyone to attempt a definition, saying "movement [...] is nothing other than the action by which some body travels from one place to another."[3] Joe Sachs comments on this passage, as follows:

> The use of the word [travels] makes this definition an obvious circle; Descartes might just as well have called the motion the action by which a thing moves. But the important part of Descartes' definition is the words 'nothing more than,' by which he asserts that motion is susceptible of no definition which is not circular [...].
>
> SACHS (2010), §3

But in comparison to Aristotle, this modern demotion of motion's importance removes the basis of perhaps the most important rebuttal to Zeno's paradoxes, namely, an understanding of the priority of the unity of continuity over its divisibility. Without this, physics in general risks leaving significant lacunae both in its ability to provide an ontology of motion and time and to provide a robust mereology.[4] But if Aristotle is right, and moving things both imply and actually establish continuities, then there is one less obstacle to motion becoming intelligible as a source of continuity comparable to space and time in importance and utility.

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The paper opens by examining the claim that Aristotle's definition of continuity implies that continuities are not in things, but originate in minds. That

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3   Descartes 1644, II.24, cf. II.25.
4   See Broadie (1984) for a critique of modern theories of time since McTaggart on the basis of Aristotle's conception of 'now.'

claim depends on the argument that the definition of continuity is to be infinitely divisible, and that infinite divisibility is something only a mind can grasp. If this argument is correct, then all continuities, including that of motion, will depend on mind. I shall argue that this view is problematic for Aristotle's view of physics. Solving this problem requires us both to make sharp distinctions between time and motion, and to clarify the relationships between them.

Both for this reason and because time depends on motion, it is also necessary to examine the continuity of motion. To determine what sort of being time has for Aristotle, we need to work out the ontology of both temporal and kinetic continuity. I shall argue first that time is a different sort of continuity than motion by describing in detail how the two are related in the soul's act of counting, and then that this difference matters for the being of motion.

Aristotle has theoretical resources to answer this question of the ontology of continuity in two different ways: by claiming that all continuities are mind-dependent, or that some continuities are real while others are mind-dependent. His answers, I shall argue, come down to two factors in the constitution of a continuity: (i) what participates in constituting it, whether the observing mind, natural things, or both, and (ii) whether the continuity is defined or constituted through unification or division.

The latter matters because the being of a particular type of continuity depends on how continuity is defined, and Aristotle appears to give two definitions: (a) things are continuous if they are in sequence and their limits are one – a "synthetic" definition (*Phys.* v.3, 227a10–18), and (b) things are continuous if they can be infinitely divided – an "analytic" definition (*Phys.* iii.1, 200b19, vi.2, 232a22–4). I shall argue that for Aristotle, although there are many sorts of continuity, the divisibility of motion is derived from its continuity, because there must first be a continuity for its division to be possible. This disentangles motion from dependence on a mind and clears the way for the argument that moving things are the ground or source of kinetic continuity. Continuity inheres in moving things, and their divisibility is merely a material attribute.

2   A Dilemma About the Nature of Continuity

To clarify the stakes, let us look at a version of the argument that for Aristotle continuity is not simply real. In an analysis of Aristotle's account of the infinite (*Phys.* iii.4–8), Alejandro Vigo argued that its continuity is not real or actual, but instead a *hypothetical* object, in the proper sense of the word, namely that the property of being infinite is a thesis, an assumption we set down without

first knowing it to be true.[5] Aristotle argues that there is no actual infinite through addition (*Phys.* III.7, 207a33–24), but that each real magnitude is infinitely divisible. Yet since it is not possible *actually* to divide a magnitude an infinite number of times (*Phys.* III.5, 203b9–15), the infinity of magnitudes can only ever be posited as something *potential* (*Phys.* III.6, 206a19–206b2). Therefore, Aristotle argues, insofar as continuity is defined by infinite division, it is only ever a potency.

At the same time, Vigo argues, the infinite divisibility of a line is not an attribute that simply belongs to a line, it is instead a compound potency. A compound potency is a potency of F that depends on a different potency or the potency of another thing G in order to be what it is. For example, a piece of wood is only carveable because carving is also a potency. In one sense all potency is compound, insofar as there is a difference between an agent and the patient, even when, for example, a doctor (an agent) is treating himself (a patient).[6]

Divisibility appears to be such a compound potency: on the one hand, the potency to be divided must be in one thing, say, a branch. But on the other hand, divisibility also requires the potency to divide to be in something else, say, an axe or a woodcutter. Even though any particular act of division can be real and accomplished by something independent of mind, as for example, when a stick is broken by a fallen rock, such actual division will always be finite.

To claim that a thing is *infinitely* divisible, Vigo argues, something more is required than mere division. Aristotle frames this discussion of division as a willful act, as a geometer might do. Because I continue to be both able to divide a line, and unable to finish dividing it, I judge that the line must be infinite. I stop the sequence and make an assumption both about my ability to continue doing this, and about what makes this possible. This is not mere speculation, made as it is through the experience of the ever-renewed capacity of the thing to be divided, combined with my ability to divide it, and my inability to complete the task of actually dividing it. To attribute infinite divisibility to a length, a mind is required: we must first divide it repeatedly, and notice that we can again and again add another division (*Phys.* III.6, 207a9, cf. 207a1).[7] To attribute infinite divisibility to a continuity depends on a mind recognizing the

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5   Vigo presented this argument in a series of lectures to the *Collegium Phaenomenologicum* in 2018. See Plato, *Meno* 86e–87b for a clear example of using a hypothesis in a similar way as basis for an inquiry.

6   Though in another sense of potency, potencies are shared – thus a piece of wood has the ability to be moved by other things only by things that are themselves physically movable as well (*Metaphysics* (=*Met.*) IX.1, 1046a20–26). See Sentesy 2020, Ch.4.

7   Translations by Sachs unless otherwise specified.

fact that the capacity for further division is not (and perhaps also cannot be), eliminated.

Therefore, Vigo argues, infinite divisibility is something only mind (*nous*) can grasp. More importantly, the property of being infinite is *generated*. Aristotle says:

> the infinity does not stay still but comes to be (*gignetai*) in the same way as time and the number of time.
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> ARISTOTLE, *Phys.* III.7, 207b14–15

It is a property that appears to be of things, but which *is* only for and only because of mind. Now, *if* infinite divisibility is what makes a continuity what it is, then continuity in general would be what it is only for minds – a *noetic* object. Continuity would have to be co-generated by a mind and its objects. If continuity depends on minds, continuous physical beings will have properties that depend on minds. This raises the question about where time is located: is it in the mind, in existing things, or in the world in general?[8]

Although continuity depends both on things being divisible and on mind, we should not characterize Vigo's view of Aristotelian continuity as a Kantian *a priori* framework that structures space and time. It is instead, to use Kantian terminology, an *a posteriori* generalization from the contingent actual interactions I have with a thing, namely the finitude of my activity of dividing it, and my ongoing ability to divide it.

This view of continuity seems to apply to time, which Aristotle claims depends on the soul's ability to count, while counting depends on dividing motion by 'nows' (*Phys.* IV.14, 223a22–29). Vigo's claim about the ontological status of continuity is that for Aristotle time is co-constructed through the interaction between the soul and change.[9] He is cautious about the consequences for continuities in general: so does this analysis apply also to continuities in general, or motion in particular? In the next section I aim to show that

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8 See Loughlin (2011), who argues against Coope (2005) that time is not, strictly speaking, everywhere, and that both time and change do not exist without souls. There is a complication in Aristotle's argument about the infinite divisibility of natural beings, namely that he argues repeatedly that potencies cannot exist unless they can also be made actual. This seems to contradict outright the claim that nothing can be actually infinitely divided (See Bolotin 1998, 53–76). Yet Aristotle would reply that the potency to be divided is always individual: there is no collective *capacity to be infinitely divided*, there is only the *capacity to be divided again*.

9 For example, McGinnis 2003, and Sentesy 2018.

it does not apply to motion, that for Aristotle the continuity of motion does not depend on mind.

To recap: the underlying question is whether the argument that the infinite divisibility of continuity is mind-dependent implies that continuity in general is mind-dependent. I will answer that for Aristotle infinite divisibility is not the basis of continuity. The first step in this argument is to establish a key exception to the claim that continuity is mind-dependent by showing that the continuity of change is independent of mind. The next step will be to show that infinite divisibility is subordinate to the unity of a continuity.

3   The Real Continuity of Change

If (a) continuities are defined as infinitely divisible, and Vigo is right that (b) infinite divisibility depends on mind, then (c) all continuities will also depend on mind. This appears to include another paradigm of continuity: motion. Indeed, Aristotle uses infinite divisibility to conclude something about the nature of kinetic continuity. Notably, motions have no spatial starting point, since motions happen over an extent, while extents are infinitely divisible, and for the same reason they do not have a spatial stopping point (though they do have a *telos* in a different sense in the accomplishment of their goal) (*Phys.* VI.5, 236a13, VI.6, 236b33). Motions have these properties because they are infinitely divisible. Moreover, Aristotle argues that it is impossible for a motion to be a motion without it being continuous (*Phys.* VI.1, 232a8–11). The extent to which infinite divisibility depends on mind is the extent to which kinetic continuity will also depend on mind.[10]

Yet there are several indicators that (c) is false, and that motion, at least, is not dependent on mind for its continuity. One such indication is that Aristotle uses movement as the paradigm for how the term activity (*energeia*) converges with the term actuality or complete being (*entelecheia*). In contrast to objects of thought and desire, he says, only things that *are* can move, because motion *is* a sort of *entelecheia* (see *Met.* IX.3, 823b20–36). Thus movement itself appears to have a sort of actual existence that Aristotle *contrasts* with objects of thought and desire (*dianoēta kai epithumēta*), because the latter may exist only in potency.[11] By foregrounding the *actuality* of motion in contrast with concepts, clearly motion does not depend on mind for its continuity. So either

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10   Bergson 1913, 119 gives a more extreme, recent version of this argument, that the continuity of change exists in the subjective, synthetic experience of duration.

11   See Frede 1994.

its infinite divisibility does not depend on mind, or its continuity is not defined by infinite divisibility, or both.

Another indication is the ground of the continuity of motion: Aristotle argues that the unceasing continuity of change is explained by some unified thing, namely the first mover (*Phys.* VIII.6, 259a15–20, VIII.7, 260b20–26).[12] Thus, the basis of continuity appears, on the one hand, not to be dependent on the activity of a mind dividing (and failing to complete dividing) something up, for its basis is perfectly unified, self-coincident mind, that is, God. Because God is a source of unity rather than division, the first *moved* thing becomes the paradigm of eternal continuity in the moving cosmos (*Phys.* VIII.7, 260a20–28, VIII.8, 261b28–9). The foundational kinetic continuity, namely the motion of the fixed stars, then, is not continuous because of a finite mind's act of division, but because of the unity of god. Since motion requires the existence of a prime mover, its being does not depend on a mind's ever-extending, ever-incomplete capacity for division.

So if (c) is false and not all continuities are mind dependent, we must reject one or both of the premises of the mind-dependence argument, namely that continuities are not all defined by divisibility, or that divisibility is separable from mind. Since I shall argue below that some continuities are generated by division, and thereby in a way defined by how they are marked off, I shall for now focus on showing how motion is not defined by divisibility.

I shall argue that for Aristotle continuities in general are defined not by infinite divisibility, but by the causes that make them unities. At the same time, unities can be defined by division, which allows for the possibility that some sorts of continuity, such as abstract geometrical continuities, are mind-dependent. This obtains in the case of time, as well, if time requires *both* a motion *and* a mind to form temporal units through dividing it. This would allow time to be dependent on mind even if the continuity of motion is not. To make this claim, it will be necessary to describe how time can both depend on and differ from motion. But to show that continuities can differ in nature from one another while also depending one another, it is necessary first to examine the nature of continuity and, in particular, how each continuity relates to its basis or ground.

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12   Only things that have parts can move themselves. For one part to move others, it must in the relevant sense be motionless (*Phys.* VIII.5, 258a2–5). The parts of such a thing are potentially divisible but actually undivided (*Phys.* VIII.5, 258b2–9).

4   The Priority of Unity Over Divisibility

In what follows, I shall first show that it is unity rather than infinite divisibility that makes a continuity what it is. This might not be immediately obvious, since, when Aristotle first introduces continuity in *Phys.* III.1, he says that the continuous is what is infinitely divisible, and he often appeals to its divisibility (*Phys.* III.1, 200b19–20, cf. V.4, 228a22, VI.2, 232a22–4). Elsewhere Aristotle describes continuities as things whose limits are one. Thus, there appear to be two different definitions of continuity:[13]

(i)   that things are continuous if their limits are one – the "synthetic" definition

(ii)   that things are continuous if they can be infinitely divided – the "analytic" definition.

Which one of these is the definition of continuity? Or are there several types of continuity, the way there are several senses of being? It is necessary to examine how Aristotle presents the role of each in defining continuity. I aim to show that the first is a definition, while the second is not a definition at all, but an expression of a necessary but not sufficient attribute of continuities.

The passage in which Aristotle comes closest to defining continuity as divisibility reads as follows:

> I call continuous that which is always divisible into divisible parts, for once this is set down (*toutou gar hupokeimenou*) about the continuous, time must be continuous.
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>> *Phys.* VI.2, 232B24–26.[14]

Yet even this phrase could instead indicate that infinite divisibility is a necessary attribute of continuity – one that must be hypothesized, as we noted above – rather than setting divisibility down unambiguously as a definition or a special, separate type of continuity.

By contrast to this sentence, which is ambiguous at best, Aristotle devotes an entire chapter to defining continuity and the terms required to understand

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13   The terminology of synthetic and analytic definitions shows up, for example, in Waschkies 1991, 153. Thanks to an anonymous reviewer for this reference. Sattler 2020, 296 follows this usage.

14   Sachs, trans. Compare Apostle's translation: "By 'continuous' I mean that which is divisible into parts which are always divisible; for if continuity is assumed to be this, then time must be continuous.".

it (*Phys.* v.3, 226b19–22, cf. 226a35–b2).[15] In this definition, division is not involved at all: two things are continuous when they are next to each other, and touching in such a way that their extremities are not just next to each other, nor even just touching, but coincident. More concisely: things in series are continuous when their limits are one or become one and hold together (*sun-echein*) (*Phys.* v.3, 227a10–12).

Now, Sattler (2020, 295–296) suggests that Aristotle provides two closely related but apparently independent and sufficient definitions of continuity. She argues this, on the one hand because she takes the link between the two not to be very clear, and on the other hand because she takes each to answer a different set of problems with the concepts of continuity and division put forward by his predecessors (284, 296). Sattler shows that Aristotle draws from the Parmenidean concept of the continuity of being, but like the mathematicians and Zeno, and unlike the atomists, makes real things infinitely divisible. However, Sattler argues, to dislodge Zeno's argument that mathematical divisibility is incompatible with the physical continuity of movement, Aristotle makes infinite divisibility into an *internal* feature of magnitudes, rather than an *external* additive infinite (311–316).

Sattler is certainly correct about the purpose of Aristotle's analysis of each definition. Yet this does not preclude the possibility that one of these definitions is primary, namely the so-called synthetic definition, and the analytic definition derivative from it. The argumentative function of the two definitions in addressing independent problems and different interlocutors does not necessarily establish that the two are independent in Aristotle's argument. Indeed, making infinite divisibility an *internal* feature of a magnitude gives its unity precedence over its divisibility. This precedence, I shall argue, will apply to all physical or real continuities, but not to mathematical ones, like time, which are generated differently.

As Sattler points out, the synthetic definition does not presuppose the existence of a continuum, whereas the analytic definition *does* presuppose a continuum that must be established in advance (296, 297). This implies that the first can be a definition, while the second would be, at best, a feature of a continuum. Indeed, in order to posit a division at all, there must be some unity to divide.

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15   "After these things, let us say what the following are: coincident and separate, touching, between, next in series, next to, and continuous; and let us say to what sort of things each of these belongs by nature."

5   The Derivation of Divisibility from Unity

The relationship between the so-called synthetic and analytic accounts of continuity becomes particularly clear in *Physics* VI.1, where, I aim to show, Aristotle argues that infinite divisibility is a *consequence* of the synthetic definition of continuity (*Phys.* VI.1, 231a20). This would make infinite divisibility a necessary but not sufficient property of continuous things.

The book begins by recalling the definition of continuous, touching, and next in series from *Phys.* V.3 and announces the key conclusion that the terms establish:

> *If what are continuous, touching, or next in series are as they were defined earlier*, continuous those things of which the extremities are one, touching those of which the extremities are coincident, and next in series those of which nothing of the same kind is between, *then it is impossible for anything continuous to be made of indivisible things*.
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>   *Phys.* VI.1, 231a20–24, emphasis added

From the definition of continuity as things whose extremities are one, he says, it *follows* that they cannot be divided into something indivisible. As Ross notes, Aristotle says that *Phys.* VI.1 has shown or proved this conclusion (*dedeiktai* at *Phys.* 232a23, *apodeixis* at 233b15–16). The structure of book VI, therefore, is deductive, with the definition of continuity establishing in VI.1 the framework for the analysis of motion and time that occupies the remaining chapters. From the definitions in book V, Aristotle derives important conclusions about magnitudes, change, and time.

Aristotle expresses the key conclusion in the negative: continuities cannot be divided into indivisible parts (*Phys.* VI.1, 231a24, VI.2, 232a24). Aristotle clearly takes this to be equivalent to the claim that continuities are divisible only into divisible parts – three times between *Phys.* VI.1, 231b12–18, and when he recaps the argument, saying

> every magnitude is divisible into magnitudes (for it has been shown that it is impossible for anything continuous to be made of uncuttable parts, and every magnitude is continuous)"
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>   *Phys.* VI.2, 232a23–25[16]

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16   At *Phys.* VI.1, 231b12: "[…] it was seen that no continuous thing is divisible into things without parts," at *Phys.* VI.1, 231b15, and at *Phys.* VI.1, 231b16–18 "And it is clear that everything continuous is always divisible into divisible things."

The argument from these definitions to the divisibility of continuities takes the chapter to unpack fully. The key argument is that uncuttable things cannot be continuities. Continuities are next in series, touch, and have unified extremities, but uncuttable things cannot be any of these given that they cannot be divided into parts. The strategy of the argument is not to investigate the relationship between points and lines in general and examine how points are related to continuities. The strategy is, instead, to examine the nature of uncuttable unities and show that they fail to play a role in the definition of continuity. Aristotle takes points as his first test case, but the following arguments in *Phys.* VI.1 apply equally to indivisible units:

(i)   231a25–29: Points cannot constitute a continuity, because they have no extremities that could be one. If they had such extremities, they would be divisible.

(ii)   231a30–b7: Points and uncuttable unities cannot touch each other, since if only parts of them were touching, they would be divisible. So, for contact to be possible, one whole would have to touch the other as a whole.

(iii)   231b8–16: Indivisible things like points, nows, and atoms cannot be next to each other, because between them there would be something different, such as other points, or a continuous line. Because there will always be something in-between two points, they will never be next to each other.

The argument shows clearly that indivisible things lack extremities to unite, cannot touch each other without coinciding, and cannot be next to each other. From the definition of continuity, then, it follows that continuities cannot be divided into indivisible things, but only into divisible ones (*Phys.* VI.1, 231b12–18).

Aristotle then claims that the same argument applies to magnitude, time, and motion, and that all must be composed of divisible parts (*Phys.* VI.1, 231b19–21). The argument is again devoted to refuting their indivisibility. The argument depends on the preceding argument's claims that uncuttable things (a distance, motion, or 'now') have either to coincide completely with each other, or not touch each other at all, since otherwise they would divide one another. It also, crucially, depends on the feature of continuity by which a motion's unity is distributed over an extent rather than coinciding with itself at a point.

This argument in *Phys.* VI.1 has five steps:

(1)   231b22–29: magnitude, motion, and time must together be either indivisible or divisible. If, for example, magnitude is composed of indivisible units, there will need to be an equivalent number of indivisible motions along the magnitude.

(2) 231b29–232a3: motion cannot occur over indivisible magnitudes. For if a motion is in process, then the moving thing would have to be traveling over part of A or B, which would make those magnitudes divisible.

(3) 232a4–6, 12–15: if magnitude were indivisible something in motion would have to already have finished its motion: someone would have to be walking to a destination and have arrived at the destination. What is moving would have to be both at rest and in motion at once in the same respect, since it will be in motion while at A, but also at rest at A.

(4) 232a6–12, 15–19: if (3) is true, motion would be composed not of motions, but of completed motions (*kekinēsthai*). Someone will have walked to their destination without moving toward it.

(5) 232a19–23: if motion were indivisible, the same would have to be true of time. This would make things all travel at the same speed, because if things travel at different speeds, one would go a different distance in the same time, or the same distance in different times, which would divide up both the distance and the time.[17]

Aristotle's claim in this series of arguments is that if magnitude, motion, or time were made up of indivisibles, it leads to the impossibilities deduced in (2)–(5). Therefore the contradictory must be true: magnitude, motion, and time must all be continuous and made up of divisible parts. The argument pivots on the idea that motion is continuous and distributed over a magnitude in a specific way. At each step, Aristotle contrasts the sort of continuity that motion has with the proposal that motion must be made up of indivisible parts: it is only because motion's continuity is made of parts that in argument (2) and (5) something moving could divide indivisible magnitudes. The upshot of argument (3) that a motion would at the same time have to be both underway and completed, and the implication in (4) that motion composed of indivisibles will not be made up of motions, only appear absurd because kinetic continuity is distributed over an extent rather than coinciding with itself at one location. Specifically, because the unity of motion is not simple self-coincidence, but made of different *successive* parts, kinetic continuity is a structure that separates the state of 'being underway' from 'having completed.' Moreover, because these parts are joined together into a unity of things of the

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17 Aristotle elaborates on this claim at greater length in *Phys.* VI.2. Subsequent chapters in Book VI draw out further conclusions from the divisibility of continuities and kinetic continuities in particular. For example, *Phys.* VI.2 argues that, because all continuity is divisible through comparison, e.g., it is possible to compare a faster thing to a slower one in an equal time, since the slower will divide the faster at an arbitrary point.

same type, that is, because the extremities of adjacent parts are unified, kinetic continuity prohibits a motion from being composed of things at rest. The argument pivots, therefore, on the definition of continuity: that it is made of parts, that these parts are next to each other and successive, and that the extremities of these parts are one.

Having started from the definition of continuity and its constituent terms, and having used this concept of continuity throughout the argument, Aristotle concludes that he has *shown* (*dedeiktai*) that continuities are divisible only into things that are themselves divisible:

> Since every magnitude is divisible into magnitudes (for it has been shown that it is impossible for anything continuous to be made of uncuttable parts, and every magnitude is continuous).
>
> *Phys.* VI.2, 232a24

The stipulation that continuities are divisible into divisible parts implies that these divisions are potentially infinite, for if a line AB were divisible into indivisible parts $A_1, A_2, ...$, then the same refutation would apply to them and to everything made out of them. It is, therefore, the definition of continuity as things next to one another whose limits are one that implies that continuities must be infinitely divisible. In other words, the divisibility of a continuity is derived from its so-called synthetic unity. Aristotle does not, therefore, offer several independent definitions of continuity, but only one, the "synthetic" definition, while the others articulate necessary, but not sufficient, attributes of continuity. Therefore, although continuity is not defined or constituted by infinite divisibility, all continuities must be infinitely divisible. When Aristotle refers to a continuity as infinitely divisible, then, we should understand that he is not defining continuities, but referring to them through their secondary attribute.

6   The Nature and Ground of Continuity

To understand Aristotle's claim that continuities can depend on one another – as he did in the argument above that magnitude, motion, and time must all be either divisible or indivisible – the next step is to understand how apparently different continuities are related to each other. First, some continuities can derive from others:

> For through the magnitude's being continuous, the motion too is con-
> tinuous, and through the motion the time.
>
>   *Phys.* IV.11, 219a11–13

The continuity of movement is derived from the continuity of the magni-
tude over which it moves, and the continuity of time is derived from that of
movement.

Moreover, some cause makes a continuity hold together, which differs
from what is held together.[18] This also means that continuities have different
attributes depending on what that makes them continuous. This is visible in
Aristotle's description of the nature of infinites. The infinite, for Aristotle, is a
surrogate for the discussion of continuities: he argues, first, that infinites are
either due to addition, or due to division. But he concludes that there is no
actual additive infinite (*Phys.* III.7, 207b19), and that the infinite *is* only insofar
as a continuous magnitude is divisible (*Phys.* III.7, 207a33–35, 207b13, 28–29).
This means that his description of the infinite includes a description of its
underlying continuity. For example, in the following passage, Aristotle claims
that the nature of the infinite – the divisibility of a continuity – varies depend-
ing on the nature of the underlying thing, that is, the nature of the continuity:

> The infinite is not the same in a magnitude and a motion and a time, as
> though it were some single nature, but what is derivative is spoken of in
> accordance with what is prior; for example, a motion [is spoken of in a
> certain way] because of the magnitude over which it moves or alters or
> increases, but a time on account of the motion.
>
>   *Phys.* III.7, 207b22–27

As we have seen already, the continuity of motion is derived from magnitude,
and that of time from motion. But for each – magnitude, motion, and time –
the infinite is different: these infinites can be distinguished from one another
based on how the underlying continuity is constituted. This means that the
continuity of a magnitude can be different than that of motion and time, even
though they are interdependent. To decide the nature of a continuity, then, it
is necessary to examine what gives rise to the continuity. The thing that makes
a continuity what it is will decide its properties, and the nature of the infinite
by which it can be divided.

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18   See De Ribera-Martin 2017, 230–231.

Aristotle describes the infinite as material and the underlying continuity as the form that contains it: *Phys.* III.7 opens with the distinction between material and form "For material and the infinite are contained within, while the form contains" (*Phys.* III.7, 207b1). Although there are some things whose underlying being is material, e.g., half of a line, here the underlying thing is taken to be a form (*eidos*) and being (*ousia*) of which other things are predicated, e.g. a student that underlies the change from ignorance to knowledge (*Phys.* I.7, 190a17–20, 190a35–190b2).

Phys. III.7 closes by identifying the continuity with the underlying form, and clarifying that the infinite is contained in it:

> And since the causes have been distinguished in a fourfold way, it is clear that the infinite is a cause as material, and that the being of it is a negation, while the underlying thing to which it belongs is what is continuous and sensible in its own right. And it is obvious that everyone else makes use of the infinite as material, for which reason it is absurd to make it what contains but not what is contained.
>
> *Phys.* III.7, 207b35–208a1

This passage clearly shows that continuity is not defined by its infinite divisibility, but rather that the infinite is contained in an underlying form, which is by *its* nature continuous. It is the subject or underlying thing (*hypokeimenon*), rather than the infinite, that he calls continuous. Continuity inheres in the unity or form of this subject, its being, while it is insofar as the thing is made of parts that it is infinitely divisible. The infinite is the material of a magnitude because it consists in the endless possibility of dividing a thing into parts (cf. Phys. III.7, 207a21). It therefore differs from and is contained within the form.

This underlying subject, Aristotle clarifies, is something asserted affirmatively (*kataphasei*, *Phys.* VI.1225a7), which further distinguishes it from the negative nature of infinite divisibility. The passage, then, contrasts the infinite's character of being a negation with the underlying sensible *positive* continuous form.

Aristotle understands what makes continuities what they are by looking at the way they are generated.

> The continuous is that which is next to something, but I call them continuous only when the limits at which they are touching *become* one and the same, and, as the name (*suneches*) implies, hold together (*sun-echein*). And this is not possible if the extremities are two.
>
> *Phys.* V.3, 227a10–14, emphasis added

Two things can become continuous when their limits become the same. What makes these limits the same is the cause or source of the continuity and will determine the features of the continuity. Now that we see how the nature of continuity is connected to the subject or form of a thing, we can understand use of the phrase "*become* one and the same" in concrete terms:

> And it is clear from this definition that the continuous is among those things out of which some one thing naturally comes into being as a result of their uniting. And in whatever way the continuous becomes one, so too will the whole be one, such as by a bolt or glue or a mortise joint, or by growing into one another.
>
> *Phys.* v.3, 227a14–18

What is continuous is made so by the actual things that join it together. Two things become continuous by real things holding them together. It is particularly important to note that this is not a mathematical or conceptual definition of continuity (cf. *Phys.* III.7, 207b28–33). Aristotle emphasizes the physical reality of continuity, clearly rejecting the claim that continuities as such depend on minds to recognize their potentially infinite divisibility. Indeed, what makes them continuous is the opposite: the limits considered as unifying, rather than dividing.

   This section showed that the character of a particular infinite depends on and is contained in the underlying thing, and the character of the continuity is derived from what is responsible for the thing coming to be a united form. This cause can be real and does not depend on a mind to constitute it, for example, when two trees grow together and become continuous. Continuity in general is not mind-dependent. But the cause of continuity does not have to be real: mathematicians work with abstract lines and generate continuities by positing them. Thus, in the case of mathematical entities, continuity can be mind-dependent. The claim that there are multiple possible causes of continuity is important to distinguishing between time and motion.

7   Continuity and 'Now'

If the argument so far is correct, that continuity is established by the unity of extremities, that divisibility is a necessary, but derivative feature of continuities, and that the cause of a continuity determines its features, then it is possible to show that time is mind-dependent, while the continuity of change is mind-independent. To make this argument, we first need to distinguish

between time and movement and establish their proper relationship. The sections that follow, then, have two goals: (a) to answer to the question: does time relate to its own distinctive sort of continuity, or does it inherit that continuity from something else? And (b) are the causes of the continuity of time (i.e. change and mind) different from that of change?

First it is essential to establish the sort of dependence time has on motion, since its continuity depends on motion. Aristotle claims that the continuity of time depends on motion. For example, at *Phys.* IV.11, 219a10–14, he says

> the change follows the magnitude: it is because the magnitude is continuous that the change is too. And it is because the change is that the time is.
>
>> *Phys.* IV.11, 219a10–14[19]

He then explains that a now "follows" (*akolouthein*) or derives from the moving thing, which in turn "follows" its position in a magnitude (*Phys.* IV.11, 219a14–20), each step introducing crucial differences. Hussey calls this relationship of "following" a "structure-preserving mapping".[20] This raises several key questions: If time is not change, but only its number, *how* precisely does time inherit its continuity? What other features would time inherit from the continuity of change? Which features would differ from change?

Because the relationship of time to change depends centrally on how the 'now' relates to change, a promising place to look for answers is Aristotle's account of the 'now.' On his argument, the 'now' divides change, but is inseparable from time: it connects time and change by defining temporal numbers (*Phys.* IV.14 219b33). Indeed, Aristotle elaborates on this claim later in the chapter, arguing that time follows change because the structure of both temporal continuity and its division at a 'now' are inherited from change and the changing thing:

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19 Translations of Aristotle's *Physics* III–IV are from Hussey, in Aristotle, 1983, unless otherwise noted. The phrase *dia de tēn kinesin ho chronos* only appears in manuscripts HVST. But there is good reason to include it, given that it is immediately followed by the claim that the now follows the moving thing, etc. It echoes the argument at III.7 207b21–25, that "time is [infinite] because the change is" (*ho chronos de dia tēn kinesin*), and goes on to claim that each type of infinite is different in kind.

20 Hussey, 1983, 144, cf. Roark 2011, 82.

time is both continuous (*sunechēs*), by virtue of the now, and divided at
the now – this too follows the motion and the moving thing.

Phys. IV.11, 220a4–6[21]

The 'now' is a limit or division of a temporal continuity that follows the posi-
tion of a moving thing in a kinetic continuity.

```
                        now
time                     |                  time
_____._____

motion         moving thing        motion
```
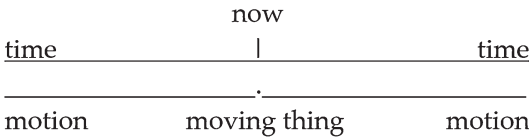
Yet Aristotle describes the 'now' as being marked off by a soul. This activity of
marking something off is not neutral: it accomplishes something. It discovers
geometrical objects by making actual something that is there in potency, by
generating them in a way analogous to a builder's creation of a house with
the materials capable of being built (compare *Met.* IX.9, 1051a21–34). By mark-
ing off a kinetic line with the position of the moving thing, a soul marks off
a temporal line with a point-like limit, a 'now.' Two 'nows' divide and define
a continuous quantity in-between them, thereby defining a unit (*Phys.* IV.11,
219a26–29):

```
now |_____| now
              1
```
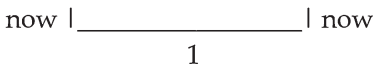
Time, then, is related to change by two mental steps: in the first, as we observe
and mark off the position of a moving body in a kinetic sequence, we divide
the motion, thereby using 'nows' to define an abstract unit of time.[22] It is "by

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21 Which is it that constitutes the continuity? Aristotle answers that: "the point, too both
    (a) makes the length continuous and (b) bounds (*horizei*) it, being the beginning of one
    and the end of another," but when a point is taken as (b) beginning of one and end of
    another, Aristotle argues, it introduces a discontinuity: "but when one takes it in this way,
    treating the one [point] as two, one must come to a halt, if the same point is to be both
    beginning and end." This passage establishes two things for Aristotle: it explains in more
    detail how the continuity of time follows that of motion, and also that continuity is con-
    trasted with division. See Sentesy (2018), 31–33 for an explanation of how limits, taken as
    divisions, can only belong to what they limit.
22 Bowin distinguishes two ways of apprehending time in Aristotle: through perception
    (*On Memory and Recollection* 1.449b29, 450a19, 451a17) and through thought (*Phys.* IV.11
    219a3–4; 219a30–b1)

the one horse that we become acquainted by the number of horses itself". Once the unit has been defined, there is a second phase: it is "by number that we become acquainted with the multiplicity of the horses" (*Phys.* IV.12, 220b20–24). In the second step, much as we can use the lines on a ruler to mark something's length, we can use this abstracted temporal quantity to measure other changes, and other changes to divide up time. Even though each unit of time corresponds to a quantity of change, the same unit can be marked out by different changes: a water clock and a song might run for the same amount of time (*Phys.* IV.12, 220b16).[23]

In this way, time *is* dependent on a soul insofar as the units we use to measure it are generated by the activity of division that defines those units. To this extent, making the continuity of time an abstraction from the continuity of change allows change to have a different and more fundamental ontological status than time.

Now, if the act of dividing up a change established its continuity, then the continuity of change would be defined through its divisibility, the so-called analytic definition of continuity. But it is not so: marking off a change does not establish the continuity of change. Moreover, although division is important to the relationship between time and change, division does not establish the continuity of time either. To see this, it is necessary to examine what makes the continuity of change and time what they are.

8   The Now and Change

A clue to what makes movement a unity comes from how Aristotle likens the 'now' to the moved body (*kinoumenon*). He says the moved body is what acquaints us with change (*Phys.* IV.11, 219b16), and more specifically, with the prior and posterior in change:

> For it is by the moving thing that we become acquainted with the before and after in change, and the before and after, considered as countable, is the now (*hēi d'arithmēton to proteron kai husteron*).
>   *Phys.* IV.11, 219b24

Aristotle understands the prior and posterior as being primarily (but presumably not only) in *place* (IV.11 219a14). But while magnitude is measurable and

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23   Compare Annas (1975), who highlights and problematizes the difference between two
       senses of time as a number.

divisible – both features that motions inherit – magnitude on its own is not oriented. It is motion that makes a continuity unified in direction and orientation, because motions are always organized. If a change is dis-oriented or random, it would not be possible to distinguish what precedes and what follows except by reference to a separate, organized change. If all change were chaos, there would be no time. We can only become aware of what is prior and posterior in the change because the *change is aimed toward a goal*. This orientation belongs to change, not to time: as Roark shows, changes can have an inherent sequential character that does not appeal to a pre-existing or parallel concept of time, since every motion is across a magnitude organized by a telic structure.[24] The only sorts of change that could have a precedence structure are *organized* changes. This means that, even if no soul marks off the position of a body in a motion, a *moved* body contains and implies *orientation*. Oriented kinetic sequences implicitly contain concepts of prior and posterior.

This orientation or priority structure is only implicit in kinetic sequences. Positing a division shifts us onto a different level of discourse.[25] The moved body can disclose this priority, however, wherever it is along the kinetic line. Although a moving body is always in a particular position, now that a soul marks it off, this position reveals a new property, namely whether the body is closer or farther away from the end or goal of the motion than it would be at another position.

For example, as someone is walking from Athens to Thebes, she crosses a stream. A distance between the river and Thebes does not in itself refer to an oriented motion, but if we refer the position of the river to the trajectory of a moving body, it now reveals whether it precedes or follows another position in the motion. At this point on the road her body marks off a portion of the road that is closer to Athens, and thereby prior in the change, and a portion that is closer to Thebes, and thereby posterior in the change. In this way, the act of setting down one position as a dividing point on the kinetic line reveals something new.

Next, when a soul marks off a second position of the moving body and grasps the continuity between them as a temporal unit, the continuity gains new features: it is now an abstract measurement of oriented continuity. The act of taking two such 'nows' to define a magnitude is the act of abstraction that defines a temporal unit. We can schematize this as follows:

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24   See Roark (2011), ch.5. Compare Bowin (2009), who also argues that it is not circular to claim that motion is the source of the direction of time.

25   Cf. Sentesy (2018), 24–27.
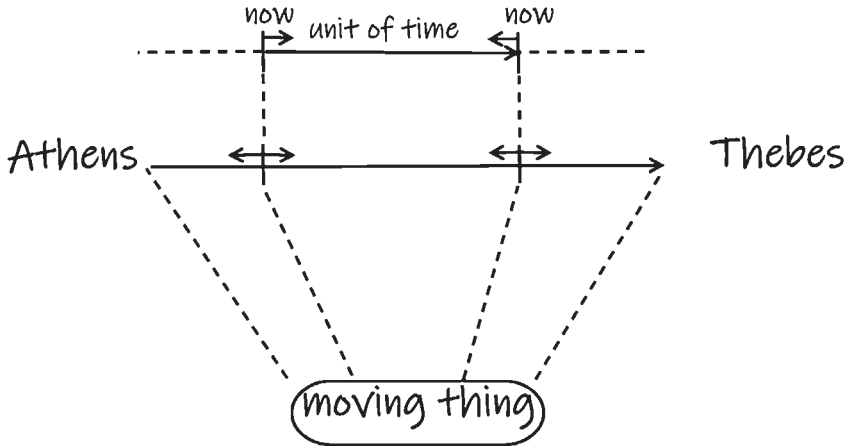
Now we have a complete answer to the question posed at the start of this section, whether the 'now' has its own sort of continuity or gets its continuity from something else. 'Nows' define their own sort of continuity.[26] But this continuity is related to change in a rich way because a now is a point that distinguishes what precedes from what follows: nows have an oriented structure that is involved in the definition of time (*Phys.* IV.11 219b25). But the precedence-subsequence structure of nows, and the oriented character of time, derives ultimately from the oriented structure of a change, as revealed by the moving thing (*kinoumenon*). Change has a sequential sort of continuity, unlike spatial magnitudes.

We have, then, distinguished two continuities: that of a change, and that of time. If my argument is correct, Aristotle denies the claim that time has its own

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26   Broadie (1984) argues that 'now' links two types of time: the 'eternal' present, and all instants whether present or past. See also Broadie (2005). Does a 'now' belong to time or to change? Because the now is a limit with no length whatsoever, it cannot be a portion or extent of any sort: "it is manifest that the now is no portion of time, nor [is] the division [a portion] of the change, any more than the point is of the line (it is two lines that are portions of the one)" (IV.11, 220a19–20). So just as a point cannot be a part of a line without having extension, the now is neither a part of change nor of time. But even though it is not *a portion or extent* either of time, or of change, nows can define an extent the way two points define a line by positing their limits. But the now does so without being part of either time or change. The 'now,' then, divides *time*: "What is marked off by the now is thought to be time: let this be taken as true" (*Phys.* IV.11, 219a29–30, cf. IV.11, 219b12). By emphasizing that nows define time, he is distinguishing the continuity of time from that of change: the being of time is different than change. Time, Aristotle argues, is an independent sort of continuity: "time is not motion except insofar as the motion has a number" (*Phys.* IV.11, 219b4).

independent reality, arguing that its continuity derives from motion, while its *units* are generated through a two-step process of a soul marking off and then measuring a motion. It is an abstraction co-constituted by motion together with a soul's activities of defining and using units of time.

9   The Reality of Temporal and Kinetic Continuities

Aristotle's definition of continuity points us toward the active causes and sources of continuity – the mortise joint holding a table together, the converging growth of two trees. The sources of continuities can be actual, such as a magnitude or a motion, making the continuities they constitute actual. But they can also be potential things, such as the ability to be divided, in which case what they constitute is something potential, for example, an infinite. The two are compatible: on the one hand, a continuity can be something actual, e.g., a 1 inch long pine needle, yet we can draw on the needle's inherent potential to be divided and actually cut it, thereby generating two segments. When such divisions are abstracted, e.g., in mathematical space, or in units of distance or time, continuities can be defined through division, and to that extent depend on the mind.

   This distinction between actual and potential helps to answer whether the continuity of time is real or mental: on the one hand, like other geometrical figures, the unit of time is not defined by the possibility of being marked off, it is defined by actually marking it off (cf. *Met.* IX.9). What is before and after are only implicit in an oriented motion until a now is *actually* posited or marked off. So once the temporal unit has been generated, it appears to be something actual, *even if it is abstract.* Yet if this marking off is something that only mind can do, then without mind, time will only be an implicit possibility. Time is thereby something actual, abstract, and mind-dependent.[27]

   On the other hand, I argued above that kinetic continuity is actual rather than conceptual or potential. For Aristotle seems to hold that continuity is inseparable from motion: a change is only ever a change of a body's attributes along a continuum between two contraries. Change occurs, Aristotle says, along a magnitude, and "it is because the magnitude is continuous that the change is too" (*Phys.* IV.11, 219a12).

   Even though Aristotle argues that change follows the magnitude and inherits the continuity of the magnitude (*Phys.* IV.11, 219a10–14), what he says in

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27   In this I disagree with Apostle, who argues in Apostle (1969) that time cannot be divided, except potentially.

Phys. v.4 seems to indicate that only *some* of the features of kinetic continuity are inherited from magnitude. There he says that the continuity of a change depends on three things being the same:

(i)   the continuity of the being that is moved – the 'what'
(ii)   the continuity of the magnitude between the two poles of the change, such as cold and hot – the 'in which'
(iii) the continuity of the time – the 'when' (*Phys.* v.4, 227b22–228b15)

Continuity depends on (i) the what, that is, the thing moved, just as a relay race is discontinuous because the runners are different, (ii) the in-which or kind of motion, just as getting sick immediately after running does not make getting sick a continuation of running, as these are different kinds of change, and (iii) the when, the time, which distinguishes motions from each other if they are separated by resting. The first criterion refers to the changing thing, the second to the kinetic magnitude, the third to the time. For a motion to be continuous, then, it must be accomplished by the same being, along the same magnitude, and in the same time. This once again suggests that neither change nor the continuum along which a thing changes are mind-dependent.

The magnitude of a change appears to be defined by the contrary states of the attribute that changes.[28] Since a continuity is determined by the extremities of its parts being one, to determine whether the continuity of motion is actual or not, we need to look at what would unify the extremities of two magnitudes. What connects 'warm' to 'hot' will be the same thing that connects 'lukewarm' to 'warm.'

Aristotle seems to think there is something in a change that unifies its different phases, for changes can be one when they are either continuous or once they are complete (*Phys* v.4, 228b13–15).[29] But what unifies a continuity of change appears to be the thing that is moving.[30] Just as we can experience

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28   Since, Aristotle argues, the existence of magnitudes between hot and cold, white and black do not cause changes to happen, since those opposites cannot act on one another (*Phys.* I.7, 189a20–33), such opposites omit the very thing – change – that would allow us to determine the ontological status of the continuum between them.

29   Aristotle argues that motion is a source of continuity, as follows: while changes admit of being completed (*Phys.* VI.5, 236a13), even while a motion is incomplete it can still be unified if it is continuous (*Phys.* v.4, 228b15).

30   It is motion that makes the whole continuous: "[…] once the moving resulting from each motion has been taken, the whole will be continuous" (*Phys.* VI.4, 235a24). If the source of change is the source of the continuity, and what decides what the relevant magnitudes are, then because change is defined using the sense of being potent or being active, it is this sense of being that makes the nature of continuity clear, and not the categorical sense of being a subject or attribute such as hot and cold.

the now either as dividing time or unifying it (*Phys.* IV.11, 219b13),[31] Aristotle describes the moving thing as a sort of limit of change:

> For as was said, the motion follows a magnitude, and, as we say, the time follows the motion. And it is likewise with the thing carried along in relation to the point, by which we recognize the motion and the before and after in it.
>
> *Phys.* IV.11, 219b17–19

The now follows the moving thing, by which we recognize the motion and divide it. This passage reinforces the claim that it is the moving thing that unifies a continuity: the moved being is that by which we can both recognize the unity of a motion and grasp the possibility of dividing it. The moved thing is not merely a source of epistemic discovery, however. Drawing on our earlier discussion of the infinite, we would expect Aristotle's argument that divisions of a motion must appear in the categories in respect to which the thing moves (*Phys.* V.4, 235a15–20) also to refer to *that which contains the divisions*, namely the underlying thing, the form that unifies the continuity. But in that passage, he also claims that completed motion makes the parts continuous, and concludes the argument with the claim that the changing thing is that to which divisibility belongs:

> we also showed that the motion is divided into the motions of the parts; for once the moving resulting from each motion has been taken, the whole will be continuous. Likewise, it will also have been shown that the length is divisible, and in general everything in respect to which there is change [...] ; for when one of these things has been divided, all of them will have been divided. And as for their being infinite, the same thing will hold for all of them. But most of all, the dividing and being infinite of them all follows upon the changing thing, for it is to the changing thing that divisibility and infinity immediately belong.
>
> *Phys.* V.4, 235b1

Thus, we have two propositions that must be reconciled: (i) that what is continuous in its own right is the underlying form, which contains divisible parts, and (ii) that divisibility belongs to the changing thing (*kinoumenon*), which also allows us to unify. These two propositions appear to be the same: the

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31   We cannot, however, simultaneously experience them as uniting and dividing, which I argue in Sentesy (2018), 32 is crucial to understanding how temporal units get constituted.

changing thing is the form of a kinetic continuity, and potentially contains infi-
nite divisions.[32] The formal aspect of the changing thing includes a telic struc-
ture that picks out the beginning and end of an extent of motion and thereby
defines the continuum. This continuum contains potentially many parts, but
it is the form of the continuum that unifies these parts into a whole. If this is
correct, the changing thing would *both* be at a position within the continuum,
thereby making it possible to divide, and also be that which unites the parts
within the continuum by referring them to the whole motion.

The aspect in which the continuity of a magnitude might depend on change
could stem from a view of magnitude as something organized by change.
Perhaps, even though the distance between Athens and Thebes exists before
someone attempts to walk it, it exists indifferently alongside every other dis-
tance between Sparta and Corinth, Mycenae and a nearby grove of trees. On
this view, these distances would not yet be oriented continuities, until some-
thing begins to traverse or measure them.

If this is right, we can determine whether a continuum is something actual
or potential by looking at the nature of the changing thing (*kinoumenon*): is it
a potency or actuality? Since change is the actuality (*entelecheia*) of a potent
being as potent, kinetic continuity must be similarly actual.[33] If the chang-
ing thing, insofar as it is changing, is a sort of actuality (albeit not an *ousia*),
then it is this actuality of a changing thing that unites a kinetic sequence and
makes it 'real.'

I have argued, then, that Aristotle offers us two sorts of continuity, each
with a different ontological status: the continuity of time, whose units of
quantity are defined by a soul, but whose unity stems from the continuity of
change. This continuity is measurable because of the magnitude across which
it changes, but its organization and limits are inherent in the moved body and
its kinetic orientation. It is by interacting with these oriented changing beings
that our minds continuously give rise to the oriented continuity of temporal
experience.

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32   Another logical possibility is that McGinnis 2003; Coope 2005: Roark 2011; and Sentesy
      (2018) were wrong to reject verificationism as an adequate description of Aristotle's
      account of time. Such an argument would depend on a strong intervention in the text to
      the effect that when Aristotle describes the changing thing as unifying and dividing, he is
      only speaking of how it displays features of a pre-existing continuity to a soul. A propo-
      nent of this position would have to qualify the claim that the changing thing is the source
      of a thing's divisibility (and continuity) by adding that it would only do so for an observer.
33   Cf. Sentesy 2020, ch.2, which argues for interpreting change using a robust conception of
      entelecheia.

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