Spinoza on space and motion

Stephen Harrop
Department of Philosophy
King's College London

ABSTRACT. In this paper, I argue for two main theses. The first is that Spinoza held that space was not an independently existing thing such as absolute space This creates a problem for his account of individuation. The second thesis is that he can solve this problem by appealing to another doctrine he accepted, that there is absolute motion. I conclude that Spinoza was among the first early modern figures to reject absolute space but accept absolute motion.

Acknowledgments: Thanks are due Michael Della Rocca and the audience at the 2021 Spinoza and Early Modern Philosophy workshop at The Johns Hopkins University for helping to bring this paper to its current form. Thanks are moreover due to two reviewers for HOPOS and to Eric Schliesser (who reviewed this paper for a different, clearly less sensible journal) for their excellent and constructive comments.

Introduction

In this paper I want to explore a historical question which has gotten comparatively little attention: What view about space and motion, if any, did Benedict de Spinoza hold, and which, given his philosophical system, ought he to have believed if he were consistent? This paper takes as its methodological presupposition that what Spinoza in fact *does* say about these matters is a guide to what he *did* believe, and what he says about other distinct but related matters is a guide to what we ought to attribute to him if we assume consistency.[1] It will make two main arguments:

(1) Contrary to what some interpreters call the "standard view," Spinoza's philosophical system was not a supersubstantivalist about space. Nor was it substantivalist. I leave open the possibility that it was not a version of Cartesian relationalism either. I tend to favor this interpretation but it will not form an important part of my argument.

(2) Spinoza's system involves a particular kind of absolutism about motion – and (I will argue) possibly he was the first early modern figure whose system both was absolutist about true motion and which rejected what I will call `spatial separatism`, (of which more shortly). More precisely: Spinoza's philosophical system commits him to true motions that cannot be secured by the Cartesian view of motion, as well as to the falsity of `spatial separatism` and what I will call `spatial reductionism`.

There is certain inherent taxonomic interest to this question. It is interesting, as a matter of intellectual history, to know where a specific historical figure stood on issues important to his contemporaries. But the import of this questions goes beyond mere categorization. One use of the history of philosophy is the opening up of new conceptual possibilities, ones to which the vicissitudes of historical change and intellectual evolution have blinded us. And here, I think, Spinoza's views offer just such a shift of horizons. As I hope to show throughout the paper, his views on space and motion are both novel and integrated into a

1. It is possible that there is simply a bald inconsistency in his works, but I think it is fruitful to explore the possibility that he is indeed consistent.

larger philosophical system. I think the best way to see how metaphysical theorizing can or should guide analysis in the philosophy of science is to see how it *has*. This paper represents one small step in that direction.

The plan of the paper is as follows. In §1, I justify a distinction over and above the classic one between relational and substantival spatial ontologies, the distinction between what I call `spatial separatism` (`separatism` for short) and `spatial reductionism`. In §§2-3, by an examination of multiple textual and historical lines of evidence, I argue that Spinoza was not a `separatist` nor a `spatial reductionist`. This leaves his system with a serious problem – his account of individuation of bodies and of identity through change appears to be untenable on this view; I examine these complications in §4. In §5, by examination of textual evidence, I argue that he was one of the first historical figures to reject any form of `separatism` while retaining some version of `absolutism` (prior even to one of the first such figures, Leibniz). I then conclude by arguing that this helps him avoid the problem raised: He can secure the true motions needed for his account of individuation and persistence without relying on a separately existing space.

Before I get started, I need to make two points about what I will be assuming throughout the paper. First, I will be assuming that Spinoza thinks that mathematics can be used to gain adequate knowledge of natural things and their behavior. In other words, I will be assuming that Spinoza's philosophy leaves room for a mathematical physics. There is a distinguished line of very serious scholars who argue the contrary point: For Spinoza, trying to describe the properties of material objects using any sort of mathematical formalism can only yield inadequate knowledge, and as a result we shouldn't be trying to do this if we're doing serious science. Recent examples of such scholars include Melamed 2000, Peterman 2015, Manning 2016, §6.3, and Schliesser 2018; less recent examples can be found in McKeon 1928, 153, Gueroult 1969, 517, Gilead 1985, 74, and Matheron 1986, 146.

I think this is a mistaken position, and going forward in this paper I'm going to assume it's false. I agree broadly with the view taken by Homan 2018, on which "geometrical figures

have a place in Spinozan nature as the determinations of finite bodies." (Homan 2018, 456)[2] But I can't defend this view at the same time as I try to give the argument of this paper. So I ask the reader's forbearance. Play along with me; we can fight about this another time.

Second, I'll be assuming that Spinoza thinks that space is a real thing, something that isn't just a "tool of the imagination." In other words, I'll be assuming that an adequate cognition of finite extended bodies will include cognition of them as standing in real spatial relations (though what those relations consist in I'll leave open for now). As far as I can tell, this view is accepted by most commentators. The most prominent proponent of the contrary view is Alison Peterman (primarily in Peterman 2012, 2015). On her view, "when [modes of extension] are understood through their essences, 'in themselves,' or (to speak anachronistically) in terms of their most fundamental properties, they are [not] extended and divisible." (Peterman 2015, 19)[3] On this view, Spinoza is close to a view that Hartz and Cover 1988 attribute to Leibniz, viz., that space is ideal or mind-dependent.

I'm going to assume in this paper that this view is mistaken, and that finite modes of extension really are extended in space. But I want to be clear that this isn't because I think the contrary view is obviously wrong, or "not even wrong." Rather, giving the radical and elegant arguments that Peterman offers their proper due would require an entire paper dedicated to the topic. It's a serious view that deserves serious consideration.[4] But I simply don't have the time or space to do justice to Peterman's larger argument in this essay, so I'll yet again throw myself on the mercy and indulgence of the reader.

2. Homan 2021, Chapters 3-4 develop this line of thought in more detail.

3. Though I believe he has yet to set forth this position in print, Yitzhak Melamed has indicated in conversation that he tends to agree with something like this view as well.

4. And Peterman's arguments make clear an absolutely crucial point. Sometimes Spinoza seems to use language that endorses the existence of something or other. But we should be very careful to infer, from this alone, that his considered opinion is that these things exist. This is especially true if the context in which this apparent endorsement occurs is one where the first kind of cognition (imagination) is involved. Cognition of this kind is inadequate, according to Spinoza. So we need to treat these texts with more than a little caution. I thank Eric Schliesser for stressing this point to me.

Section 1. Beyond the substantivalism/relationism debate

What is space, *really*? Here's one way of mapping some answers to this question. Begin with `separatism`.[5] On this view, space is something distinct from material bodies (whatever those are: extended continuous matter, lattices of atoms, variations in certain quantum fields, and so on). It's a sort of container, with regions which these bodies occupy. Spatial relations obtain both between the material bodies, and the material bodies and the container space. It's often supposed to have certain topological properties (such as regions), certain geometric properties (such as well-defined distances between those regions), and certain mereological properties (these regions are taken to be parts of space).

`Separatism` is a view which grants somewhat equal standing to space and bodies. But one can obtain a more parsimonious ontology by reducing in one of two directions. The first of these results in what I'll call `material reductionism`. On this view, space is reduced to certain kinds of relations that hold between material bodies. There is no container space where material goings-on take place. One important historical example of such a view is that of René Descartes, who states plainly that "in reality the extension in length, breadth, and depth which constitutes a space is exactly the same as that which constitutes a body," (*Principles* II 10 / Descartes 1984, 227 / Descartes 1897-1910, VIIIA 45) and that "[t]here is no real difference between space and corporeal substance." (*Principles* II 10 / Descartes 1984, 227 / Descartes 1897-1910, VIIIA 46)[6]

The second of these results in what I'll call `spatial reductionism`. On this view, one reduces each material object to a specific region of the container space endowed with specific properties or property bundles. Space, its regions, and their properties are all that is. This view has had few historical defenders, but some contemporary philosophers who

5. The typewriter font used throughout the paper is meant to draw attention to my employment of specifically delineated concepts that carry specific meanings.

6. A reviewer suggests that one might be tempted to call Descartes' view an *identification* of space and body rather than a *reduction* of one to the other. This is an fascinating (and I think plausibly correct) suggestion; indeed, it is suggested by some passages in *Principles* II beyond the ones quoted, such as the remaining part of article 10 (which states that the difference between space and body lies in our way of conceiving it). Nonetheless, for the purposes of this paper I will adopt the reading of Descartes on which he is a `material reductionist`, because that is what the current philosophical consensus is. I leave a more thorough challenge to that consensus to future work, be it mine or theirs.

defend it or something like it include Lehmkuhl 2018 and Schaffer 2009. Lawrence Sklar is the first contemporary figure I can find who discusses a version of this view (Sklar 1974, 165–6) called "supersubstantivalism," and notes supposed historical precursors in the works of Plato, Descartes, W. K. Clifford, Einstein, and John Wheeler.[7]

(You may be wondering why I haven't taken up the usual division of views on space, that between substantivalism and relationalism. The reasons for this will become apparent shortly, I promise. Suffice it to say, for now, that this division carries some assumptions that I want to keep free of.)[8]

On the heels of our first question follows another: What is motion? There is a simple, classical answer: Motion (specifically, local motion) is change of place over time. But this still leaves some further questions.[9] Imagine you're on a train just leaving the station. If you try, you can trick yourself into perceiving that the train is at rest and the station platform in motion. But, *in reality*, the train is moving and the station at rest.

This points to a distinction between *true* motion and *apparent* motion. Apparent motion is quite familiar, but also quite uninteresting: it results from our perceptions, from how things appear to us. When you trick yourself into perceiving that the station platform is moving, that platform is in apparent motion. The question of what *true* motion really is, however, is more interesting.

One answer to this question is what I'll call $\texttt{Absolutism}_1$. This view assumes that `Separatism` is true, and analyzes true motion as the change from being in one region of this separate space to another. Another view is what I'll call `Relationism`. It doesn't have to assume any specific position on spatial ontology (though some proponents do), but rather analyzes the true motion of a body as a change of that body's relation to another distinguished

7. One might think to interpret Newton's view in *De gravitatione*, which we'll examine shortly, as a sort of `spatial reductionism`, but I do not think this can quite be right. At the time of writing Newton clearly thinks there are material substances, or what he calls "bodies" (see for instance Newton 1978a, 122), but that space is not a substance (see Newton (1978a, 131–2)). Moreover, he defines a body as what *fills* parts of space (places), not *as* a part of space (122). I thank a referee for the journal for pressing me on this point.

8. Nor is this an exhaustive carve-up. For example, it is not at all clear that Leibniz, who is in some sense a relationalist, is a `material reductionist`; see fn 10. I leave a more thorough taxonomy for future work, but what we have here is enough for our purposes.

9. The question of what place is, and the distinction between absolute and relative, places are not currently salient. I'll mention it when they are.

material body or class of material bodies. One may also deny that there are any privileged frames of reference. Still another view is one I'll call `Relativism`. On this view, there are no true motions, and all motion is just the relative motion of bodies. Hans Reichenbach put it this way: "There exists only a motion of bodies relative to other bodies, and it is impossible to distinguish one of these bodies as being at rest, because rest means nothing but rest relative to another body." (Reichenbach 1958, 210)

The last view I'll consider, what I'll call $\texttt{Absolutism}_2$, is perhaps the strangest. On this view, true motion is neither denied nor analyzed in terms of motion relative to a material frame or to space itself. One possible adherent of this view is Gottfried Leibniz, who wrote: "I grant that there is a difference between an absolute true motion of a body and a mere relative change of its situation with respect to another body. For when the immediate cause of change is in the body, that body is truly in motion." (Fifth letter to Clarke, ¶53 / Leibniz 1989a, 341)[10]

Before going on, let me make sure I've made an important point very clear: There is an important distinction between *true* and *absolute* motion. As said above, the true motions of bodies are those which they have independently of any episode of sense perception. We also saw above that there are multiple analyses of what it takes to define or characterize true motion. The most familiar one nowadays, given to us primarily by Newton, is $\texttt{absolutism}_1$. But it's important to remember that this is an *analysis* of true motion. If absolute and true motion are sometimes used interchangeably nowadays, this is only because the other analyses are often thought to be failures, and *not* because of synonymy.

Now let me make good on the promise I gave earlier. In making my divisions I've steered clear of the traditional relationalist/substantivalist distinction. My rationale for this

10. Leibniz is a tricky one to categorize, both with respect to motion and with respect to space. With respect to space: While he usually is placed into the relationalist camp, there are significant questions as to whether he maintained, through his mature period, the view upon which space (and time) are well-founded relations between monads, or whether they were merely ideal. This complicates a view on which he is a `material reductionist`. See, to take just two examples, Cover and Hartz 1994, which takes the view that monads are not spatially located, and McDonough 2016, §5, which takes the contrary view. With respect to motion: we'll see a little later on.

is is that these two camps import specific ontological assumptions, assumptions which don't map neatly onto the supposed proponents of these positions.

For example, the (supposedly) prototypical example of the substantivalist is Isaac Newton, who – we all remember – believed in absolute space. But while it's clear that Newton did believe in something called "absolute space," it's not clear he believed that this space was anything like what substantivalists believe in. For example, in the manuscript *De gravitatione et aequipondo fluidorum*, he writes that "[s]pace is a disposition [*affectio*] of being *qua* being," that it is "an effect arising from the first existence of being," and that space and duration "are dispositions of being or attributes [*entis affectiones sive attributa*] according to which we denominate quantitatively the presence and duration of any existing individual thing." (Newton 1978b, 136) This does not neatly fit the traditional category of substance in the least.[11] Indeed, Newton says outright that space (or in the passage, extension, though in that context he clearly means the same thing) "has its own manner of existence which fits neither substance nor accidents." (132)

My reason for not employing the classic substantivalist/relationalist division should now be clear. There's a perfectly reasonable relationship between the divisions I've made and the divisions often made: substantivalism is an instance of `separatism`, relationalism is an instance of `material reductionism`, and (perhaps most strangely) supersubstantivalism is an instance of `spatial reductionism`. But introducing these divisions helps us categorize without building too much into our taxonomy, at pain of making historical figures hold views their writings indicate they didn't.

One final note before continuing: In saying this, I don't think that the debate between substantivalism and relationalism is outmoded, or beside the point, or meaningless. The question of whether space (or in contemporary views spacetime) is a substance holds genuine philosophical interest. Instead my point is that in order to conduct historical analysis, one needs to be sensitive to the categories that thinkers themselves used. This suggests making

11. On this point see e.g. DiSalle 2006, 37–8, Slowik 2016, Chapter 2, and perhaps most importantly Stein 1967, 191–7.

taxa as broad as possible while still supporting genuine distinctions. And that is what I've tried to do.

Section 2. Spinoza's texts

This section will look at Spinoza's views on space throughout a variety of his major works. It will, however, place a greater emphasis on *Ethics* and leave the developmental question of how and whether his views on space evolved to the side. This is because the conclusions this section reaches, and the complications which ensue in later sections, depend almost entirely on the views that Spinoza held in *Ethics* or around the time he was seriously writing it, and after the first two texts we'll examine, *Tractatus de intellectus emendatione* and *Principles of Cartesian Philosophy*

Subsection 2.1. Space in *Tractatus de intellectus emendatione*. In §56-7 of Spinoza's early work *Tractatus de intellectus emendatione* (henceforth TdIE), when discussing the act of feigning that something is true, Spinoza gives the following example:

> It remains now to note also those things that are supposed in Problems. This sometimes happens even concerning impossible things. E.g., when we say "Let us suppose that this burning candle is not now burning, or let us suppose that it is burning in some imaginary space [*aliquo spatio imaginario*], *or* where there are no bodies." Things like this are sometimes supposed, although this last is clearly understood to be impossible...
>
> In the second case, nothing is done except to abstract the thoughts from the surrounding bodies [*corporibus circumjacentiubus*] so that the mind directs itself toward the sole contemplation of the candle, considered in itself alone, so that afterwards it infers that the candle has no cause for its destruction. So if there were no surrounding bodies, this candle, and its flame, would remain immutable, or the like. (Spinoza 1985, 26 / Spinoza 1925, II 21–2)

Here, Spinoza seems to be saying two things. The first is that there cannot be space without body. The second is that, insofar as we are engaging in reasoning concerning space without body, we are engaging in abstraction. Consequently, insofar as we think of space as independent of body, we are thinking of it only abstractly, and therefore (for Spinoza) not adequately.[12] Later on, he makes some cryptic remarks in speaking of the errors which people fall into when they do not know how to distinguish between the imagination and the intellect: "Such errors as: that extension must be in a place [*debeat esse in loco*], that it must be finite, that its parts must be really distinguished from one another, that it is the first and only foundation of things, that it occupies more space at one time than at another [*uno tempore majus spatium occupet*], and many other things of the same kind." (Spinoza 1985, 37–8 / Spinoza 1925, II 33)

Unfortunately, Spinoza does not tell us what he means by "place" in the TdIE. Does he mean by "place" what Descartes means by "place" in, e.g., *Principles* II.14 (Descartes 1984, 229 / Descartes 1897-1910, VIIIA 47-8), when the latter speaks of place as being distinct from body, since place "designates more explicitly. . . position, as opposed to. . . size or shape"?[13] Maybe, but we should be cautious in doing so. In his reworking of the *Principles*, Spinoza writes that Descartes thinks that "place. . . is not something real, but depends merely on our thoughts." (Spinoza 1985, 263 / Spinoza 1925, I 182)

That notwithstanding, Spinoza clearly says it's an error to think that extension must be in a place. I take this to mean, not that an extended *thing* cannot be properly said to be in a place, but that an extended *substance* cannot be properly said to be in a place. This is because of the other errors that he attributes to those who imagine extension: that it is finite, and that its parts are really distinct. These are precisely the points that he deals with in EIp15s, when discussing whether extended substance is finite or has parts. So if bodies occupy space, they cannot be substances. (This is of course assuming, as I do throughout this essy, that bodies are extended in space. Even if that view is false, however, the conditional is still true.)

12. This same point is made by Gueroult 1974, 373 (though not on the same textual basis).

13. Descartes treats "internal place" and "space" as synonymous elsewhere in the *Principles* (in *Principles* II.10 / Descartes 1984, 227 / Descartes 1897-1910, VIIIA 45).

Subsection 2.2. Space in *Principles of Cartesian Philosophy* and *Cogitata Metaphysica*. In *Principles of Cartesian Philosophy* (henceforth PCP), Spinoza's geometrical reworking of Descartes' *Principles*, he writes that "we only make a distinction of reason between *space* and extension [*spatium ab extensione non, nisi ratione, distinguimus*], *or* they are not really distinct. Read *Principles* II, 10." (Spinoza 1985, 263 / Spinoza 1925, I 181) The passage from Descartes is the one we quoted above, which asserts that "there is no real distinction between space. . . and the corporeal substance contained in it."

One can read this passage in two ways. In the first, Spinoza is equating spatial relations with relations between corporeal substances. In the second, he is equating spatial relations with relations between *bodies*. This distinction is important when we get to his mature philosophy, since bodies, while extended, are not substances.

Spinoza tells us later on that "space and body do not really differ" (Spinoza 1985, 267 / Spinoza 1925, I 187). He reasons as follows: Body and extension don't really differ, space and extension don't really differ, so body and space don't really differ. Space also may not be conceived except as indefinitely or infinitely large: "No one can conceive the limits of any extension, *or* space, unless at the same time he conceives other spaces beyond them, i.e., immediately following them." (Spinoza 1985, 265 / Spinoza 1925, I 184)

In *Cogitata Metaphysica* (appended to PCP, henceforth CM), Spinoza says something similar to what he said in TdIE about space abstracted from matter: "[D]uration presupposes, or at least, supposes created things. Those, however, who imagine duration and time before created things labor under the same prejudice as those who invent a space outside matter [*qui extra materiam spatium fingunt*]." (Spinoza 1985, 335 / Spinoza 1925, I 269) The reasoning seems to be this. Those who think that there is time or duration without things are mistaken, and make the same error as those who think of space as something over and above matter.

This finds more support elsewhere in CM. Spinoza writes that the common account of creation arises because "when things are generated, they [the philosophers] customarily suppose something prior to the things, out of which the things are created." (Spinoza 1985, 334 / Spinoza 1925, I 268) He continues: "The same has happened concerning matter. Because

they see that all bodies are in a place [*loco*] and are surrounded by other bodies [*et ab aliis corporibus cingi*], when they ask themselves where the whole of matter would be, they reply, in some imaginary space [*spatio imagniario*].[14]" (Spinoza 1985, 334 / Spinoza 1925, I 268)

In this passage, a space in which all of the material universe is located is said to be "imaginary." For Spinoza, this likely means that such a space does not actually exist outside the mind. This too is support for the idea that Spinoza is a `material reductionist`, since it entails that space without matter does not exist outside the mind. But since this is both an early work and one which we know Spinoza does not entirely agree with at the time of writing (of which more later), we will place comparatively little weight on it. I'll now turn to an examination of the *Ethics*, which is both his most mature work and the one containing the views on which I'll place the most weight.

Subsection 2.3. Space in the *Ethics*. In the works we've examined so far, Spinoza appears to say that space or extension is nothing over and above bodies. This picture is slightly more complicated in the *Ethics*. Spinoza does not talk about space explicitly there, not even in the Physical Digression, where all else being equal we would expect him to if we were going to.[15]

There is, however, much discussion of *extension*. Spinoza thinks that extension, or extended substance, to be prior to bodies. In EIId1[16] he writes: "[b]y body I understand a mode that in a certain and determinate way expresses God's essence insofar as he is considered as an extended thing." (Spinoza 1985, 447 / Spinoza 1925, II 84) Since attributes constitute the essence of God (EId4 / Spinoza 1985, 408 / Spinoza 1925, II 45), and bodies are modes of God, or ways God is, extension is both conceptually and causally prior to bodies.

14. This may be a reference to Adriaan Heereboord's *Meletemata philosophica*. There, Heereboord writes of an "imaginary space outside of created things", which God is said to be in. (Heereboord 1665, 101–2) This parallels some of Spinoza's remarks. Both write of a space that is outside of bodies (in Spinoza) or created things (in Heereboord). In both cases, such a space is said to be "imagined." This carries more import for Spinoza than for Heereboord, in all likelihood, but a comparison of both concepts is beyond the scope of this paper.

15. Peterman 2014, 219 notes the same thing.

16. I employ the standard abbreviation of *Ethics*. For example, *Ethics* part II definition 1 is here referenced as EIId1; proposition 1 would be made reference to as EIIp1, and so forth.

This complicates the view of Spinoza as a `material reductionist`. If space is the same as extension, and bodies are prior to space, then bodies are in some respect prior to extension. But this is an inversion of the relationship that Spinoza wants to set up. Extension, or extended substance, is both conceptually and causally prior to individual bodies. So in the *Ethics* at least, space cannot be identified with extension.

This might be a reason to think that Spinoza is a `spatial reductionist`. Recall that this position identifies material objects or bodies either with regions of space or qualities possessed by those regions. This keeps the explanatory flow in the right direction. Properties are predicated of regions of space, or inhere in them, just as modes are said to inhere in substance.

But this proposal won't work. In the scholium to EIp15, Spinoza points out how those who think God is not an extended substance get things wrong. One of their chief errors is in thinking "that corporeal substance, insofar as it is substance, consists of parts." (Spinoza 1985, 421 / Spinoza 1925, II 57) The parts of matter [*materiam*] are "distinguished only modally, but not really." (Spinoza 1985, 424 / Spinoza 1925, II 59)

Here's the problem. If space really does have regions, as both the `Separatist` and the `spatial reductionist` think, then it really has parts. And since matter or corporeal substance doesn't really have parts, matter or corporeal substance can't be identified with space. So Spinoza can't be a `spatial reductionist`. Hence when Jonathan Bennett, for instance, writes that, for Spinoza, "bodies should be understood in terms of – to put it in shorthand – thickenings of regions of space" (Bennett 1980, 396), he is attributing to Spinoza a view which the text indicates Spinoza did not hold.[17]

This criticism is not original to me. It's also made by Melamed 2009, 77n193: "Extension has neither actual nor potential parts, whereas regions of space seem to be potential parts of space."[18] Melamed, for his part, reads Spinoza as thinking that "space is just an infinite

17. I should note that Bennett wants to say that space may have regions without having parts. I must confess, this is unintelligible to me. Maybe there's a way to make good on a material object having different spatial relations to different regions of space without having relations to *parts* of the same space. But for my part I don't know what this can mean.

18. See also Schmaltz 1999.

mode (either immediate or not) of Extension." (Melamed 2009, 77n193) This is a sort of `Separatist` view – spatial relations are just relations between (finite) modes of extension and an infinite mode of extension.[19] What they are *not* is relations between bodies, which Spinoza thinks are finite (see EIp15 / Spinoza 1985, 421 / Spinoza 1925, II 57).

One might raise something like the following issue.[20] One might think that, in denying that infinite extension has parts in EIp15, Spinoza merely means to deny that it has parts that are prior to it. Perhaps he takes a view similar to that taken by some contemporary priority monists (such as Schaffer 2010) on which the whole is ontologically prior to its parts. On this view, then, corporeal substance can be identified with a space that is simply prior to its parts.

I see at least two problems with this proposal as a reading of Spinoza. First, consider EIp12, which reads: "No attribute of a substance can be truly conceived from which it follows that the substance can be divided." (Spinoza 1985, 419 / Spinoza 1925, II 55) But if infinite extension has parts, then it can be divided, and hence infinite substance would be able to be divided. And in EIp15s (Spinoza 1985, 422 / Spinoza 1925, II 58) Spinoza explicitly says that the notion that corporeal substance is composed of parts is something he has already shown to be absurd.

The second problem with this comes in Ep. 35, written in 1666 to Johannes Hudde, where Spinoza explicitly states that parts are prior in nature to wholes.[21] There he says that a necessary being "is simple, and not composed of parts. For component parts must be prior in nature and knowledge to what is composed by them. In a being eternal by its nature this cannot be." (Spinoza 2016, 27 / Spinoza 1925, IV 181) A more unqualified endorsement of the classical view that the parts are prior to the whole is hard to imagine. Given these two considerations, I think we should conclude that Spinoza thinks infinite extension and hence corporeal substance are exactly what he says they are – partless.

19. As noted in the introduction, however, Melamed has indicated that he does not currently hold this view.
20. I thank a referee for raising this to me.
21. Spinoza's letters are cited as Ep. [number]. For example, in this case, the thirty-fifth letter is Ep. 35.

Now, perhaps Spinoza might allow for a somewhat deflated notion of parthood or regionhood, where the regions of corporeal substance are just parts of corporeal-substance-insofar-as-it-is-modified.[22] One jumping-off point for this reading might be Spinoza's discussion of how the parts of substance are distinguished only modally but not really, as water is generated and corrupted in one sense but not another. (Spinoza 1985, 434 / Spinoza 1925, II 60) Hence, while space might be mereologically simple insofar as it is just unmodified corporeal substance, it might be mereologically complex insofar as it is modified.

The trouble with this interpretation, to my mind, is that we plausibly know what Spinoza thinks that the parts of extension would be if it were divided, and it's not regions of space but *bodies*. He writes, earlier in the scholium to EIp15: "So also others, after they feign that a line is composed of points, know how to invent many arguments, by which they show that a line cannot be divided to infinity. And indeed it is no less absurd to assert that corporeal substance is composed of bodies, *or* parts [*corporibus, sive partibus*], than that a body is composed of surfaces, the surfaces of lines, and the lines, finally, of points." (Spinoza 1985, 423 / Spinoza 1925, II 59) So insofar as corporeal-substance-insofar-as-it-is-modified has parts, Spinoza takes this parts to be *bodies*, not regions of space. This suggests against `separatism` yet again. It does not decide decisively against *spatial reductionism*, but to my mind there are at best weak independent reasons to attribute this view to Spinoza in the first place. We will now turn to positive, systematic reasons why we should attribute neither `separatism` nor `spatial reductionism` to Spinoza.

Subsection 2.4. More reason for `material reductionism`. But this view also has problems. Even if Spinoza hadn't thought corporeal substance is perfectly simple, there's another argument for why Spinoza cannot recognize real regions of space independent of bodies. It's the one that Leibniz gives against absolute space in the third letter to Clarke: "Space is something absolutely uniform, and without the things placed in it, one point of space absolutely does not differ in anything from another point of space. Now, from hence it

22. I thank a referee for raising this point to me.

follows (supposing space to be something in itself, besides the order of bodies among themselves) that is impossible there should be a reason why God, preserving the same situations of bodies among themselves, should have placed them in space after one certain particular manner and not otherwise–why everything was not placed the quite contrary way, for instance, by changing east into west." (Third letter to Clarke ¶5 / Leibniz 1989a, 325)

Here is my reconstruction of Leibniz's reasoning:

(P1) If there is absolute space, then its parts are not intrinsically different.

(P2) If parts of space are not intrinsically different, then there is no reason why the world exists as it is rather than reflected about an axis relative to absolute space

(P3) There is a reason why the world exists as it is and not otherwise.

So: (C1) Parts of space are intrinsically different.

So: (C2) There is no absolute space.

(P1.3) is the crucial joint of the argument. It's also a corollary of the principle of sufficient reason (PSR). And Spinoza would certainly accept the version of the PSR that entails this premise. In EIp8s2 he writes that "there must be, for each existing thing, a certain cause on account of which it exists." In EIp11d2 he writes that "for each thing there must be assigned a cause, *or* reason, as much for its existence as for its nonexistence." (Spinoza 1985, 415 / Spinoza 1925, II 50) And in axiom 11 of PCP (Spinoza 1985, 246 / Spinoza 1925, 158), he writes that "[n]othing exists of which it cannot be asked, what is the cause, *or* reason, for which it exists." It seems that (P1.3) is a clear upshot of this version of the PSR, so Spinoza should be forced to accept it, along with the conclusion that there is no absolute space.

Now of course Spinoza never read the Leibniz-Clarke correspondence. But as we saw above, he definitely accepted the version of the PSR necessary to get the argument going. Recall that we are not just interested, in this paper, in what Spinoza *did* say – we are also interested in what, given his system as a whole, he ought to have said to remain consistent.

On the basis of these two considerations, therefore, we have yet another reason to suspect that he did not accept `separatism`.

Section 3. Extant Readings of Spinoza on space

Some philosophers take Spinoza to be a `spatial reductionist`. For instance, Jonathan Bennett writes that "[Spinoza] suggests that there is just the one substance–namely, the whole of space–regions of which get various qualities such as impenetrability, mass, and so on, so that any proposition asserting the existence of a body reduces to one saying something about a region of space." (Bennett 1984, §22.1) Philosophers and commentators who agree with him on this count include Schaffer 2009, 133, Lehmkuhl 2018, 24, Grant 1981, 229, Alexander 1920, 401, Rice 1996, 36, Garrett 2021, 46, and Cover 1999, 108, who goes so far as to call the view that "[t]he one extended substance is…the entirety of space" the standard view. Others, such as Koyré 1957, 155, Donagan 1995, 348, Robinson 2009, §4.3, Smith and Nelson 2010, 12n20, and Yenter 2014, 262, take Spinoza to be a relationalist, and hence in my classification a `material reductionist`. One should not, however, get the impression that these are extended treatises on Spinoza's conception of space; instead, they tend to be brief comments or asides.

When we look at Spinoza's historical context, the common reading of his near-contemporaries was that he was a Cartesian (someone who identifies matter with extension, and hence space). For instance, Pierre Bayle 1697/1965, 307 presents, as one of his objections to Spinoza's system, that "[t]he immutability of God is incompatible with the nature of extension. Matter actually allows for the division of its parts." Later on down he writes that Spinozists "contend that for matter to be divided it is necessary that one of its portions be separated from the others by empty spaces, which never happens." (307) This seems a clear reference to EIp15s, where Spinoza gives an argument from the impossibility of a vacuum that corporeal substance is not composed of parts (see Spinoza 1985, 423 / Spinoza 1925, II 59). This mutability is attributed to matter, and so it seems fair to read the first quotation as saying that the immutability of God is incompatible with the nature of extension *because* matter is

extension and matter allows for the division of its parts. Bayle's intent therefore seems to be the imputation of a Cartesian view on which extension (and therefore space) and matter are one and the same.

Anglophone readers of Spinoza seem to have done this as well. Peterman, forthcoming, 11 notes that in a draft of Query 23 of the *Opticks*, Newton attacks "An Atheist" with views suspiciously like those of Spinoza, such as that "matter is space." Colin Maclaurin seems to have considered Spinoza as a follower of Descartes, who (he thinks) erred by "placing the essence of matter in extension alone." (Maclaurin 1748, 74). He writes, of Spinoza's inferences "from the Cartesian principles": "As we are not able to conceive that space can be annihilated, or that there ever was a time when space or expansion was not; so if we allow that extension alone constitutes the essence of matter, we cannot but ascribe infinity, eternity, and necessary existence to it." (74)

Henry More, in the so-called *Confutation of Spinoza* (More 1675-1679, II i 615–35), thought so as well. By "attribute" of God, More thinks, Spinoza has in mind the Cartesian notion of attribute; More refers at one point to "nature or attribute [*natura sive attributi*]. (II i 617) He further notes in various places that, as he reads things, Spinoza seems to equate God and matter. In one passage (II i 622), he reproduces the entirety or large portions of propositions 16, 17, 25, 26, 28, 29, 32, and 33, along with various of their corollaries and scholia. In every case, where the word "Deus" and its inflections appear, he inserts immediately after "[i.e. Materia]" (properly inflected).[23] So, it seems, More thinks that Spinoza equates the essence of God with matter.

It seems unlikely that More, who thought long and hard about the nature of space, would not understand that he was imputing to Spinoza an essentially Cartesian view. More's definition of body as "A substance impenetrable and discerpible [divisible]" (More 1659/1987, 30) comes as a specific repudiation of Descartes' notion of body as extension.[24] This notion

23. For more on More's criticisms of Spinoza see, for instance, Reid 2013.

24. More recognized two senses of extension, one in which bodies were said to be extended, and another in which spirits, "a substance penetrable and indiscerpible" (More 1659/1987, 29) were said to be.

he explicitly denies: "[I]t is not characteristical of a body to have *dimensions*, but to be *Impenetrable*." (55) So I conclude that More, just like Maclaurin, read Spinoza as a Cartesian about space.

These roughly-contemporaneous attributions of Cartesianism provide some evidence that Spinoza was a `material reductionist`. But it is not decisive, and that is not a conclusion I would be justified in drawing from this evidence alone. Almost all of Spinoza's early readers were quite hostile towards him, so we mustn't take their interpretations at face value. We must look to the texts, as we have done in the previous section, and to systematic evidence, which we'll do in the next section.

Section 4. Complications

In spite of what we've seen so far, there are also powerful motivations for Spinoza to be some sort of `Separatist`. These reasons have to do with the role motion plays in his system. The problem is two-fold. First, his account of diachronic and synchronic individuation requires something like absolute motion, which (one might think) can't be secured without absolute space. (More precisely, it requires true motions which can't be secured by reference merely to relative motion.) This motivates a commitment to `Separatism`. And second, various positions he takes about natural laws rule out the Cartesian picture of motion and instead demand absolute motions. This, again, counts in favor of absolute space, and hence `Separatism`.

Subsection 4.1. Problem One: Individuation. First, let's examine the Physical Digression, found after EIIp13. Lemma 1 is: "Bodies are distinguished from one another by reason of motion and rest, speed and slowness, and not by reason of substance." (Spinoza 1985, 458 / Spinoza 1925, II 97) On composite bodies, Spinoza writes: "When a number of bodies, whether of the same or of different size, are so constrained by other bodies that they lie upon one another, or if they so move, whether with the same degree or different degrees of speed, that they communicate their motions to each other in a certain fixed manner, we shall say that those bodies are united with one another and that they all together compose one

body *or* Individual, which is distinguished from the others by this union of bodies." (Spinoza 1985, 460 / Spinoza 1925, II 99–100) This fixed communication of motions is what constitutes "the form of the Individual." (Spinoza 1985, 461 / Spinoza 1925, II 100) In order for an individual to retain the same form through change, its parts must retain the same "ratio of motion and rest to each other" (Spinoza 1985, 461 / Spinoza 1925, II 100–1) This strongly suggests that what it is for the parts of this individual to communicate their motions in the same way is for them to retain the same ratio of motion and rest to each other.

This kinematic property underlies Spinoza's principle of synchronic and diachronic identity. As long as an individual retains this property through some change, it remains the same through that change. Further, in EIVp39 Spinoza claims that "[t]hose things are good which bring about the preservation of the proportion of motion and rest the human Body's parts have to one another." (Spinoza 1985, 568 / Spinoza 1925, II 239) He even goes so far to say, in EIVp39s, that he "understand[s] the Body to die when its parts are so disposed that they acquire a different proportion of motion and rest to one another.[25]" (Spinoza 1985, 569 / Spinoza 1925, II 240)

But problems lurk. We can see this by considering the following premises:

(1) The nature of an individual consists in a certain ratio of motion and rest

(2) An individual only has one nature.

(3) There is only relative motion.

Spinoza endorses (1), as we've just seen. (2) follows from his definition of essence in EIId2: "I say that to the essence of any thing belongs that which, being given, the thing is [NS: also] necessarily posited and which, being taken away, the thing is necessarily [NS: also] taken away, or that without which the thing can neither be nor be conceived, and which can neither be nor be conceived without that thing."

The basic idea is this. Suppose that a thing can have two essences or natures. Then that thing is conceivable, completely, using one essence or using the other. But then that thing

25. For discussions of the ratio of motion and rest and what it consists in, see Matheron 1969, 40; Gueroult 1974, Chatper 6; Lachterman 1977, 84–5; Adler 1989, 1996; Matson 1990, 89; Garrett 2018b, 306–7.

can be conceived adequately using one essence and without the other, in which case the other isn't an essence at all.[26]

Now (3) doesn't follow from any of Spinoza's commitments so far. But I want to use it to bring out a possible route to `Separatism`. Suppose that (3) is correct. Then whether or not a body is in motion will depend on which body is taken as the reference point.

But this won't do. We saw above that Spinoza thinks that the nature of an individual consists in the ratio of motion and rest its parts maintain. If (3) is true, however, any particular body can be chosen to be the reference frame from which to judge the motion. And from this, it follows that the ratio of motion and rest plausibly changes depending on which part we choose. And so if we have multiple different, equally acceptable ratios of motion and rest, then we have multiple, equally acceptable natures of the individual in question. And then (2) is mistaken.[27]

But this by itself is too quick, since the mere fact that the motion of some body is relative does not mean that it is not truly moving (as noted in §3). Descartes' conception of motion furnishes an example of a view on which the inference from "x is moving relatively" to "there is no fact of the matter as to whether x is really in motion" fails. He thinks that all motion is the relative motion of bodies, but also that there's a privileged material frame for motion which secures true motion, motion "in the strict sense.". For him, this is "the transfer of one piece of matter, or one body, from the vicinity of other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies." (*Principles* II.25 / Descartes 1984, 233 / Descartes 1897-1910, VIIIA 53) So for Descartes, it's false that one body, chosen as a point of reference, is as good as any other. True motion is always just motion with respect to a particular neighborhood of bodies with which the moved body is in contact.

26. For an opposing view on whether a thing can have multiple essences, see Newlands 2018, Chapter 5.

27. Note that this argument does not rely on whether the ratio of motion and rest is a mathematical ratio or proportion (though I think this is the correct view), but instead merely on the idea that all motion is just the motion of one body relative to the other. Since we may regard any body we like as being at rest, we get indeterminacy. I thank a referee for pressing me on this point, and more on this subject soon.

But this faces another problem. On Descartes' view, motion is *reciprocal*. See, for instance, *Principles* II.29: "[T]ransfer is in itself is a reciprocal process: we cannot understand that a body AB is transferred from a body CD without simultaneously understanding that CD is transferred from the vicinity of AB." (Descartes 1984, 235 / Descartes 1897-1910, VIIIA 55-6) When combined with Descartes' view that true motion is just the transferal of a body away from its contiguous neighborhood, the reciprocity of motion entails that there is no mind-independent fact of the matter concerning whether a body is in motion in the strict sense or its neighborhood is, since whether we consider AB as moving away from CD or CD as moving away from AB is a pure act of convention.[28] In other words, which body is the subject of *true*, mind-independent motion is indeterminate.[29] So on the Cartesian view of motion, it's indeterminate whether or not a particular part of an individual is truly in motion or truly at rest. And this matters for Spinoza. For him, merely apparent motion is (plausibly) a product of the first kind of cognition, in the same way that apparent figure is.[30] And since the nature of an individual is something that should be defined without reference to inadequate ideas (which are the only sort that the first kind of cognition produces), it should only be characterized in terms of true motion. But on the Cartesian view, this cannot be uniquely secured.

We don't know how to calculate the ratio of motion and rest, so it's impossible to be absolutely certain whether this would create a problem. As Alan Gabbey notes, the ratio "lacks a quantitative anchoring, and is therefore much too vague to allow an assessment of what exactly is being claimed." (Gabbey 1995, 169) But this indeterminacy of motion is still a worrying feature. We might yet again wind up contradicting (2).

28. This, to be clear, is not Descartes' view, but rather an upshot of his view. I thank a referee for pressing me on this.

29. This was noted by, among others, Leibniz: "If motion is nothing but the change of contact or of immediate vicinity, it follows that we can never define which thing is moved…if there is nothing more in motion than this reciprocal change, it follows that there is no reason in nature to ascribe motion to one thing rather than to others. The consequence of this will be that there is no real motion [*motum realem esse nullum*]." (Leibniz 1989b, 393 /Leibniz 1965, IV 369) Leibniz's own solution to the problem is to require that the cause of change of motion be internal, that it be "a force, an action." (Leibniz 1989b, 393 /Leibniz 1965, IV 369)

30. See EIIp35s.

So there are two points here. First, the nature of the individual involves a kinematic property. And second, it seems like this kinematic property can't be analyzed in terms of the Cartesian view of motion, and plausibly in terms of any view on which the true motion of a material body is analyzed as in some way relative to some other material body. Now assuming that Spinoza wants to make his account of individuation work, he can't just give up – he's got to secure those true motions in some non-relative way. And it seems like the natural way to do that is to introduce absolute space and analyze "true" motion in something like the way Newton does, as transference of a body from one region of absolute space to another.[31] But, as we saw, there are substantive reasons to think Spinoza did not accept the existence of absolute space.

Subsection 4.2. Problem Two: Natural laws. There is a second problem which might be solved by `Separatism`. Spinoza holds various positions about natural laws that are in tension with the Cartesian picture of motion. Let's see how.

Spinoza holds that "a body in motion moves until it is determined by another body to rest; and…a body at rest also remains at rest until it is determined to motion by another." (Spinoza 1985, 459/ Spinoza 1925, II 98) This is his formulation of a law of inertia. The problem is that, as is well-known, under the relativist and relationist pictures of true motion, inertial concepts like rectilinear motion can't be properly defined. Newton notes just this in *De gravitatione*: "I say that [from the Cartesian theory of motion] it follows that a moving body has no determinate velocity and no definite line in which it moves. And, what is worse, that the velocity of a body moving without resistance cannot be said to be uniform, nor the line said to be straight in which its motion is accomplished. On the contrary, there cannot be motion since there can be no motion without a certain velocity and determination." (Newton 1978a, 129)

Modern commentators on Descartes note the same thing. According to Slowik 2002, 59, "one must admit that, without absolute [spatial] positions or a fixed material reference frame, it is just not possible to salvage an intelligible relational description of inertial motion."

31. See Newton's famous scholium at Newton 1999, 408ff.

Elsewhere he writes that "since all trajectories are determined relative to each observer given [a relativist account of motion], and all observers are in relative motion, any effort to fix the unique path of a particular moving body will result in a host of conflicting measurements, none of which can lay claim to its 'actual' path." (Slowik 1999, 120) Gabbey 2008, 658 write that "in Descartes' world a moving body has no determinate path, and therefore no determinate speed." Dissenting somewhat about whether there is a "privileged frame for determining the motion and rest of a given body," Garber 1992, 171 nonetheless writes that, for Descartes, "as a body moves in a plenum, its contiguous neighborhood will change from moment to moment. And without a common frame of reference from one moment to the next, it is very difficult to see what sense can be made of the speed or direction of a given body."

So if Spinoza is a good Cartesian, he's in a bind. On the one hand, he wants a law of inertia on the books. On the other, a purely Cartesian notion of motion will not do the trick. From what we saw above, the Cartesian picture of motion doesn't let one define rectilinear motion, and Descartes indeed believed that inertial motion (though he didn't call it that in the *Principles*) was rectilinear (*Principles* II 39 / Descartes 1984, 241 / Descartes 1897-1910, VIIIA 64).

But was Spinoza a Cartesian about laws of motion? He doesn't (except in PCP) explicitly avow Descartes' laws.[32] But arguably he does implicitly avow them. In Letter 31, Henry Oldenburg writes to Spinoza that "[w]hen you speak about Huygens' *Treatise on Motion*, you hint that Descartes' Rules of motion are almost all false." (Spinoza 2016, 16 / Spinoza 1925, IV 167) In response, Spinoza writes that "[a]s for what you write next – that I hinted that Descartes' Rules of motion are almost all false – if I remember rightly, I said that Mr. Huygens thinks this. I did not affirm that any of the Rules was wrong except the sixth." (Spinoza 2016, 20 / Spinoza 1925, IV 174a) It seems reasonable to say that if Spinoza disbelieved all the rules, he would've said so here. But he explicitly declines to say that.

32. He does, at least in PCP, argue that inertial motion is rectilinear (Spinoza 1985, 277 / Spinoza 1925, I 202). Arguably A2" in the Physical Digression (Spinoza 1985, 460 / Spinoza 1925, II 99) implies this too, since it requires that the angle of incidence in a collision equal the angle of reflected motion. This could not be accomplished unless the resulting paths were rectilinear.

So it seems reasonable to say that he didn't disbelieve the second rule (since the only one he says he disbelieved was the sixth).

Spinoza also thinks that it's a natural law that "a body which strikes against another lesser body loses as much of its motion as it communicates to the other body." (Spinoza 2016, 125–6 / Spinoza 1925, III 57) This is Descartes' third law of nature: "[I]f a body collides with another body that is stronger than itself, it loses none of its motion; but if it collides with a weaker body, it loses a quantity of motion equal to that which it imparts to the other body." (*Principles* II.40 / Descartes 1984, 242 / Descartes 1897-1910, VIIIA 65) This creates similar problems. Garber 1992, 171 observes that "without a common framework in which to conceive of the relative motions of more than one body, it is difficult to see how we could give an adequate treatment of the phenomenon of impact." And Blackwell 1966, 226 writes that: "The two parts of the law describe what Descartes thinks happens when the force of the first body is either larger or smaller than the force of the second body. But in a collision two bodies, which one should be designated as the first body and which the second? If the two bodies involved are B and C, should we say that collides with C or that C collides with B? The answer, it seems, is both. But on this basis the first and the second parts of the third law are inconsistent."

So if Spinoza adopts Descartes' third law of nature, along with the latter's theory of motion, he is saddled with problems and inconsistencies. He needs some way out.

Subsection 4.3. Upshot: `Absolutism` without `separatism`? As we've seen, Spinoza has two motivations for adopting a commitment to absolute space. First, it would secure for him the sort of true motions he needs to make his account of individuation work (as we saw, this can't be accomplished by analyzing true motion in terms of mere relative motion). Second, it would allow him to retain the conception of motion necessary for an inertial law and one which allows for the retention of Descartes' third law. These motivations don't necessarily involve rejecting (3) wholesale. Both the relativist and relationist about motion and the `Separatist` about space might think of motion as an irreducibly dyadic predicate:

x moves relative to y.[33][34] The relativist or relationist about motion thinks that y is some material reference frame, whereas the `Separatist` might think that it's space itself.

Still, this sits uneasily with the rest of Spinoza's metaphysics. For one thing, it implies that space actually has regions. As we saw above, the most natural candidate for absolute space (God qua extended substance) doesn't have part or regions, and so isn't up for the job. So how is Spinoza to solve this problem? To answer this, we need to examine Spinoza's conception of motion.

Section 5. Spinoza on Motion

We saw above that Spinoza has good reason to believe in absolute space: It solves various problems regarding motion. I'll argue in this section, however, that this move is unnecessary. Not only can Spinoza solve the relevant problems without adopting `Separatism`, he can do so with resources that already exist within his system – namely, by using his conception of absolute motion.

Subsection 5.1. The texts. As has been pointed out by some commentators (by e.g. Peterman 2015, 17), Spinoza nowhere defines motion, at least not in his own voice.[35] This was also noted by some of his interlocutors. Ehrenfried Walther von Tschirnhaus, in Letter 59, "humbly [asks Spinoza] for the true Definition of Motion and its explanation." (Spinoza 2016, 431 / Spinoza 1925, IV 269) In his reply in Letter 60, Spinoza demurs: "As for the other things, concerning motion and Method, because they aren't yet written out in an orderly

33. This follows the strategy used first, at least explicitly, by Sklar (Sklar 1974, 187), I think, and later by other such as, e.g., Friedman 1983, 232, Rynasiewicz 2000, 74 and Rynasiewicz 1995, 134, though the analyses given by Sklar and Rynasiewicz as to the views on the completeness of the predicate "x moves" are, I think, somewhat different. Something similar is suggested in Armstrong 1963, 217, with respect to "complete" and "incomplete" statements, which occurs prior to Sklar's discussion.

34. Or, perhaps, a monadic predicate that is analyzed in terms of motion with respect to some other bodies. Technically, I am here departing somewhat from the construal of motion as a complete or incomplete predicate as presented in, for instance, Rynasiewicz 1995, 2000, 2014; Huggett and Hoefer 2018. The latter notes that even though, in the Cartesian case, "x moves-properly-speaking" is analyzed in terms of relative motion, it is still a complete predicate. I have decided on an exposition upon which the predicate is incomplete in the `relationist` case mostly for clarity of exposition, and I do not think any important philosophical point hinges thereon.

35. He offers a definition of motion in the PCP, but there's good reason to believe that this may not represent his own thoughts on the matter, as we'll see shortly.

fashion, I reserve them for another occasion." (Spinoza 2016, 433 / Spinoza 1925, IV 271) So we have no definitive statement of Spinoza's definition of motion.

But we can still make educated inferences. First, motion is one of the immediate infinite modes of extension (strictly speaking, this is motion and rest, not motion alone). (Spinoza 2016, 439 / Spinoza 1925, IV 278) Second, it is used to define the kinematic property that provides diachronic and synchronic individuation. There are other scattered indications as well. For instance, Spinoza says in TdIE that the intellect "forms the ideas of motion only by attending to the idea of quantity." (Spinoza 1985, 43 / Spinoza 1925, II 39) In a somewhat oblique footnote in the *Short Treatise*, he writes: "But, you say, if there is motion in matter, it must be a part of matter, not in the whole, since the whole is infinite. For in what direction would it be moved, since there is nothing outside it? Then in a part. I reply: there is no motion by itself, but only motion and rest together, and this is, and must be, in the whole; for there is no part in extension." (Spinoza 1985, 71 / Spinoza 1925, I 25) What Spinoza appears to be saying here is that motion, as a mode of extended substance, is everywhere in extension.[36] It also bolsters the idea that motion is not relative to regions of space or extension.

Spinoza writes the following in the Physical Digression: "For when I suppose that body A, say, is at rest, and do not attend to any other body in motion, I can say nothing about body A except that it is at rest…If, on the other hand, A is supposed to move, then as often as we attend only to A, we shall be able to affirm nothing concerning it except that it moves." (Spinoza 1985, 459 / Spinoza 1925, II 99–100) Here's how I read this passage: It's possible to conceive of an object as being in rest, or in motion, *absolutely*. In other words, it's possible to do so without reference to any other body. This suggests that Spinoza holds some sort of absolutist view about motion.[37]

This is supported by the demonstration of Lemma 2 ("All bodies agree in certain things"): "For all bodies agree in that they involve the concept of one and the same attribute (by Dl), and in that they can move now more slowly, now more quickly, and absolutely, that now they

36. For another short discussion of the passage see Schmaltz 2020, 218.
37. See also Peterman 2012, 43, who notes the same thing.

move, now they are at rest. ” (Spinoza 1985, 459 / Spinoza 1925, II 98) Spinoza has just said (in Lemma 1) that we distinguish bodies in four different ways: by speed, slowness, motion, and rest.[38] In this demonstration, he introduces a distinction into these: Some are absolute, some aren't. So, we might infer, there is clearly absolute motion.

But leaning too heavily on this might be over-interpretation. A more systematic examination of how Spinoza uses "*absolute*" would be needed to make this more than a suggestive hypothesis. But still, it is suggestive.[39] It seems at least plausible that Spinoza held some form of absolutism about motion.

Subsection 5.2. A path to absolute motion. But how, if he rejects `Separatism`? To see how, let's take a detour through Leibniz's views on the matter. He was certainly an anti-`Separatist`, but also an absolutist about motion. How? We saw above how some absolutists thought that absolute motion was motion relative to absolute space, and might treat motion as a dyadic predicate. You get absolute space from this by saying that absolute motion is, in Newton's words, "the change of position of a body from one absolute place [part of absolute space] to another." (Newton 1999, 55) But there's another way. You can introduce another predicate, this time a monadic one: x is in motion. By doing this, you eliminate the need for x's motion to be motion relative to anything at all. This is strange, but not incoherent.[40]

But there's a complication. In PCP (Spinoza 1985, 272 / Spinoza 1925, I 194) Spinoza writes that "we have proved that the essence of matter consists in extension, *or* space, which is always divisible; and that there is no motion without space." This seems disastrous for my interpretation. Here, Spinoza says there must be space for there to be motion, which might seem to imply that motion must in some sense *depend upon* space. But if the only sort of space there is is `material reductionist` space, then the only sort of motion there may be

38. Though see Peterman 2017, §3.2 for some problems when we take this seriously as providing a principle of individuation.

39. The only other commentator I can find who has noticed this point in Lemma 2 is Eric Schliesser (in, e.g., Schliesser 2012, 438 and Schliesser 2018, 180). Other commentators, such as Manning 2016, §5.3 and Klever 1988, 189n38, seem to take Spinoza to be a straightforward relativist about motion.

40. In fact, such a maneuver is explicitly recommended by Sklar 1974, 230.

is relative motion. So on this view, if Spinoza rejects `Separatism`, he cannot help himself to absolute motion.

But I think we shouldn't read this as Spinoza speaking in his own voice. In PCP, he is speaking in a Cartesian mode. But we know that he thinks the Cartesian version of extension is deficient. He writes to Tschirnhaus that "Descartes defines matter badly by Extension... it must necessarily be explained by an attribute which expresses eternal and infinite essence." (Spinoza 2016, II 487 / Spinoza 1925, IV 334) Furthermore, Spinoza's extension, the attribute of God, is simple – or, put another way, extended substance is simple. But in the quote above, when speaking in the Cartesian mode, Spinoza says that it divisible. This is good reason to think that the passage above doesn't represent Spinoza's view on extension, which in turn suggests he doesn't agree with the rest of it either, particularly the equation of extension with space (which Spinoza notes is divisible).

Subsection 5.3. Upshot. If the reading I've given above is right, two things follow. First, Spinoza may have been one of the first figures in history to be an $\texttt{absolutist}_2$. Nick Huggett notes that "almost everyone who considered the issue, from Aristotle until the twentieth century, had that conception [that true motion was the change of position with respect to something else]." (Huggett 2012, 213) He notes two possible exceptions: Leibniz and Dutch polymath Christiaan Huygens.[41]

41. What about one of Spinoza's great influences, Thomas Hobbes?. In *De corpore* Hobbes defines understands by space "imaginary space", that is, "the phantasm of a thing existing without the mind simply." (Hobbes 1839-1845, I 94). On the other hand, he writes that "[t]he extension of a body, is the same thing with the magnitude of it, or that which some call real space." (I 105). "Place" is defined as "that imaginary space, which is coincident with the magnitude of any body." (I 104) (For discussions of his views on the reality of space see, for instance, Slowik 2014 and Gaukroger 2006, 284ff) He then goes on to define motion as "a continual relinquishing of one place, and acquiring of another." (Hobbes 1839-1845, I 109) Now, if we import this meaning of "place" back into the definition of motion, it seems to have the consequence that motion is motion relative to imaginary space, which seems to make motion itself a phantasm. But it also seems clear that Hobbes might not want this to be the case, given his mechanistic tendencies.

According to Tom Sorell, "by 'motion' [Hobbes] means simply change of place or locomotion." (Sorell 1986, 60) But unless we have an idea of whether Hobbes means by *relative* or *absolute* place, we can't settle the issue definitively. Indeed, given his discussion of "real space", one might be inclined to think of place as absolute place. In any event, however, it seems reasonable to assume, from Hobbes' definition of motion, that whether he accepted absolute places or not, he analyzed motion in relational terms – motion is relative to a place.

To say that Spinoza was indeed *the first* to think in this way goes beyond the evidence, but if the reading above is correct, certainly was one of the first.[42] If Curley (Spinoza 1985, 405–6) is to be believed, a first draft of the first two parts of the *Ethics*, which include the passages we have just examined, were done by 1665 or thereabouts. And if Gebhardt is to be believed, it may have been done as early as 1663; this is also attested by Akkerman 1980, 99, who on the other hand sets the upper bound for the completion of at least EIIa2 at 1664 (99). The earliest of Leibniz's writings I can find where he might accept something like absolute motion is in the document *Leges reflexionis et refractionis demonstratae* (dated by the Akademie editors at 1671). He distinguishes between two genera of motions: public and private. Private motions are the motions which a body may have when thought of as in a vacuum [*in vacuo*] or in a quiescent medium [*medio quiescente*]. (Leibniz 1926-, VI ii 314) The vacuum point indicates that the body may be considered to be in motion without respect to surrounding bodies.

But this interpretation is complicated by the talk of a quiescent medium, which may be a medium considered at rest.[43] It's further complicated by a 1677 work, where Leibniz writes: "in reality…motion is not absolute, but consists in relation." (A VI iv 1968; I quote from the translation in Leibniz 2001, 225) This suggests that either Leibniz changed his mind between 1671 and 1677 or that the private motion in *Leges reflexionis* is not absolute motion. Whichever option is correct, Spinoza's writings on the topic predate Leibniz's by at least 6 years.

Second, Spinoza is in good company. As we saw above, Leibniz (at least in his middle and mature writings) recognizes that a body has a true degree of motion which we don't discover by looking at its relative motion. He also writes in 1692 that "[i]f motion is nothing other than change of contact or [*seu*] immediate vicinity, it follows that which thing moves

42. Not even the arch-relationalist Mach seems to have come to this conclusion, if Sklar 1974, 200 is to be believed – he too accepted Newton's assumption that acceleration and motion had to be acceleration and motion *relative to* something else.

43. There is some indication that Leibniz regards such a medium to be equivalent to a vacuum. He writes in 1675, for instance, that "[i]f I imagine in space, instead of extension, a perfectly quiescent fluid [*fluidum quiescens*] which, when some body swims in it, is moved to fill its place, then I am simply saying that space is a vacuum." (Leibniz 1926-, VI iii 466; I quote from the translation at Leibniz 1992, 11)

will never be able to be defined. For... thus attributing real motion to one or the other of these [things] whose mutual vicinity or place [*viciniam aut situm inter se*] changes will always be allowed... Therefore, if something may be said to be moved, we require not only that it change place with respect to something else, but also that the cause of change – force, action – be in the thing itself." (Leibniz 1965, IV 369; translation my own)

Here Leibniz recognizes something component of motion beyond change in relative place. There has to be an internal principle of change in the object itself for there to be true motion. So, in the terminology above, Leibniz's theory involves a monadic predicate, "x is in motion."

Contrast this with Spinoza's acquaintance Christiaan Huygens. In *De motu corporum ex percussione* he writes that "[b]oth the motion of bodies and their equal or unequal speeds must be understood in relation to other bodies considered at rest, even if both sets of bodies happen to be involved in some other common motion." (Huygens 1888-1950, XVI 33; I quote from the translation in Huygens 1978.) So he rejects the monadic predicate view of motion. Since he also rejects absolute space, he therefore loses the ability to define true or absolute motion as motion relative to regions of absolute space.[44]

Was Spinoza familiar with this passage? That goes beyond the evidence, I think, even though Spinoza owned some works by Huygens.[45] But it's entirely possible that Spinoza would have had first-hand knowledge of Huygens' views on motion, since we know they discussed the subject. When Oldenburg asks Spinoza "what is happening about [Huygens']... Treatise *On Motion*" (Spinoza 2016, 12 / Spinoza 1925, IV 165), Spinoza answers as follows: "But as for the treatise on motion about which you also ask, I think you are waiting for it in vain. It's too long now since he began to boast that by calculation he had discovered rules of motion and laws of nature far different from those Descartes gives, and

44. A point of chronology here: while Huygens' views on motion underwent some change during the course of his life, it seems likely that the views expressed in *De motu corporum* were those he held during his acquaintance with Spinoza. Blackwell notes (Huygens 1978, 574n1) that while the date of publication of the treatise is later than 1673, it is likely that it had its origins in the 1650s – and it is precisely during this period when Spinoza and Huygens knew each other.

45. See Krop 2013.

that Descartes' rules and laws are almost all false. Still, so far he has not published any example of this." (Spinoza 2016, 13[46]) While there's no explicit acknowledgment that Spinoza thoroughly knows with Huygens' views on motion, the passage supports the inference that he had at least *some* knowledge of them.

Did Spinoza endorse Huygens' view? The passages we've examined from the *Ethics* count against this. For it suggests that we may consider a body truly to be in motion without reference to any other bodies in its vicinity. And if this is true, then a body can be in motion without it being in motion with respect to other bodies, which suggests that Huygens' view is not operative.

It seems reasonable, based on these considerations, to attribute something like $\texttt{absolutism}_2$ to Spinoza. This would be a departure from his supposed Cartesianism. For Descartes thinks that "each body has only one proper motion" (Descartes 1984, 239 / Descartes 1897-1910, VIIIA 57), that is, motion with respect to its contiguous neighborhood. But it appears that Spinoza is saying that a body may be truly in motion or at rest *even when not regarded as being in the vicinity of any bodies*. This won't do, on the Cartesian picture.

One result of this is that the motion discussed in the Physical Digression, the one used as the principle of individuation for bodies, is (contra, for instance, Klever 1988, 172) *not* local motion as he defines it at Spinoza 1985, 263 / Spinoza 1925, I 181: "*Local motion* is the transfer of one part of matter, *or* one body, from the vicinity of those bodies that touch it immediately, and are considered as resting, to the vicinity of others." Since the motion discussed in the Physical Digression does not rely on bodies being in the vicinity of one another, I take it that this marks a sharp differentiation between local motion and *true* motion. This marks Spinoza's true motion off from Descartes' true motion as well, which was, recall, defined as the transfer of one bit of matter from "the vicinity of other bodies which are in immediate contact with it…to the vicinity of other bodies." Even though Descartes thinks bodies have privileged motions, he is still a relationist, someone whose analysis of motion

46. Curley notes that this fragment does not appear in Gebhardt, so I don't include a citation to Gebhardt's critical edition.

"[selects] relations a body has over time to certain other bodies." (Rynasiewicz, forthcoming, 8)

So it seems as though Spinoza need not go the `Separatist` route that so bedeviled him in the previous section. He can hold that there are absolute or true motions, but reject the need for absolute space against which to define these. This is a strange position, but as we have seen, not an incoherent one. It merely requires us to revise our commonsense idea of motion even further than someone like Descartes or Newton might require. For these both define proper or absolute motion with reference to some privileged frame of reference. But while Spinoza's system appears to need proper or absolute motion, it does not (indeed cannot) get it from absolute space.

Section 6. Conclusion

Spinoza is generally not classed amongst the participants in the early modern debate over the nature of space and motion – and this is fair enough, as he did not engage in any such controversies. But I hope to have demonstrated in this paper that he is not silent on the issue. Indeed, he may be of more than mere antiquarian interest in representing one of the first attempts to hold onto some form of `absolutism` without also endorsing some kind of `separatism`

References

Primary Sources.

Bayle, Pierre. 1697/1965. *Historical and Critical Dictionary.* Translated by Richard H. Popkin. Indianapolis: Bobbs-Merrill.

Descartes, René. 1984. *The Philosophical Writings of Descartes.* Translated by John Cottingham, Robert Stoothoff, and Dugald Murdoch. Vol. 1. Cambridge: Cambridge University Press.

———. 1897-1910. *Oeuvres de Descartes.* Edited by Charles Adam and Paul Tannery. 11 vols. Paris: J. Vrin.

Heereboord, Adriaan. 1665. *Meletemata Philosophica.* Amsterdam: Joannem Ravestenium.

Hobbes, Thomas. 1839-1845. *The English Works of Thomas Hobbes.* Edited and translated by William Molesworth. 11 vols. London: John Bohn.

Huygens, Christiaan. 1978. "The Motion of Colliding Bodies." Translated by Richard J. Blackwell. *Isis* 68 (4): 574–597.

———. 1888-1950. *Oeuvres Complètes de Christiaan Huygens.* Edited by Johan Adriaan Vollgraff. 22 vols. Den Haag: Martinus Nijhoff.

Leibniz, G. W. 1965. *Die philosophischen Schriften.* Edited by C. I. Gerhardt. 7 vols. Hildesheim: Georg Olms.

———. 1989a. *Philosophical Essays.* Edited by Roger Ariew and Daniel Garber. Indianapolis, Cambridge: Hackett.

———. 1989b. *Philosophical Papers and Letters.* Edited by Leroy E. Loemker. Norwell, MA: Kluwer Academic Publishers.

———. 1992. *De Summa Rerum: metaphysical papers 1675-1676.* Edited and translated by G. H. R. Parkinson. New Haven, CT: Yale University Press.

807 ———. 2001. *The Labyrinth of the Continuum: Writings on the Continuum Problem, 1672-*
808 *1686.* Translated by Richard T. W. Arthur. New Haven: Yale University Press.

809 ———. 1926-. *Sämlichte Schriften und Briefe.* Akademie Verlag.

810 Maclaurin, Colin. 1748. *An Account of Sir Isaac Newton's Philosophical Discoveries, in*
811 *Four Books.* Edited by Patrick Murdoch. London: A Millar / J Nourse.

812 More, Henry. 1675-1679. *Opera Omnia.* 2 vols. London: J. Macock.

813 ———. 1659/1987. *The Immortality of the Soul.* Edited by Alexander Jacob. Dordrecht:
814 Martinus Nijhoff.

815 Newton, Isaac. 1978a. "De Gravitatione et aequipondo fluidorum." In Newton 1978b, 89–
816 156.

817 ———. 1978b. *Unpublished Scientific Papers of Isaac Newton.* Edited and translated by
818 A. Rupert Hall and Marie Boas Hall. Cambridge: Cambridge University Press.

819 ———. 1999. *Mathematical Principles of Natural Philosophy.* Translated by I. Bernard
820 Cohen and Anne Whitman and Julia Budenz. Los Angeles, CA: University of California
821 Press.

822 Spinoza, Benedict. 1925. *Opera Omnia.* Edited by Carl Gebhardt. 4 vols. Heidelberg: Carl
823 Winter.

824 ———. 1985. *The Collected Works of Spinoza.* Edited and translated by Edwin Curley.
825 Vol. 1. Princeton: Princeton University Press.

826 ———. 2016. *The Collected Works of Spinoza.* Edited and translated by Edwin Curley.
827 Vol. 2. Princeton: Princeton University Press.

828 **Secondary Sources.**

829 Adler, Jacob. 1989. "The Development of Three Concepts in Spinoza." *Southwest Philoso-*
830 *phy Review* 5 (1): 23–32.

Adler, Jacob. 1996. "Spinoza's Physical Philosophy." *Archiv für Gesichte der Philosophie* 78 (3): 253–276.

Akkerman, Fokke. 1980. *Studies in the posthumous works of Spinoza: On style, earliest translation and reception, earliest and modern edition of some texts.* Groningen: Rijksuniversiteit Groningen.

Alexander, Samuel. 1920. *Space, Time, and Deity.* New York: The Humanities Press.

Armstrong, David. 1963. "Absolute and Relative Motion." *Mind* 72 (286): 209–223.

Bennett, Jonathan. 1980. "Spinoza's Vacuum Argument." *Midwest Studies in Philosophy* 5:391–399.

———. 1984. *A Study of Spinoza's Ethics.* Indianapolis, Indiana: Hackett Publishing Company.

Blackwell, Richard J. 1966. "Descartes' Laws of Motion." *Isis* 57 (2): 220–234.

Cover, Jan A. 1999. "Spinoza's Extended Substance: Cartesian and Leibnizian Reflections." In Gennaro and Huenemann 2002, chap. 5.

Cover, Jan A., and Glenn A. Hartz. 1994. "Are Leibnizian Monads Spatial?" *History of Philosophy Quarterly* 11 (3): 295–316.

Curley, Edwin, and Pierre-Francois Moreau, eds. 1990. *Spinoza: Issues and Directions.* Leiden: E. J. Brill.

Della Rocca, Michael, ed. 2018. *The Oxford Handbook of Spinoza.* New York: Oxford University Press.

DiSalle, Robert. 2006. *Understanding space-time: the philosophical development of physics from Netwon to Einstein.* Cambridge: Cambridge University Press.

Donagan, Alan. 1995. "Spinoza's Theology." In Garrett 1995, chap. 8.

Friedman, Michael. 1983. *Foundations of Space-Time Theories: Relativistic Physics and Philosophy of Science.* Princeton, New Jersey: Princeton University Press.

Gabbey, Alan. 1995. "Spinoza's natural science and methodology." In Garrett 1995, chap. 4.

———. 2008. "New Doctrines of Motion." In Garber and Ayers 2008, chap. 20.

Garber, Daniel. 1992. *Descartes' Metaphysical Physics.* Chicago: The University of Chicago Press.

Garber, Daniel, and Michael Ayers, eds. 2008. *The Cambridge History of Seventeenth-Century Philosophy.* Vol. 1. Cambridge: Cambridge University Press.

Garber, Daniel, and Steven Nadler, eds. 2010. *Oxford Studies in Early Modern Philosophy.* Vol. 5. Oxford: Oxford University Press.

Garrett, Don, ed. 1995. *The Cambridge Companion to Spinoza.* Cambridge: Cambridge University Press.

———. 2018a. *Nature and Necessity in Spinoza's Philosophy.* Oxford: Oxford University Press.

———. 2018b. "Spinoza's Theory of Metaphysical Individuation." In Garrett 2018a, chap. 11.

———. 2021. "Monism, Spinoza's Way." *The Monist* 104:38–59.

Gaukroger, Stephen. 2006. *The Emergence of a Scientific Culture: Science and the Shaping of Modernity, 1210-1685.* Oxford: Oxford University Press.

Gennaro, Rocco J., and Charles Huenemann, eds. 2002. *New Essays on the Rationalists.* Oxford: Oxford University Press.

Gilead, Amihud. 1985. ""The Order and connection of Things": Are They Constructed Mathematically-Deductively According to Spinoza?" *Kant-Studien* 76 (1): 72–78.

Grant, Edward. 1981. *Much Ado About Nothing: Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution.* Cambridge: Cambridge University Press.

878 Gueroult, Martial. 1969. *Spinoza.* Vol. 1. Paris: Georg Olms.

879 ———. 1974. *Spinoza.* Vol. 2. Paris: Georg Olms.

880 Hartz, Glenn A., and Jan A. Cover. 1988. "Space and Time in the Leibnizian Metaphysic."
881 *Noûs* 22 (4): 493–519.

882 Homan, Matthew. 2018. "Geometrical Figures in Spinoza's Book of Nature." *Journal of the*
883 *History of Philosophy* 56 (3): 455–476.

884 ———. 2021. *Spinoza's Epistemology through a Geometrical Lens.* Cham, Switzerland:
885 Palgrave Macmillan.

886 Huggett, Nick. 2012. "What did Newton mean by 'Absolute Motion'?" In Janiak and Schliesser
887 2012, chap. 8.

888 Huggett, Nick, and Carl Hoefer. 2018. "Absolute and Relational Theories of Space and Mo-
889 tion." In *The Stanford Encyclopedia of Philosophy,* Spring 2018, edited by Edward N.
890 Zalta. https://plato.stanford.edu/archives/spr2018/entries/spacetime-theories/.

891 Janiak, Andrew, and Eric Schliesser, eds. 2012. *Interpreting Newton: Critical Essays.* Cam-
892 bridge: Cambridge University Press.

893 Klever, Wim. 1988. "Moles in Motu: Principles of Spinoza's Physics." *Studia Spinozana*
894 4:165–193.

895 Koyré, Alexadre. 1957. *From the Closed World to the Infinite Universe.* Baltimore: The Johns
896 Hopkins University Press.

897 Krop, Henri. 2013. "Spinoza's Library: The Mathematical and Scientific Works." *Intellectual*
898 *History Review* 23 (1): 25–43.

899 Lachterman, David R. 1977. "The Physics of Spinoza's ETHICS." *The Southwest Journal of*
900 *Philosophy* 8 (3): 71–111.

901 Lehmkuhl, Dennis. 2018. "The Metaphysics of Super-Substantivalism." *Noûs* 52 (1): 24–46.

902 Manning, Richard. 2016. "Spinoza's Physical Theory." In *The Stanford Encyclopedia of Phi-*
903 *losophy,* Spring 2018, edited by Edward N. Zalta. https://plato.stanford.edu/entries/
904 spinoza-physics/.

905 Matheron, Alexander. 1969. *Individu et communauté chez Spinoza.* Paris: Minuit.

906 ———. 1986. "Spinoza and Euclidean Arithmetic." In Nails 1986, chap. 5.

907 Matson, Wallace. 1990. "Body Essence and Mind Eternity in Spinoza." In Curley and Moreau
908 1990.

909 McDonough, Jeffrey K. 2016. "Leibniz and the Foundations of Physics: The Later Years."
910 *Philosophical Review* 125 (1): 1–34.

911 McKeon, Richard. 1928. *The Philosophy of Spinoza: the unity of his thought.* New York:
912 Longmans, Green / Co.

913 Melamed, Yitzhak. 2000. "On the Exact Science of Nonbeings: Spinoza's View of Mathe-
914 matics." *Iyyun* 46:3–22.

915 ———. 2009. "Spinoza's Metaphysics of Substance: The Substance-Mode Relation as a Re-
916 lation of Inherence and Predication." *Philosophy and Phenomenological Research* LXXVIII
917 (1): 17–82.

918 ———, ed. 2017. *Spinoza's 'Ethics': A Critical Guide.* Cambridge: Cambridge University
919 Press.

920 Nails, Marjorie Grene and Debra, ed. 1986. *Spinoza and the Sciences.* Boston: D. Reidel.

921 Newlands, Samuel. 2018. *Reconoceiving Spinoza.* Oxford: Oxford University Press.

922 Peterman, Alison. 2012. "Spinoza on "The Principles of Natural Things"." *The Leibniz Re-*
923 *view* 22:37–52.

924 ———. 2014. "Spinoza on Physical Science." *Philosophy Compass* 9 (3): 214–223.

925 ———. 2015. "Spinoza on Extension." *Philosopher's Imprint* 15 (14).

Peterman, Alison. 2017. "The "Physical" Interlude." In Melamed 2017, chap. 5.

———. Forthcoming. "Newton and Spinoza." In Schliesser and Smeenk, forthcoming.

Reichenbach, Hans. 1958. *The Philosophy of Space and Time.* Translated by Maria Reichenbach. New York: Dover.

Reid, Jasper. 2013. "Henry More and Nicholas Malebranche's Critiques of Spinoza." *European Journal of Philosophy* 23 (3): 764–792.

Rice, Lee C. 1996. "Spinoza's Infinite Extension." *History of European Ideas* 22 (1): 33–43.

Robinson, Thaddeus S. 2009. "Spinoza on the Vacuum and the Simplicity of Corporeal Substance." *History of Philosophy Quarterly* 26 (1): 63–81.

Rynasiewicz, Robert. 1995. "By Their Properties, Causes, and Effects: Newton's Scholium on Time, Space, Place, and Motion–I. The Text." *Studies in the History and Philosophy of Science* 26 (1): 133–153.

———. 2000. "On the Distinction between Absolute and Relative Motion." *Philosophy of Science* 67 (1): 70–93.

———. 2014. "Netwon's Views on Space, Time, and Motion." In *The Stanford Encyclopedia of Philosophy,* Summer 2014, edited by Edward N. Zalta. https://plato.stanford.edu/archives/sum2014/entries/newton-stm/.

———. Forthcoming. "Netwon's Scholium on Time, Space, Place, and Motion." In Schliesser and Smeenk, forthcoming.

Schaffer, Jonathan. 2009. "Spacetime the one substance." *Philosophical Studies* 145:131–148.

———. 2010. "Monism: The Priority of the Whole." *The Philosophical Review* 119 (1): 31–76.

Schliesser, Eric. 2012. "Newton and Spinoza: On Motion and Matter (and God, of course)." *The Southern Journal of Philosophy* 50 (3): 436–458.

———. 2018. "Spinoza and the Philosophy of Science: Mathematics, Motion, and Being." In Della Rocca 2018, chap. 8.

Schliesser, Eric, and Chris Smeenk, eds. Forthcoming. *The Oxford Handbook of Newton.* Oxford: Oxford University Press.

Schmaltz, Tad M. 1999. "Spinoza on the Vacuum." *Archiv Für Gesichte der Philosophie* 81 (2): 174–205.

———. 2020. *The Metaphysics of the Material World: Suárez, Descartes, and Spinoza.* Oxford: Oxford University Press.

Sklar, Lawrence. 1974. *Space, Time, and Spacetime.* Berkeley: University of California Press.

Slowik, Edward. 1999. "Descartes, Spacetime, and Relational Motion." *Philosophy of Science* 66 (1): 117–139.

———. 2002. *Cartesian Spacetime.* Dordrecht: Springer.

———. 2014. "Hobbes and the Phantasm of Space." *Hobbes Studies* 27:61–79.

———. 2016. *The Deep Metaphysics of Space: An Alternative History and Ontology Between Substantivalism and Relationism.* Cham, Switzerland: Springer.

Smith, Kurt, and Alan Nelson. 2010. "Divisibility and Cartesian Extension." In Garber and Nadler 2010, chap. 5.

Sorell, Tom. 1986. *Hobbes.* London & New York: Routledge & Keegan Paul.

Stein, Howard. 1967. "Newtonian Space-time." *Texas Quarterly* 10:174–200.

Yenter, Timothy. 2014. "Clarke Against Spinoza on the Manifest Diversity of the World." *British Journal for the History of Philosophy* 22 (2): 260–280.