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Force, Motion, and Leibniz's Argument from Successiveness

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Abstract: This essay proposes a new interpretation of a central, and yet overlooked, argument Leibniz offers against Descartes's power-free ontology of the corporeal world. Appealing to considerations about the successiveness of motion, Leibniz attempts to show that the reality of motion requires force. It is often assumed that the argument is driven by concerns inspired by Zeno. Against such a reading, this essay contends that Leibniz's argument is instead best understood against the background of an Aristotelian view of the priority of real being over time. The essay also shows how this alternative interpretation can help to shed new light on the difference between Leibnizian forces and Aristotelian powers, as well as on Leibniz's famous claim that accounting for force leads us beyond the mechanistic corporeal realm.

1 Introduction

Leibniz was critical of the Cartesian view that extension constitutes the essence of body and that all the variety in the corporeal world is to be accounted for in terms of the fundamental modes of extension: size, shape, and motion. A main problem, he famously argues, is that such a view leaves out force or power.

I will discuss one of the key issues concerning Leibniz's critique: his engagement with the Cartesian conception of motion. In the *Principles of Philosophy* Descartes characterizes motion in the "proper sense" as "the translation of one piece of matter, or one body, from the vicinity of the other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies." (AT VIIIA 53/CSM I 233) Leibniz takes this passage to express a purely geometrical conception of motion: there is nothing more to a body's being in motion than transfer or translation, i. e., its successively occupying dif-

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ferent positions.[1] "In order to say that something is moving," Leibniz objects, it is required that "there be within itself a cause of change, a force, an action" (GP IV 369/L 393).

This line of criticism is likely to appear peculiar to a modern reader. One peculiarity has to do with the *kind* of forces Leibniz takes to be central. After Newton, the claim that forces play a fundamental role in nature is obviously uncontroversial. More surprising, however, is Leibniz's idea that the relevant forces are, as he explains in the passage just quoted, forces *internal* to bodies, sustaining their motions. We tend to think of such forces or powers – Leibniz often uses these terms interchangeably[2] – as belonging to an Aristotelian conception of the natural world displaced by the mechanistic science championed by both Descartes and Leibniz. According to the mechanistic view, the basic form of motion is inertial: a body keeps on moving at the same rate along a straight line until something gets in its way. This is usually taken to imply that no forces are needed to *maintain* a body's motion, but only to *change* it.[3] It is not so far-fetched then to see the mechanistic view as inviting just the sort of conception of motion Descartes offers, a conception of motion as fundamentally power-free – as mere translation.

Another aspect of Leibniz's criticism that might at first sight strike us as peculiar is the central role he gives to considerations about *reality* or *real being*. If motion consists in mere translation, then, he claims, "there will be no real motion" (GP IV 369/L 393) or "nothing real in motion" (GM VI 235/AG 118). That is, in criticizing the Cartesian conception of motion Leibniz's primary point is that force is needed as a *real ground* of motion.

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1 Descartes's position has been subject to much scholarly discussion, and I certainly do not mean to take a stand on this vexed matter. As my aim is to explicate Leibniz's view, it is enough for my purposes to present Descartes *as Leibniz understands him*. For an interpretation of Descartes that comes close to Leibniz's reading see, e. g., Garber 1992, 293–99. Other commentators such as Woolhouse 1993, 86–88, 121 f., and Hoffman 2009 attribute to Descartes a view of the role of force in motion more in line with the one defended by Leibniz. In any case, it seems fair to say that Descartes himself is much less concerned with the issue than Leibniz is.

2 For the interchangeability of *vis* (French: *force*) and *potentia* or *virtus* (French: *puissance*) see, e. g., GM VI 236/AG 119; GP IV 509/AG 160; *NE* 169. Note that Leibniz distinguishes the forces associated with motion (*active forces*) from those associated with resistance and impenetrability (*passive forces*) (e. g., GM VI 236/AG 119; GP IV 511/AG 162; A II.iii 547/LDV 75). I will use the term 'force' to denote active force, in line with Leibniz's claim that active force is what "one usually calls 'force' in the absolute sense" (GP IV 395/AG 252).

3 While the principle of inertia was not fully formulated before Newton, it is widely accepted that something like this principle is expressed already in Descartes's first law of nature. Newton himself had a rather complex view of the role of force in uniform motion, see McMullin 1978, 33–43.

To understand what the worry about the reality of motion amounts to, and how it is supposed to license what looks like a return to an Aristotelian view, I will focus on what I take to be Leibniz's main line of argument against the Cartesian picture, namely that as mere translation motion will be something *merely successive*. In the literature this argument – which I will call the *argument from successiveness* – has been treated rather cursorily. More attention has been given to another argument to the same conclusion offered by Leibniz: an argument from the relativity of motion, i. e., from the fact that translation takes place, as Descartes puts it in the passage just quoted, "from the vicinity of the other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies." Leibniz argues that without force or power such relativity will undermine the very distinction between motion and rest. This argument, which is the one that Leibniz stresses in his remarks on Descartes's *Principles*, raises interesting questions concerning the notion of relativity.[4] Yet for the purposes of understanding the heart of Leibniz's opposition to the Cartesian view the argument from relativity seems secondary: what the argument from successiveness aims to show is that the conception of motion as mere translation is problematic *in itself*, independently of further considerations about relativity.

Given its significance, the neglect of the argument from successiveness is unfortunate. One reason why it has not received much attention may be that the argument has often been read as simply trading on ideas about the composition of motion already familiar from Zeno. I will argue, however, that such a reading leads astray and thereby also obscures the interest of the argument. As I will explain in more detail below, the argument is better understood as driven by a broadly Aristotelian view of the priority of real being over time, a view fundamentally at odds with the Zenonian motivations commonly ascribed to Leibniz. Connectedly, I will suggest that the role of power in grounding motion has to do precisely with the way in which powers are supposed to be prior to the temporal order. This approach will allow us to see that the forces constituting the reality of motion are not to be construed as instantaneous tendencies to change position, as interpreters have been prone to assume. Instead, I show that the relevant notion of force is that of *enduring activity*, wholly present throughout motion, on the model of an Aristotelian *energeia*.

Against the background of the conception of force emerging from a close examination of the argument from successiveness, we will also be able to revisit

4 On the argument from relativity see, e. g., Puryear 2012 and Arthur 2015, and further references given therein.

two of Leibniz's most central, but difficult, claims about the nature of force. To begin with, the idea of force as enduring activity can help us to appreciate the contrast he draws between his own notion of power as force and the Aristotelian notion of power as potency. In addition, attending to the priority of force over time offers a promising new starting-point for explaining Leibniz's well-known thesis that force needs to be located beyond the mechanistic corporeal realm.

I will proceed as follows. In Section 2, I present the argument from successiveness, as well as a common way of reading it. In Section 3, I turn to some problems with this reading, arising from Leibniz's commitment to a broadly Aristotelian view of time. Drawing on the latter, and the associated conception of the nature and role of power in constituting change, in Section 4 I propose a novel interpretation of the argument from successiveness, which also better allows us to appreciate its modal strength. In the final section, I explore some main ramifications of this interpretation: the way it bears on the difference between Leibniz's notion of force and the Aristotelian notion of power, as well as on the problem of locating Leibnizian forces within the mechanistic view of the corporeal world.

2 The Argument from Successiveness

Leibniz discusses the argument from successiveness in published works as well as letters throughout his career. I will begin by examining one of his most succinct, as well as oft-cited, formulations of the argument, found in the first paragraph of his seminal 1695 essay "Specimen dynamicum," where he tries to anticipate a Cartesian worry about his thesis that force is fundamental to the corporeal world.[5] The worry is that bringing in forces would conflict with the central mechanistic tenet "that every corporeal action derives from motion, and that motion itself comes only from motion, either previously existing in the body or impressed from without." (GM VI 235/AG 118) In other words, the tenet says that in order to explain why a body moves we only need to appeal to motion: either the body's own previous motion, or that of another body by virtue of which the first one is set into motion. Here 'motion' of course means local motion, change of position, as this is what all corporeal change consists in on the mechanistic world-picture.

5 Other examples include A II.ii, 171, 434, 488, 590, 748, 864; A II.iii, 101, 336, 452f.; Costabel 1973, 106; LDV 382n4; GP III 457/WF 201; D II.2 154. I will focus on texts from the late 1680s to the early 1700s, the period in which Leibniz makes most use of the argument.

Leibniz's response to the worry is to use the argument from successiveness to show that the mechanistic tenet in fact presupposes the notion of force. It is actually the Cartesian view – the view that leaves out force, conceiving of motion as mere translation – that conflicts with the mechanistic view:

> For, strictly speaking [*si rem ad akribeian revoces*], motion (and likewise time), never exists, since the whole never exists, inasmuch as it does not have coexistent parts. And so, there is nothing real in motion but a momentary something which must consist in a force striving toward change. [*Nihilque adeo in ipso reale est, quam momentaneum illud quod in vi ad mutationem niente constitui debet*.] (GM VI 235/AG 118)[6]

By characterizing motion as having parts that do not coexist (successive parts) Leibniz seems to mean that motion consists in a body's being at one time in one location, and at another time in a different location.[7] He wants to argue that this cannot be an exhaustive account of motion, since such an account needs to involve force. Given the schematic character of the passage, it is perhaps less clear what exactly his line of argument is supposed to be. Before delving into the details, it is worth highlighting what is distinctive about Leibniz's concerns, in particular since the conception of motion to which he objects, the conception of motion as mere translation, may, as noted earlier, seem like a natural consequence of the mechanistic world-picture.

Typically, the reason the mechanistic view is taken to undercut the Aristotelian doctrine of powers keeping bodies in motion is that the latter is bound up with the idea that we need to appeal to a *mover* (agent), as well as a *moved* (patient), to explain not only why a process of change is *instigated*, but why it *continues*. Yet on the mechanistic view the basic form of motion is uniform motion, which continues without the need for any mover. And from that perspective, it may then seem natural to question the need for powers, along the lines of Descartes and other early modern thinkers.[8]

It is, however, important to note that the question of why motion takes place is not really Leibniz's primary interest in the passage from the "Specimen" just quoted. The problem with taking mere translation from one position to another as an exhaustive account of motion is not that it fails to explain *why* a body con-

6 Here and in some subsequent quotes I have slightly modified the translation cited in order to stay closer to Leibniz's original phrasing.

7 Leibniz speaks of motion as a "successive being" (e. g., A II.ii 170 f., 434) and sometimes also of "the transitory nature of motion" (LDV 339).

8 Koyré 1965, 66–72, attributes such a line of thought to Descartes. As Hoffman 2009, 126, notes, it is not clear that in itself this is enough to rule out the need for force to explain why motion continues.

tinues in motion, but that it fails to explain *what* motion is. That is, the argument from successiveness is concerned with the *nature* of motion.

To begin to understand the problem about the nature of motion that Leibniz wants to raise, it is useful to first try to unpack some of the terminology he employs in the passage (henceforth I will simply refer to it as 'the "Specimen" passage'). Note, in the first place, that the question of whether motion "exists" is a question about the *reality* of motion, as for example comes out in another formulation of the argument: "Since in itself motion never has its parts together, no more than time does, it cannot pass for a real being [*quelque estre reel*]" (A II.ii 590; cf. A II.ii 171, 434). Real being here contrasts with what Leibniz calls *phenomenon*. This is a distinction between mind-independent and mind-dependent, respectively. Yet it is important not to confuse the distinction between real being and phenomenon with our modern distinction between objective and subjective: the former concerns the ontological status of entities, whereas the latter concerns truth. In the time period, Leibniz's distinction would have been more commonplace. Traditionally, relations, such as being-taller-than, were taken to be a paradigmatic example of something mind-dependent (a so-called *being of reason*) – not because Plato's being taller than Socrates would be subjective, but because being-taller-than is not in itself an ingredient of reality. What is real are Plato and Socrates with their respective statures, serving as the foundation for the comparison on which the relation of being-taller-than depends.[9]

Leibniz's talk of "real in motion" then means that motion is a *phenomenon*: it does not itself belong to basic reality, but is grounded in, or contains, something real. It is in in this sense that I will also use the expressions 'reality of' or 'reality in'. It is important to note that without such a basis in reality a phenomenon would, as Leibniz puts it to Arnauld, be something "wholly imaginary" (A II.ii 186/LA 122), something "where there is nothing real" (A II.ii 169).[10]

9 On the traditional notion of being of reason (*ens rationis*), see Doyle 1995 and Carriero 2015. Leibniz himself uses the term 'being of reason' but often seems to reserve it for that which depends on the intellect whereas the distinctive mark of phenomena is that they depend on perception or imagination (A II.ii 185/LA 121; GP VI 586/AG 263). In the context of the argument from successiveness, Leibniz usually employs the term 'phenomenon'.

10 Leibniz sometimes uses the expression "real motion" (e. g., GP IV 369/L 393). This does not mean that motion is something real *tout court* – as interpreters sometimes assume – but rather that motion is a phenomenon based in reality. Here I agree with Puryear 2012. My account, however, differs somewhat from his: for example, he reads the qualification "in itself" as introducing a specification of the essence of motion (Puryear 2012, 153), whereas I believe it signals that what is considered is an abstraction (see below).

The second piece of terminology concerns the qualifications "strictly speaking" and "in itself," which Leibniz also employs synonymously with "formally and precisely" (e. g., A II.ii 171; A VI.iv 1559/AG 51). We should not read these qualifications as signaling an account of the *nature* of motion: Leibniz uses 'formally' (*formaliter* or *formellement*) in the sense of a *distinction of reason*, something mind-dependent, along the lines of singling out an aspect in thought.[11] Note further that for Leibniz 'precisely' seems more or less interchangeable with 'separated from' or 'in abstraction from' (A II.ii 274/LA 167; A II.ii 81/LA 65; A II.ii 191). This is in line with the traditional meaning of *praecise* as cutting away (prescinding) from: to consider something precisely is to consider it apart from, excluding, something else.[12] Read in this way "strictly speaking" ("in itself") simply indicates that we are here concerned with an aspect taken in isolation: a body considered only *insofar as* it changes position.

The general point of the "Specimen" passage appears then to be the following: by supposing that motion taken strictly offers an exhaustive account of the nature of motion, the Cartesian view leaves out what is real in motion, thus making motion into something "wholly imaginary" – into something that cannot (contrary to what the Cartesians assume) be a fundamental mode at all. This is Leibniz's reason for claiming that it is the Cartesian position, and not his own, that conflicts with the mechanistic tenet about the causal role of motion: in order to make sense of that role, motion needs to be based in something real.

Now that we have a better understanding of what Leibniz wants to claim, we can turn to his motivations for these claims. Why is motion as something successive a phenomenon? Why does an account of motion as mere translation undermine the reality of motion? And why does the reality of motion require force?

Given Leibniz's emphasis on motion having *parts*, it may be thought that a natural place to look for an answer to these questions is his well-known doctrine that aggregates are phenomena in that their unity is dependent on their being conceived of as unities.[13] On this line of interpretation (call it the *aggregate reading*), motion is a phenomenon because it is an aggregate, although the parts are successive, and not coexistent, as in the case of, say, a heap of sand. Yet this is not quite what Leibniz says. The reason motion never exists is not that it has parts, which happen to be successive, but it has specifically to do with the *successiveness* of the parts. Moreover, even if considerations about aggregation could

11 See, e. g., LDV 257 and LDB 309. This is a use we also find in Descartes (e. g., AT IV 439/CSMK 280).

12 For a useful discussion of the scholastic Aristotelian notion of *praecise*, see Carriero 2009, 94 f.

13 See, e. g., A II.ii 120/LA 93 f. For a helpful treatment, see Lodge 2001.

explain the phenomenality of motion, it is hard to see how this could account for the stronger claim that motion considered as mere translation is a phenomenon without *any* basis in reality. For when Leibniz says that there is "nothing real" in motion thus construed, this presumably implies that even the parts of motion turn out to lack reality. And if the aggregate reading does not offer any explanation of the latter claim, it also leaves us without any explanation of Leibniz's inference to the need for force as what is real in motion.

Another approach to the argument from successiveness may seem more promising. The approach goes back to Bertrand Russell's proposal that the "Specimen" passage simply offers a version of "the old argument of Zeno": "Motion is change of position; but at any one instant the position is one and only one. Hence at every instant, and therefore always, there is no change of position and no motion." (Russell 1937, 88)[14] While such a "Zenonian" reading shares with the aggregate reading the assumption that motion is built up from parts, this is not seen as the source of the problem with conceiving motion as mere translation. Instead, the problem is located in the fact that the parts of motion contain no motion: at any moment of its trajectory a body simply occupies a given position. In this way, the Zenonian reading can make sense of the crucial claim that motion construed as mere translation is a phenomenon lacking *any* basis in reality. If the parts of a body's motion consist in the body's occupying different locations at different times, there is no intrinsic difference at a moment between motion and rest. And in that case, a conception of motion as mere translation would leave motion without any reality at all, in line with Zeno's original conclusion.

In order to avoid that conclusion, it seems as if there has to be some feature of the parts of motion that can serve to ground its reality. This is what, on the Zenonian reading, explains Leibniz's inference to the need for force. His characterizations of force as "a momentary something" and as "striving toward change" (GM VI 235/AG 118) have suggested to interpreters that force in this context is to be understood as an instantaneous (existing at, and only at, an instant) tendency to change position. Such a view would, as Donald Rutherford proposes, be akin to the way in which some philosophers have recently construed the notion of

14 Cf. Wilson 1989, 204 f. Sometimes the Zenonian reading seems to be simply assumed, see, e. g., Rutherford 2008 discussed below. It is worth noticing that Phemister has suggested what seems to be yet another reading of the argument from successiveness, claiming that the problem is that "motion is unreal due to the body's lack of co-existent parts. No aggregate of parts remains the same long enough to be able to count as the subject of the motion." (Phemister 2005, 191) It is not clear to me why Phemister talks about body here, since Leibniz explicitly says that it is *motion* that lacks co-existent parts. It is true that for Leibniz bodies do not persist through change. Yet this is not because they would lack co-existent parts, but because they lack true unity.

instantaneous velocity within classical mechanics as a tendency at an instant t_0 to bring about change of position at a certain rate after t_0.[15] Thus conceived, force seems to supply exactly the kind of feature needed for the parts of motion to serve as a ground of motion: instantaneous tendencies make for a distinction between motion and rest at a moment, and so can supply the "real elements" of motion. On the Zenonian reading, what is real in motion is a succession of instantaneous tendencies.

While the Zenonian reading at first sight appears as a rather straightforward way of construing the argument from successiveness, it fails to account for the modal strength of Leibniz's conclusion: it only gets us to the idea of force as *a* candidate for avoiding the Zenonian predicament, but does not explain why what is real in motion "*must* consist in a force" (emphasis added). As we will see next, the reading also faces deeper problems, since it seems hard to reconcile with some of Leibniz's other doctrines. Before turning to these problems, and to the alternative interpretation I propose, it is worth considering briefly the broader significance of getting the argument from successiveness right.

The conception of force the Zenonian reading attributes to Leibniz – the conception of force as instantaneous tendency to change position – reflects a widespread picture of his general view of the nature of corporeal, or what he also terms *derivative*, force.[16] This picture tends in turn to shape discussions of the relationship of the corporeal world to the basic metaphysical order of substances in Leibniz. He famously holds that the nature of substance, or what he in later writings terms *monad*, lies beyond the corporeal realm and is constituted by *primitive* force, which he characterizes in terms of the notions of soul, perception, and appetite. This is commonly taken to imply that the model of a substance for Leibniz is a Cartesian mind. His system thus appears to contain two fundamentally distinct types of force: the derivative forces at the corporeal level are

15 Rutherford 2008, 277, citing Lange 2005 (on which I also draw here) as an example of this approach to instantaneous velocity.

16 For the distinction between derivative and primitive forces see, e. g., GM VI 237/AG 119. Note that I am simplifying matters in two ways. To begin with, corporeal forces also include passive forces, but since my focus, as already noted, is on active force, I leave passive forces aside (see footnote 2 above). Secondly, while Leibniz himself often reserves the term 'derivative force' for corporeal forces, the notion of derivative force is commonly taken to apply also to the perceptual and appetitive modifications of substances. My reason for limiting my use of 'derivative force' to corporeal forces is simply that I am concerned with outlining a common worry about the relationship between corporeal derivative forces and the primitive forces of substances. And in any case, it is not obvious to me, as will become clearer later on, that the correct way of framing the relationship between corporeal and substantial forces is in terms of a relationship between types of force.

instantaneous tendencies to change position, whereas the primitive forces at the fundamental level of reality are mind-like in nature.

This leads to a much-debated problem: it is difficult to see how these types of force are related to each other, especially since Leibniz claims that derivative forces are modifications of primitive forces – for how could tendencies to change position be modifications of something like a Cartesian mind? What makes the problem even more pressing is that, according to Leibniz, the reason why the ultimate level of reality needs to lie beyond the corporeal realm has to do with the very notion of force itself. In the "New System," published the same year as the "Specimen," he explains that from force "there follows something analogous to sensation and appetite," which is why we must conceive of the nature of substance "on the model of the notion we have of souls" (GP IV 479/AG 139). This is often read as suggesting that mind-likeness is built into the very notion of force. But in that case, it is natural to wonder not only how derivative forces can be modifications of primitive forces, but how derivative forces could in any way count as genuine forces.[17]

While my primary concern here is with the argument from successiveness, I believe that my alternative reading of the argument also has important implications for these broader issues. Towards the end of the essay, I will indicate how reconsidering the argument from successiveness can help rethinking the traditional way of framing the relationship between derivative and primitive, or corporeal and substantial, forces.

3 Time, Change, and Power

In order to see why the Zenonian reading is problematic, we need to attend more closely to Leibniz's emphasis on the relationship between motion and time in the "Specimen" passage: "if we are speaking strictly, motion (and likewise *time*), never exists, since the whole never exists, inasmuch as it does not have coexistent parts." (GM VI 235/AG 118, emphasis added). In a draft of a letter to Arnauld, Leibniz elaborates on that relationship as follows:

17 This way of setting up the issue seems to constitute a common ground for many interpretations of Leibniz, despite disagreement over how to spell out the ontological status of derivative forces and their relationship to primitive forces. Prominent examples of a so-called idealist approach to corporeal forces include Adams 1994, 378–93; Rutherford 1995, 237–88; Rutherford 2008. Phemister 2005, 187–211, defends a more realist view, whereas Garber 2009, 99–179, 303–88, takes the problems just indicated to express a deep conflict within Leibniz's philosophy.

> [W]hen it comes to motion, it is very clear that, as it is a successive being and does not have its parts together, it could never exist, no more than the time which it needs [...] formally and precisely motion consists in a change of neighborhood continued for some time (A II.ii 170 f.).

The claim that time does not exist reflects Leibniz's well-known view that time is mind-dependent, or as he will later put it, *ideal*.[18] At first sight, this point may seem to be in line with the Zenonian reading: the idea that motion, something that requires an interval of time, needs to be composed of instantaneous parts, seems to rely precisely on a commitment to the unreality of the temporal interval.

Yet, on closer inspection, the Zenonian view actually turns out to be very much at odds with Leibniz's position. By claiming that time is ideal, he does not mean to say that time is built up from instants. Instead, Leibniz is in general agreement with Aristotle's familiar criticism of Zeno in book VI of the *Physics*. Given that time is a continuous quantity, Aristotle argues, the interval is prior to the instant, as a line is prior to points: just as points are termini of line segments, instants are termini of intervals. Echoing Aristotle's view, Leibniz explains in the *New Essays* that "strictly speaking, points and instants are not parts of time or space, and do not have parts either. They are only termini." (*NE* 152)

Combining the rejection of the Zenonian position with the thesis that time is mind-dependent would not have been surprising from an Aristotelian perspective. While endorsing Aristotle's view of the priority of the interval over the instant, scholastic Aristotelians commonly took time to be a being of reason.[19] This is reflected in the widespread skepticism among these thinkers towards counting so-called *successive entities* (*entia successiva*), entities that have different parts at different times, as real.[20] A process of change, such as the growth of a plant, was taken to be a paradigmatic instance of a successive entity: for the process to exist would be for some stretch of it, some temporally successive stages, to exist.

Leibniz's view is thus in line with a broadly Aristotelian conception of the priority of reality over time, a conception comprising both the claim that the

18 I set aside the details of Leibniz's complex views of time and space. For somewhat differing interpretations see, e. g., Hartz/Cover 1988 and Arthur 2014, 142–65.

19 This was how they understood Aristotle's characterization of time as the measure of change. For an overview of the discussion within mediaeval Aristotelianism, see Trifogli 2010, 272–75.

20 Here I am indebted to the discussion of mediaeval treatments of *entia successiva* in Pasnau 2011, 374–89. He also notes in passing that Leibniz seems to endorse the Aristotelian conception of successive entities (Pasnau 2011, 374).

temporal interval is prior to instants and the claim that time itself is a being of reason. On the face of it, it is then difficult to see how he could have thought of the problem faced by the Cartesian conception of motion in Zenonian terms, i. e., as a problem about how to compose motion out of instants. It is equally difficult to see how the "solution" the Zenonian reading attributes to Leibniz – that the real elements of motion are instantaneous tendencies – could make sense for him. If instants depend on time, and time itself is unreal, instants can hardly count as real. Indeed, what the Zenonian reading takes to be the real elements of change would for Leibniz be two steps removed from reality: since instants depend on time, and time is a being of reason, what is instantaneous depends on something that is itself mind-dependent.[21]

As a point of contrast, it is instructive to consider the positive account of the reality of change found in the Aristotelian tradition. In characterizing successive entities, such as a process of change, as beings of reason, Aristotelians imply that while these are not in themselves real, they nevertheless have a foundation in reality. Aristotelians also hold that this foundation is to be understood in terms of power – in other words, for Aristotelians powers are not only, or perhaps even primarily, supposed to enter into the explanation of why change occurs, but also serve to ground the reality of change. Yet it would have been foreign to Aristotelians, for the reasons already given, to think of powers as instantaneous tendencies, in the vein of the Zenonian reading. When Aristotelians characterize a process of change as having successive parts, they do not want to say that the reality of the process is to be found in its parts.

The profound difference between, on the one hand, the Aristotelian conception of the nature of power and its role in relation to change, and, on the other hand, the one the Zenonian reading attributes to Leibniz, comes out in Aristotle's famous characterization of change (*kinesis*) in the *Physics* as "the actuality of what is in potency, as such" (201a9). Early modern philosophers often ridiculed Aristotle's formulation as obscure, but his general point is not particularly difficult to discern. What he is concerned with is precisely the role of the notion

21 In an earlier writing, Leibniz even contends that "what exists only at a moment has no existence, since it starts and finishes at the same time" (A VI.iv 296/*LOC* 297). For a helpful discussion of this text and Leibniz's earlier views on motion, see Levey 2010. Cf. also the criticism in Whipple 2010 and Crockett 2005 of a common tendency among commentators to attribute a notion of instantaneous state to Leibniz. While I am sympathetic to their criticisms, my claim here does not depend on taking a stand on the general issue of the status of instantaneous states in Leibniz. In raising doubts about the Zenonian reading, my aim is simply to pave the way for a positive alternative proposal about how to interpret Leibniz's argument.

of potency or power[22] as answering the question of the nature of change (rather than that of why change occurs). To put it briefly, his claim is that a process of change consists in a potency insofar as it is actual, but not fully actual – 'as such' signals that the power is still in potency – the full actuality being the end-point of change. For example, an oak's augmentative power is aimed at its full size, and when that size is reached the process of growth has come to an end; the process consists not in the full actuality of the power, but in the power's being progressively actualized.[23] This is not to say, at least for scholastic Aristotelians, that the actualization of power would constitute the process as a further ingredient in the world. Rather, the idea is that the power somehow functions as the real basis on which the process, as a being of reason, depends.

What is distinctive about the conception of the role and nature of power offered in the *Physics* passage is that a power is present *throughout* change: the augmentative power of a plant underlies the entire process of its growth. Rather than being an instantaneous tendency, a power is, as scholastic Aristotelians put it, *permanent*, not in the sense that it could not cease to exist, but in the sense that it is something *enduring*.[24] The significance of permanence in this context can readily be understood in light of the Aristotelian thesis of reality as prior to time. Given that powers are permanent, time does not enter into their essence: it is not part of what it is to be a power to have some temporal duration or to exist at some particular time, but powers are fully present at any moment of their existence. Powers also provide a basis for an ordering that does not inherently depend on temporal indexing. Sprouting, developing roots, and growing foliage and stalks are to be understood as degrees of actualization of a plant's augmentative power. The priority of, e. g., growing roots over foliage and stalks is not based on a difference in time, but on the fact that the latter degree of actuality is attained

22 For now, I will use the terms 'power' and 'potency' interchangeably, although Leibniz, as we will see in Section 5 below, wants to distinguish his own notion of power as force from the Aristotelian notion of power as potency.

23 See Coope 2009. On subsequent scholastic developments of this idea, see Maier 1982, 21–39, and Trifogli 2010.

24 This is compatible with the fact that some mediaeval Aristotelians connected permanence to the possibility of momentary existence (Pasnau 2011, 378). Here I think it is helpful to distinguish between: (i) S possibly existing only at an instant; and (ii) S being instantaneous in the sense of essentially existing only at an instant. In (ii) momentary existence is built into the essence of S, whereas in (i) it is because the essence of S is non-temporal (it is neither of the essence of S to exist at, nor for, some time) that it is possible for S to exist only at an instant. The possibility of momentary existence does not, however, necessarily follow from a non-temporal essence. For example, it is not clear that such a possibility would have made sense for Leibniz, see footnote 21 above.

via the former. It is in this sense that powers and their actualizations can be said to be prior to the temporal order.

However the details of the Aristotelian view are supposed to be worked out, we are already in a position to see that there are good reasons to question the Zenonian reading of Leibniz's argument from successiveness, as such a reading appears to conflict with his view of time. At a more general level, the dialectical setting of the argument also makes Zenonian considerations appear out of place. Given that Leibniz seems to want to defend the Aristotelian idea of motion as sustained by power against Descartes, it would be rather strange for him to appeal to considerations that from an Aristotelian perspective are incoherent. Yet my aim in contrasting the Zenonian reading to the Aristotelian position is not mainly negative. I believe that taking into account the Aristotelian conception of the relationship between change, reality, and power also offers an alternative way of construing Leibniz's argument.

4 The Argument from Successiveness Reconsidered

In this section, I aim to show that reading Leibniz's criticism of the Cartesian view as expressing an Aristotelian, rather than a Zenonian, concern with successiveness makes better sense of the structure of the argument, its modal strength, as well as the notion of power or force it involves.

The first point to keep in mind is that the traditional Aristotelian worry about successiveness takes a distinctive shape in light of the Cartesian conception of the corporeal world. For Aristotelians, the question of the status of processes of change is a question of whether the process is something that exists *in addition* to the power's being actualized. What is conceived in conceiving a process of change, a successive entity, is a power actualized to different degrees. Now, when Descartes gets rid of powers, construing motion as mere translation, all that seems to be left is a body's occupying different locations at different times. That is, all that is conceived in conceiving the motion of a body B is something like B-at-l_1-at-t_1, B-at-l_2-at-t_2, and so on. From Leibniz's perspective, the latter are not, however, good candidates for something real, given that time is ideal. Not only then is motion considered strictly a phenomenon, given that it is a successive entity, but if mere translation is all there is to motion, then there is a very deep sense in which there is *nothing* real in motion. In this way, taking into account the dependence of motion on time is enough to explain Leibniz's claim that the Cartesian view deprives motion of any ground in reality. There is no need, as there

is on the Zenonian reading, to introduce a further appeal to the lack of an intrinsic difference at a moment between motion and rest.

One may of course wonder whether considerations about the priority of reality over time would have been compelling to Leibniz's Cartesian opponent. From a contemporary point-of-view, such considerations may seem foreign: nowadays philosophers – whatever their exact conception of the nature of time – tend to think of time (or space-time) as a prior order in which things exist and changes take place. Yet it is important to note that the view of time as mind-dependent remained widespread among early modern philosophers, including Descartes.[25] Consider for example article 57 of the first part of the *Principles of Philosophy*:

> [I]n order to measure the duration of all things, we compare their duration with the duration of the greatest and most regular motions which give rise to years and days, and we call this duration 'time'. Yet nothing is thereby added to duration, taken in its general sense, except for a mode of thought. (AT VIIIA 27/CSM I 212)

Leibniz can then be seen as exploring the way in which getting rid of powers makes the Cartesian conception of motion unstable. On the one hand, motion is supposed to be prior to time; time is supposed to be the measure of motion. On the other hand, as mere translation motion will be time-dependent through and through.[26] It is worth noticing that while vulnerable to Leibniz's criticism read in Aristotelians terms, it is much less clear that Descartes would have been moved by a Zenonian line of objection, as he too endorses a broadly Aristotelian view of continuous quantities (see AT IV 445–47).

Reading the argument from successiveness in the context of the dialectic between Aristotelians and Descartes further helps to explain why Leibniz thinks that what is real in motion *must* consist in force, a point the Zenonian reading leaves somewhat obscure, as noted earlier. Recall that Leibniz's Cartesian opponent can be seen as reasoning along something like the following lines: if there are no powers sustaining motion, then all there is to motion is translation; mechanism shows that there is no explanatory need for powers sustaining motion; and so, all there is to motion is translation. I suggest that we read Leibniz as arguing from the same starting-point but in the other direction. In other words,

25 See also Spinoza's claim in *Metaphysical Thoughts* I.4 that time "is not an affection of things, but only a mere mode of thinking, *or*, as we have already said, a being of reason." (Spinoza 1988, 310). Cf. *Ethics* II, proposition 45, scholium (Spinoza 1988, 482).

26 Appealing to duration as distinct from time does not really help here, since duration itself seems to be a matter of motion for Descartes, as he says in the passage just quoted.

my proposal is that Leibniz begins from an assumption shared by his Cartesian opponent, but where the Cartesian affirms the antecedent, Leibniz denies the consequent: if there are no powers sustaining motion, then all there is to motion is translation; it cannot be the case that all there is to motion is translation (for as such motion would entirely lack reality); and so, there are powers sustaining motion. Even if we grant that the role Aristotelians attribute to powers in explaining *why* change takes place is rendered void by the mechanistic conception of uniform motion as basic, this does not undermine the *constitutive role* of powers with respect to motion.

What then about Leibniz's claim in the "Specimen" that what is real in motion is "a momentary something which must consist in a force striving toward change"? As we have seen, this passage seems at first sight to support the sort of conception of force proposed by the Zenonian reading – force as instantaneous tendency. However, a closer look at other texts where Leibniz elaborates the argument from successiveness suggests that this is in fact not at all what he has in mind. Consider the following passage from a 1703 letter to Jaquelot:

> [M]otion is not a being, any more than is time, since it has no coexisting parts, and so can never exist. But *force subsists and can endure*. [...] Since force *is present at an instant* [*se trouvant dans l'instant*] it is by means of it that a moving body at an instant differs from a body which is at rest [...] (GP III 457/WF 200, emphases added)

Here Leibniz seems to say that force is *both* present at an instant *and* something that subsists. This may strike us as puzzling, at least to the extent that we associate 'momentary' or 'instantaneous' (and their cognates) with existing at, and only, at a moment. Yet Leibniz seems to mean something different by these locutions, as comes out in a letter to Pellisson, written twelve years earlier:

> Motion is a successive being, which consequently never exists, no more than time, since all of its parts never exist together: instead of this, I hold that force or effort *exists wholly at each moment* [*existe tout entier à chaque moment*] and has to be something true and real. (A II.ii 434, emphasis added)

This suggests that, in the context of the argument from successiveness, Leibniz uses 'momentary' in the sense of *existing wholly at each moment*. That is, 'momentary' here does not mean existing at, and only at, a moment, but being *constantly* present: to divide up a body's trajectory is not to divide up the underlying force, since the latter fully exists at any moment throughout the trajectory.

Contrary to what might seem to be the case, Leibniz's characterization of force as "momentary" is in fact very much in line with the Aristotelian notion of power as *permanent* in the sense of enduring. Indeed, in a later letter to

Hermann, Leibniz connects the momentary character of power with its not involving time: "power for me is extended through time [*per tempus extenditur*], since, in my sense, in and of itself it does not involve time, but is something momentary [*momentaneum*]" (GM IV 389). "Extending through time" does not mean that force is temporally extended in the way successive entities are, but that force is something that is fully present *throughout* change. This suggests that the reason power does not involve time is that it is not part of the essence of power to have a certain duration or to exist at some particular time.[27] In other words, the point Leibniz makes in terms of 'momentary' is precisely the Aristotelian point about the permanence of powers. Elsewhere Leibniz also uses the contrast between permanence and successiveness to characterize power or force: "action and power are different things, the former successive, the latter permanent," as he puts it in his 1698 essay "On Nature Itself" (GP IV 509/AG 160; cf. C 481; GP IV 396/AG 253).

The idea of force as a "momentary something" in the sense of permanent, of existing wholly at each moment, is of course exactly what is to be expected on an Aristotelian reading of the argument from successiveness. The upshot is then that this reading not only manages to better capture the structure and modal strength of the argument, but also fits better with the notion of force that Leibniz employs. It is true that in the letter to Jaquelot quoted above Leibniz emphasizes the significance of force in distinguishing between motion and rest. Yet this need not indicate that Zenonian considerations play any important role in the argument – after all, such considerations would be incompatible with the permanence of force also stressed in the same passage. The claim about the role of force in distinguishing between motion and rest is, I believe, best read as a further point, rather than one of the central premises of the argument.[28]

27 Rutherford 2008, 276 – to which I owe the reference to, as well as the translation of, the Hermann passage – seems to read it in line with the Zenonian interpretation, taking "does not inolve time" simply to mean that force does not exist *for* a time, but only *at* a time. He is perhaps encouraged by the fact that Leibniz goes on to talk of force as being "replicated at any moment" (GM IV 389). However, the general thrust of the passage suggests to me that we should not take talk of "replication" too literally.

28 An additional question, which I will not be able to address here, is how to understand other places where Leibniz seems to appeal to apparently Zenonian considerations, such as his famous argument in "On Nature Itself" concerning the individuation of bodies in the plenum (GP IV 512–4/AG 163 f.).

5 Force vs. Potency

In this final section, I will turn to the more general significance of the reading of Leibniz's argument from successiveness defended here. I will indicate how the reading can actually shed new light on some of his most important claims about the nature of force: the contrast he seeks to draw between his own conception of power as *force* and the Aristotelian conception of power as *potency*, as well as his idea that, in some sense, forces need to be located beyond the mechanistic corporeal realm.

While seeking to restore the Aristotelian view of power as a permanent ground of motion, Leibniz is also critical of the way in which Aristotelians understand the nature of powers. In the "Specimen" he talks disparagingly of scholastic powers as "simple facult[ies]" (GM VI 235/AG 118) and elsewhere as "bare potencies" (*NE* 140). I believe these comments reflect a difficulty about upholding even the constitutive role of powers within the framework of the new science. Here we need to keep in mind that on the Aristotelian conception of *kinesis* as "the actuality of what is in potency, as such" (201a9) a process of change is directed towards an *end-state*, the full actuality of the potency. In the case of the growth of a plant the end-state is its full size; in that of the downward motion of a rock it is resting on the ground, near the center of the earth. It is hard, however, to see how the actualization of a potency could be what underlies uniform motion, since the latter is by nature open-ended, *not* directed to an end-state. To the extent that there are powers sustaining uniform motion, it seems as if the nature of power needs to be reconceived.

Such an approach to Leibniz's critical remarks about Aristotelian powers tallies well with the way in which he elaborates the contrast between force and potency. Of particular significance is his stress on the notion of *activity* as a key to understanding force: for example, in the "New System" he characterizes force as "contain[ing] not only act or the completion of possibility, but also an original *activity*" (GP IV 479/AG 139, Leibniz's emphasis; cf. GP III 657).[29] 'Activity' (*activitas* or *activité*) is Leibniz's rendering of the Aristotelian *energeia* (e. g., GP III 368;

29 In this context, Leibniz discusses *primitive force* – that is, force as constituting the nature of substance – but I take it that his characterization applies to force in general. Indeed, as we will see at the end of this section, one upshot of my reading of the argument from successiveness is that it encourages us to rethink the significance of the distinction between derivative and primitive forces. It is, of course, a further question what it means for force to constitute the nature of substance. I take up this issue in "Leibniz on Power and the Nature of Substance" (manuscript), where I deal more generally with Leibniz's critique of the Aristotelian notions of power and substance.

GP IV 504/AG 156; GP IV 588/WF 163). While it may initially seem confusing to make use of the Aristotelian apparatus in criticizing the Aristotelian position, appealing to *energeia* in the course of trying to work out the ground for the new mechanistic conception of change is actually not so far-fetched. In *Metaphysics* IX.6 Aristotle himself introduces *energeia* by way of contrast to *kinesis* – a contrast between processes that lack and those that have an internal limit, respectively.[30] As directed towards some non-actual end-state, a *kinesis* has a limit, and as such it can be more or less incomplete: for example, more or fewer of the stages of the growth of a plant can be in place. Correspondingly, the underlying potency can be more or less incomplete in the sense that it can be more or less actualized. An *energeia*, on the other hand, lacks a limit: it is not directed at some further end-state, but is undertaken for "its own sake" – it is an end in itself.

Aristotle takes living as a paradigmatic example of *energeia* (others include perceiving and understanding). When a plant dies before reaching its full size, its process of growth is left incomplete: the stages that would complete the process never came into existence; the plant's potency remains partly unactualized. With respect to the plant's life or living there is, however, no such end-state that the plant failed to achieve: death is not the full actuality of life, but an interruption of it. At any moment of its life the plant was "fully" living.

This is a somewhat difficult point. One way to understand it, which at least helps to appreciate what Leibniz found attractive about the notion of *energeia*, is to take Aristotle to distinguish between: (i) life as a successive process; and (ii) living, *energeia*, as the permanent or enduring basis of life. *Energeia* is thus not quite on a par with *kinesis*, but instead occupies a place similar to that of a potency: the *energeia* of living stands to the successive process of life as a potency stands to *kinesis*, i. e., as something that underlies or is the basis of it. There is, however, an important difference here, paralleling the difference between the open-ended sort of succession that an *energeia* grounds and the end-state-directed sort (*kinesis*) that a potency grounds. Unlike a potency, an *energeia* cannot be more or less actualized, but is, as it were, a permanent "doing" – throughout life there is constant living.

Thereby we can also understand why Leibniz would have found the notion of activity attractive in developing an alternative conception of power suited to the mechanistic view of motion. Constant activity seems to be a better candidate

30 Here I draw on Waterlow 1982, 183–91. Doing justice to the complexities of Aristotle's views would of course require a more nuanced treatment than the one offered here. For example, Charles 2015 argues that *kinesis* is in some respect more *energeia*-like than my schematic presentation of the contrast allows for.

than potency for the purpose of accounting for the sort of power that underlies the open-ended process of a body moving uniformly, changing position at a constant rate. When Leibniz in the letter to Pellisson quoted in section four above says that "force or effort exists wholly at each moment" (A II.ii 434), the emphasis on *wholly* may then not only express the traditional Aristotelian idea that what is real in motion is a permanent power, but also an alternative way of conceiving of such a power – not as a potency, but as force: as an activity *fully actual* at each moment.[31]

Of course, important further questions remain about how to spell out the details of the constitutive role of power on Leibniz's new conception of power as force. Here I would, however, simply want to draw attention to the way his talk of a "force striving toward change" (GM VI 235/AG 118) is placed in a new light. The emphasis on striving is naturally read in dispositional terms: the nature of force is given by its being directed to some non-actual state. Indeed, this is central to the Zenonian reading's construal of force as an instantaneous tendency to change position. Yet an activity is supposed to be something fully actual in the sense of not being directed to some further end-state. Hence, if force is to be understood in terms of activity, it seems as if dispositionality cannot belong to the essence of force.

In fact, a more careful look reveals that Leibniz does *not* want to identify force and striving, or explain force in terms of striving. In the "Specimen" he states that striving *depends* on force: "only force and the nisus *arising* [*nascens*] from it exist at any moment (for motion never really exists, as we discussed above)" (GM VI 252/AG 135, emphasis added). The idea seems to be that it is *in virtue* of its force that a body will have a *nisus* (tendency) to change position. It is not clear, however, what the status of these tendencies is supposed to be. Even if there is a sense in which a body moving with uniform velocity can be described as at any moment "tending" to move to the next position along the tangent, it is not clear that this amounts to positing tendencies over and above the presence of constant force.[32]

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31 Note that from an Aristotelian perspective, there is no opposition between potency and activity, but activity is rather an exercise of a distinct *kind* of potency. To fully understand Leibniz's reason for seeing activity as an alternative to the account of power as potency, we would need to consider his view that force constitutes the nature of substance (see footnote 29 above).

32 See Leibniz's cautionary comment in the "Specimen" concerning the notion of *solicitation to motion*: "I wouldn't want to claim on these grounds that these mathematical entities are really found in nature, but I only wish to advance them for making careful calculations through mental abstraction." (GM VI 238/AG 121) I take this to apply also to what Leibniz calls *dead force*, so-called "since motion does not yet exist in it, but only a solicitation to motion" (GM VI 238/AG

But how far can the connection between forces underlying motion and the traditional notion of *energeia* really be taken? While it seems to some extent plausible to think of staying alive as an end in itself, as something for the sake of which a plant or an animal does various things (e. g., taking in nutrition), can proceeding with uniform motion – having uniform velocity or speed – really be understood in the same way? Here some caution is needed. It is crucial to Leibniz that speed is *external* to the nature of force. He elaborates on the point in an important, but somewhat technical, letter to De Volder from September 1699, where he draws a distinction between *modal* and *real* effects, which seems to correspond to the distinction between phenomenon and real being, respectively (e. g., A II.iii 601/LDV 131). In the case of uniform motion (what he also calls *free action*) the modal effect is change of place, whereas the real effect consists in the conservation of force, in the fact that "the previous force is conserved" (A II.iii 596/LDV 123). Leibniz employs this distinction to contrast force to speed:

> [S]ince the power exercising itself through a free action would in vain be measured by its real effect (given that it is identical with the cause, i. e., the same in every respect), in such a case the modal effect and its quickness [*promtitudinem*] is useful and is in fact the only recourse. (A II.iii 596/LDV 123)

In other words, the rate of change of position should not be seen as giving the nature of the real effect, but is rather just a measure of it – from the presence of a given force, manifestation as a certain speed follows, since in this case there is no hindrance.

I will set aside the details of the rather intricate argument on which Leibniz bases these claims, an argument that draws on his famous criticism of Descartes's conservation principle.[33] For our purposes, it is enough to observe that the need to distinguish force from speed can be motivated by the role of force as providing the real ground of motion. Central to the latter idea is, as seen, the notion of force as permanent, and thus prior to time, a point on which Leibniz also insists in the letter to De Volder: "no account is taken of time in a real effect" (A II.iii 597/LDV 123).[34] Even though existing at, or for, some particular time does not belong to the essence of speed, the latter nevertheless seems to involve an essentially temporal

121). Hence, we should not assume, as Rutherford 2008, 278 f., does, that the notion of force at work in the argument from successiveness is to be identified with that of dead force.

33 On this argument and some of its complications, see Lodge's discussion in LDV, xl–xlii.

34 In general, the importance of the priority of real being over time to Leibniz's criticism of Descartes's conservation law seems underappreciated by commentators and merits further discussion (see, however, Costabel 1973, 63 f.).

effect, namely change of position at a certain temporal rate. This would explain why speed, as time-dependent, cannot capture the reality of force.

Close attention to Leibniz's argument from successiveness thus brings out the complexity of his notion of corporeal force. The activity-based conception of power can be explicated by the need for powers suited to ground the novel mechanistic conception of motion as open-ended. This is not to say, however, that the *nature* of force can be accounted for within the framework of a mechanistic conception of the corporeal world, since, as we just saw, the relevant mechanistic notions are time-dependent and thus would undermine the *reality* of force.[35]

In this way, we can begin to see how the argument from successiveness is directly related to Leibniz's thesis that making room for force takes us to a metaphysical realm beyond the corporeal world of mechanistic science. Here another aspect of the Aristotelian notion of activity may have been important to him. For Aristotle activity is, as noted, connected to life, and as such seems to offer resources for articulating a positive alternative to the categories of mechanistic science. Taking Leibniz to be drawing on this aspect of the notion of activity offers a new way of looking at his claim in the "New System" that from force "there follows something analogous to sensation and appetite" and that we must conceive of the nature of substance "on the model of the notion we have of souls" (GP IV 479/AG 139). Given that the soul was traditionally understood as the principle of life, Leibniz's emphasis on perception, appetite, and soul-likeness may be intended to evoke an Aristotelian notion of life-activity, rather than, as commonly held, a conception of the ultimate level of reality as populated by something like Cartesian minds.

Thereby we are also in a position to revisit the common way of framing the question of the relationship between primitive and derivative forces. Recall that derivative forces are usually thought of as instantaneous tendencies to change position; to reach something permanent we need to take a further step to another type of force, primitive force, the force constituting the nature of substance. My examination of the argument from successiveness offers a distinctively different picture. While the relevant force seems to be derivative force, it is also to be understood as permanent. I believe this should not be taken as a sign of some sort of confusion on Leibniz's part, but rather as an invitation to reconsider the idea that the distinction between derivative and primitive forces is a distinction

35 Attending to the permanence of force brings out another reason for thinking that mechanistic notions are insufficient. Even though the basic form of motion is supposed to be uniform, there is, as a matter of fact, little room for uniform motion within Leibniz's plenum physics (see Levey 2010). To the extent that there are forces present *throughout* the motions of bodies within a plenum mechanistic universe, it seems as if they need to be such that they sustain complex, non-uniform, motions.

between fundamentally different *types* of force. In fact, Leibniz's own way of explicating the distinction suggests that he sees the relation between derivative and primitive forces as much closer: he insists that derivative force is just a "limitation," or "determination," of primitive force (see, e. g., LDV 307, 287). Now, if derivative force is just a way in which primitive force is limited it seems as if a concern with derivative force is *ipso facto* a concern with primitive force. And in that case, there does not appear to be anything problematic about the idea that the argument from successiveness, as having to do with derivative forces, would be an argument for permanent force.

Note further that there is a more general reason to question the need for interpreting the relationship between, on the one hand, derivative or corporeal force, and, on the other hand, primitive force, in terms of a distinction between two types of force. As we have seen, such a need results from the conception of corporeal forces as tendencies to change position and thus as essentially different in kind from primitive forces. Yet this may not be the right way to think of corporeal force, at least if my interpretation of the argument from successiveness is on the right track. For on my interpretation, the notion of corporeal force is to be understood as activity rather than as tendency to change position. This opens up, as we have also seen, a route from *within* the notion of corporeal force to the thesis that force ultimately lies beyond the mechanistic realm. That is, the notion of corporeal force is itself a more "metaphysical" notion than what has often been thought. While these suggestions stand in need of further elaboration, one important implication is that some supposedly deep worries about how to fit together the corporeal and the metaphysical in Leibniz – worries arising precisely from the usual way of construing derivative force as a distinct type of force from primitive force – may not be so deep after all.

Concluding Remarks

My main aim here has been to present an alternative reading of the argument from successiveness, according to which it is to be understood as a version of an Aristotelian worry about the time-dependence of successive entities, and as appealing to a corresponding notion of force as *permanent*. I have also tried to bring out the broader significance of this interpretation by showing how it bears on some of the fundamental issues concerning Leibniz's conception of force. First, I have argued that the question of what the nature of permanent powers looks like on a mechanistic picture provides a good starting-point for appreciating the contrast Leibniz wants to draw between, on the one hand, the Aristotelian conception of

power as potency, and, on the other hand, his own conception of power as force. Secondly, and finally, I have broached the way in which the activity conception of corporeal force can offer a new understanding of Leibniz's route to the thesis that force ultimately lies beyond the purview of the mechanistic world-picture.[36]

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