

Margaret Cavendish on Motion and Mereology

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ABSTRACT Recent exciting work on Cavendish's natural philosophy highlights the important role of motion in her system. But what *is* motion, according to Cavendish? I argue that motion, for Cavendish, is what I call 'compositional motion': for a body to be in motion is just for it to divide from some matter and join with other matter. So when Cavendish claims to reduce all natural change to motion, she is really reducing all natural change to mereological change. Cavendish also uses 'motion' to name the power that matter has to set itself in compositional motion. That power is not reducible to local motion. If motion is not local motion and if motive power is not a function of actual motion, then despite her polemics, Cavendish does not reduce natural change to local motion. Instead, she offers a unique and exciting account of natural change.

KEYWORDS Margaret Cavendish, motion, materialism, mereology, natural philosophy

INTRODUCTION

WHAT IS MOTION, ACCORDING TO MARGARET CAVENDISH (1623–1673)? There has been a groundswell of exciting work on Cavendish's natural philosophy lately, all of which highlights her materialism, as well as the centrality of motion in her system.¹ But none of it directly addresses this question in detail. Cavendish claims that motion grounds all qualitative and quantitative variety in matter, but we will not understand her explanations of natural phenomena if we do not know what motion *is*.

In this paper, I argue that Cavendish reduces motion to mereological change. More precisely, she holds that for a body to move is just for it to separate from one whole and join with another whole. I call this account of motion 'compositional motion.'

¹See, e.g. Jacqueline Broad, *Women Philosophers of the Seventeenth Century*; David Cunning, *Cavendish*; Stewart Duncan, "Debating Materialism"; Sarah Hutton, "In Dialogue"; Susan James, "Philosophical Innovations"; Marcy Lascano, *Early Modern Women Philosophers*; Karen Detlefsen, "Reason and Freedom" and "Atomism, Monism, and Causation"; Eileen O'Neill, introduction to *Observations on Experimental Philosophy*; and Lisa Sarasohn, *The Natural Philosophy of Margaret Cavendish*.

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In section 1, I present a brief outline of some relevant aspects of Cavendish's natural philosophy. In section 2, I argue that motion is not local motion, for Cavendish. In section 3, I argue that motion is 'compositional motion': when Cavendish writes that a body is in motion, she means that it dissociates from some parts and joins with other parts. In section 4, I show that, in fact, Cavendish uses 'motion' in two senses: first, she uses it to refer to actual (compositional) motion, and second, to motive power. In section 5, I suggest some ways that Cavendish might ground the parthood relations. Finally, I conclude that because Cavendishian motion is not local motion, and because she does not reduce motive power to actual motion, Cavendish's mechanist polemics are entirely superficial: her claim to reduce all change to motion is not *that* claim at all. Instead, we should understand her as someone who—interestingly and uniquely—reduces all natural change to change in mereological facts.

I. CORPOREAL FIGURATIVE MOTION

I will focus on Cavendish's natural philosophical system as it is developed later in her life, especially in the *Observations on Natural Philosophy*. I draw for support on passages from the later *Grounds of Natural Philosophy*, the earlier *Philosophical and Physical Opinions*, and *Philosophical Letters* to the extent that they concern matters on which these other texts are consistent with the *Observations*.

According to Cavendish's later work, nature is one infinite and eternal body made of self-moving matter. There is nothing in nature that is not material, and there is no vacuum.² When Cavendish writes that matter is self-moving, she means two things. First, the motion in nature is caused by matter itself, and not by God, some spirit or élan vital, or something else that is not matter.³ Second, she means that particular parts of matter set themselves in motion, and are not set into motion by other moving bodies.⁴

There are no 'single parts' in nature,⁵ by which Cavendish means parts that can "subsist by themselves" with "no reference to each other, and consequently, not to the body of nature."⁶ But there are (at least) two senses in which there *are* parts in this material plenum: according to Cavendish, nature has essential parts and

²GNP 4; OEP 55, 79.

³OEP 21–22, 212. As a referee helpfully pointed out, Cavendish does pen some curious passages in early work that suggest that she did not always hold that matter is self-moving; one is in both editions of the *Philosophical and Physical Opinions* (1655/1663), where she posits "Deitical" centers from which motion "flowes" (PPO 172). It is also true that, in earlier work, Cavendish posits a pneuma that is specifically responsible for the motion in matter; she later changes her view so that she consistently holds that motion is caused by matter. I believe that Cavendish changes her views on many subjects over time, and that she sometimes experiments with philosophical positions and arguments that she is not fully committed to, so I do not see any reason to read such passages as undermining her frequent insistence that matter is self-moving.

⁴E.g. OEP 48. For more on Cavendish's account of inter-body causation in light of these facts, see O'Neill, introduction to OEP xix–xxi, James, "Philosophical Innovations," 160; and Cunning, Cavendish, 35–47.

⁵Cavendish, PL 157.

⁶OEP 31. She also sometimes takes the claim that a part is single or finite to imply that it is divisible (e.g. OEP 125–26).

it has effective parts.⁷ The essential (or sometimes, “constitutive”) parts of nature “constitute the body of nature” and comprise the three kinds or degrees of matter: inanimate, sensitive, and rational.⁸ These degrees of matter are distinguished by their intrinsic capacities and their functions. Inanimate matter has self-knowledge but not self-motion, and must be moved by the other two kinds. Sensitive and rational matter are both self-moving as well as self-knowing, but rational matter is the ‘architect’ while sensitive matter is the ‘laborer.’⁹

According to Cavendish, the three constitutive parts of matter, or types or “degrees” of matter, are “completely blended,”¹⁰ so that there is no effective part of matter that does not contain all three: “self-motion is throughout all the body of nature . . . no part or figure, how small soever, can be without self-motion.”¹¹ Cavendish takes this as a license to treat nature, in many contexts, as a homogeneous body made of self-moving matter.¹² Unless she is writing specifically about the constitutive parts of matter and how they interact, she almost always means ‘effective parts’ when she writes “parts.”¹³

The effective parts are “effects of the body of nature.”¹⁴ More precisely, they are the effects of what Cavendish calls “self-moving matter.”¹⁵ These effective parts are creatures like animals, plants, and rocks, and Cavendish is clear that none of that would exist if matter were not in motion.¹⁶ Nature is “an infinite body, bulk or magnitude, which by its own self-motion, is divided into infinite parts.”¹⁷ This raises the question of how, exactly, motion is responsible for generating these effective parts. Unfortunately, Cavendish does not always consistently characterize the difference between what *generates* the parts of nature and what the parts of nature *are*. She identifies the effective parts of nature variously as ‘motions,’ ‘corporeal figurative motions,’ and ‘figures.’ For example, in the following passage, you can see her switch from identifying corporeal figurative motions as the parts of nature to identifying them as the cause of nature’s parts:

⁷OEP 47. There is another sense in which nature has at least potential parts: Cavendish says that parts must be distinguishable in nature, since anything material has quantity and anything with quantity is divisible (OEP 124–66).

⁸OEP 27–28.

⁹OEP 49, 161.

¹⁰To use a term coined by Eileen O’Neill (OEP iv). See, e.g. OEP 158.

¹¹OEP 126.

¹²E.g. “it is one thing to speak of the parts of the composed and mixed body of nature, and another thing to speak of the constitutive parts of nature, which are, as it were, the ingredients of which nature is made up as one entire self-moving body” (OEP 25); “When I say that ‘none of nature’s parts can be called inanimate, or soulless,’ I do not mean the constitutive parts of nature, which are, as it were, the ingredients whereof nature consists, and is made up of; whereof there is an inanimate part or degree of matter, as well as animate; but I mean the parts or effects of this composed body of nature, of which I say, that none can be called inanimate” (OEP 16).

¹³To simplify matters, then, I will focus on effective parts in this paper. I think that we can understand much about Cavendish’s account of motion without wading too deep into consideration of the three degrees of matter.

¹⁴OEP 27.

¹⁵PL Section 2, Letter 9 (hereafter PL section.letter).

¹⁶OEP 35.

¹⁷OEP 126; see also, OEP 31, 119.

what we call finite parts, are nothing else but several corporeal figurative motions, which make all the difference that is between the figures or parts of nature, both in their kinds, sorts, and particulars.¹⁸

Attempts to disentangle the corpus, the figure, and the motions is stymied somewhat by the fact that Cavendish is very insistent that there is only *one* great principle of nature: “corporeal self-motion” or “corporeal figurative (self-)motion.”¹⁹ And she frequently stresses that “matter, motion and figure are but one thing.”²⁰

But, Cavendish does not consistently hold that matter, motion, and figure are identical—sometimes she does distinguish between them. She claims that matter is the cause of motion, and that motion, in turn, is the cause of nature’s other effects or effective parts:

all effects lie in matter and motion, indeed in matter only; for motion is but the effect of matter.²¹

And while she claims that matter cannot be without color, magnitude and place, matter *can* be and be conceived without motion;²² without motion, matter could exist as “an infinite, and eternal dull lump.”²³ Matter and figure, however, are inextricable: matter cannot be without figure, nor can figure be without matter.²⁴ Insofar as such distinctions can be made among matter, motion and figure, much of what Cavendish writes suggests that she thinks of motion as the *cause* of distinctions between parts, while figure as the distinguishing features of parts, or the results of those distinctions. For example,

finite and particular parts are all one, called thus, by reason they have limited and circumscribed figures, by which they are discerned from one another.²⁵

So Cavendish does seem to think of a figure as the result of motion in matter, and she does seem to talk of the nature of a unified or organic creature as a ‘figure.’ I will return to figure in section 5, and to the question of what it is and what role a creature’s figure plays in unifying it.

Cavendish describes every natural change as a ‘motion’ or as ‘motions.’ All creatures, properties, and natural phenomena are or are generated by motions; the list of things that Cavendish refers to as kinds of ‘motions’ is incredibly impressive, including cold and heat,²⁶ sickness,²⁷ color,²⁸ fire,²⁹ darkness,³⁰ and light.³¹ So it

¹⁸OEP 31.

¹⁹OEP 257; see also, PPO 18, 35, 48, 116, 119.

²⁰OEP 120; see also, PPO 47, OEP 49.

²¹PPO 94; see also, OEP 83.

²²E.g. GNP 2. Cavendish claims this despite claiming that motion, like matter, is eternal (e.g. PPO 93). Eternity is infinite duration, for Cavendish, and does not entail necessary existence.

²³PPO 93.

²⁴E.g. OEP 49. She follows Hobbes in this (see DC 8.3, 104).

²⁵OEP 31. I am grateful to an anonymous reviewer for encouraging me to say more about the role of figure in distinguishing between the parts of nature.

²⁶PPO 144.

²⁷PPO 308.

²⁸OEP 75.

²⁹PPO 185.

³⁰PPO 185.

³¹PPO 184.

seems especially important to know, for Cavendish, what motion *is*. But nowhere does Cavendish offer an explicit definition or a characterization of motion, and often she seems to use the word ‘motions’ to describe natural changes in general, or the properties of objects. In the next section, I will show that, although it is tempting to think that Cavendish must just mean that motion is local motion, this is not so. Then, in section 3, I will argue that motion is compositional motion, or change of parthood relations.

2. IS CAVENDISHIAN MOTION LOCAL MOTION?

In section 2.1, I briefly discuss Cavendish’s use of the phrase ‘local motion,’ showing that nothing in her use of it suggests that she believes that all motion is change of place. Then, in section 2.2, I analyze Cavendish’s account of place, and argue that it entails that motion cannot be change of place.

2.1. *Local Motion*

Cavendish emphasizes that all motion is what she calls “corporeal motion.”³² In two places, she claims that all natural or corporeal motion is local motion. Once in the *Grounds*, she writes that “all corporeal motion is local.”³³ And at *OEP* 40, she describes something as “naturally, that is, locally self-moving.”

Sometimes, especially in the *Observations*, she seems to use ‘local motion’ (which she also calls ‘progressive motion’) interchangeably with ‘motion.’ However, it is clear that in those contexts, she is using ‘local motion’ to mean not change of place, but the visible, “exterior” translation of macroscopic objects like animals. When she uses ‘local motion’ to mean ‘progressive motion,’ it is to be contrasted with the interior motions of their parts, which are insensible and which do not involve large-scale translations. For example, of vegetables and minerals, she writes, “their property is not to move locally, that is, to have a self exterior motion.”³⁴ Of animals, she writes,

there is . . . no creature without self-motion, although not always perceptible by us, or our external senses; for all motion is not exteriorly local, and visible.³⁵

In these contexts, it is clear that Cavendish does not think that all motion is what she calls there ‘local motion’ or ‘progressive motion.’

In another place, as part of a discussion of Aristotle’s view about motion, Cavendish intentionally resists classifying all motion with local motion. To Aristotle’s (attributed) belief that “There are three sorts of motion; accretion and diminution, alteration and local motion,” she replies that

it is needless to make three sorts of motions: we might say rather, there are infinite sorts of motions; but yet all is self-motion, and so is accretion, diminution, and alteration.³⁶

³²OEP 128.

³³GNP 171.

³⁴PPO 231. She also talks in the same place about ‘local figure,’ by which, similarly, she seems to mean exterior visible figure.

³⁵PL 287; see also, PL 436, 447, OEP 131.

³⁶OEP 268.

In the *PPO*, she implies that local motion is only one kind of motion when she refers to motions both “local or otherwise.”³⁷

There seems to be some tension here between Cavendish’s claim that “all corporeal motion is local,” and her claim that local motion is but one kind of motion.³⁸ I think that Cavendish must be using the phrase in different ways in these different contexts. When she identifies it with progressive motion, she is thinking of it as everyday, visible translation in space in order to contrast it with interior, insensible motions. She is concerned there to stress that ‘local motion’ is not the only kind of motion; similarly, in her critique of Aristotle, where she is mostly just concerned to stress that there is not one basic kind of motion. When she identifies local motion with “corporeal” or “natural” motion, she is thinking of it as physical motion of bodies. In these contexts, she is concerned to stress her naturalism, without committing to some particular interpretation of ‘local motion.’

What is important is that nothing in Cavendish’s use of the phrase ‘local motion’ suggests that she means ‘change of place,’ and little suggests that she thinks all motion is local, in any case. However, the most significant evidence that Cavendish does not think that motion is change of place comes only when we analyze her account of place, as we will do in the next section.

2.2. *Place and Motion*

In this section, I argue that Cavendish identifies the place of a body with its magnitude, and that she does not think that motion involves a body losing, gaining, or changing its place.

It helps to start by looking at Hobbes and Descartes, whose accounts of place and motion are more familiar and more detailed, and with whom Cavendish engages explicitly about these matters in her *Philosophical Letters*. There, Cavendish discusses the account of place, space, and motion in Hobbes’s *De Corpore*, where Hobbes identifies two concepts: the ‘real space’ of a body and the ‘place’ of a body. The real space is the volume that a body takes up, but Hobbes argues that this is simply the three-dimensional extension of a body, or its magnitude. There is no volume that the body takes up that is distinct from it, so real space is identical with the body itself.³⁹

Hobbes defines place, however, as “that space . . . which is coincident with the magnitude of any body.”⁴⁰ Lest this sound like real space, Hobbes immediately goes on to write that

place, and the magnitude of the thing placed differ: first in this, that a body keeps always the same magnitude both when it is at rest, and then it is moved; but when it is moved, it does not keep the same place. Secondly, in this, that place is a phantasm of any body . . . but magnitude is the peculiar accident of every body; for one body may at several times have several places, but always one and the same magnitude.

³⁷PPO 120.

³⁸This was helpfully pointed out to me by an anonymous reviewer.

³⁹DC 8.4, 105. References to *De Corpore* are according to chapter, section, and page number in William Molsworth’s edition published by John Bohn.

⁴⁰DC 8.5, 106.

Thirdly, in this, that place is nothing out of the mind, nor magnitude any thing within it. And lastly, place is feigned extension but magnitude true extension.⁴¹

Two of these distinctions are particularly important. First, place is a ‘phantasm,’ which is “nothing out of the mind,” while real space, or magnitude, is a real accident of bodies that “does not depend upon our cogitation.”⁴² Second, a body cannot change its magnitude (at least by moving), but it can leave one place and gain another. Indeed, Hobbes characterizes motion as “a continual relinquishing of one place, and acquiring of another.”⁴³

In her reading of these passages from *De Corpore*, Cavendish denies Hobbes’s distinction between real space and place: “this doth not well agree with my reason, for I believe that place, magnitude and body are but one thing, and that place is as true an extension as magnitude, and not a feigned one.”⁴⁴ This passage may seem to show pretty straightforwardly that Cavendish simply identifies place with magnitude.⁴⁵ Unfortunately, as noted above, Cavendish says that *X* and *Y* are “all one thing” or “but one thing” very frequently, and sometimes when she clearly cannot mean strict identity. In this case, I do think that she means that place and magnitude are identical. Although not totally decisive, that Cavendish strictly identifies the magnitude of a body with its place is strongly suggested by her treatment of place in the rest of her work. In addition, Cavendish is using Hobbes’s own terms to claim that real space and place are identical, contrary to his view. Since Hobbes is very clear that real space is identical with magnitude, it is reasonable to think that Cavendish is aware that she is thereby identifying place and magnitude.

Cavendish, then, equates place with magnitude. A body’s place can change, but that just means that it is getting bigger or smaller—not that it is moving from some spatial position to another. Let us call what Cavendish explicitly calls ‘place’ ‘magnitude place’ for the sake of clarity. When Cavendish uses the word ‘place,’ this is what she most often means.

There is more evidence that Cavendish equates place and magnitude in what she says about what it means for the place of a body to change. First, she writes that change of place involves contraction and dilation: “as the magnitude of a body is, so is place; so that place is larger or less, according as the body contracts or dilates.”⁴⁶ Second, she repeatedly denies that a man may change the place of his body without changing the body, writing that “if place be changed, then body must change also.”⁴⁷ This suggests that change of place cannot be a merely extrinsic change, for Cavendish. I am purposefully leaving ‘extrinsic’ and ‘intrinsic’ vague here, in order to capture whatever Cavendish means in these contexts where she argues that “body must change also.” Change in magnitude counts as such an

⁴¹DC 8.5, 106.

⁴²DC 8.4, 105.

⁴³DC 8.10, 109.

⁴⁴PL 1.17.

⁴⁵As one anonymous reviewer helpfully (and charitably) urged.

⁴⁶OEP 125. Again, this is not decisive: it is possible that Cavendish thinks that place involves contraction and dilation of magnitude but also some other change. But in conjunction with the other textual evidence, I think reading this as exhaustive of change of place is reasonable.

⁴⁷OEP 37.

intrinsic change, and is a reasonable-enough candidate for the kind of change she has in mind.

Remember that Hobbes could define motion as change of place because he distinguished place from magnitude. But Cavendish denies this distinction. So she must either say that a body's motion involves change of magnitude, or that a body's motion is simply not change of place. She opts for the latter, arguing against Hobbes that since motion does not involve losing and gaining magnitude, motion cannot be loss and gain of place:

place moves, according as the body moveth, for not any body wants place, because place and body is but one thing. . . . Wherefore motion cannot be a relinquishing of one place and acquiring another, for there is no such thing as place but place different from body.⁴⁸

A body cannot leave its place behind it because "all bodies carry their places along with them, for body and place go together and are inseparable."⁴⁹ Now, according to Cavendish, to say that a body cannot lose its place does not mean that a body cannot change its place; she simply thinks that, "if place be changed, then body must change also." And Cavendish *does* think that a body can change its place. But she does not think that change of place, in the sense that she uses the word 'place,' is motion: motion is only "improperly called change of place."⁵⁰

So, as Cavendish fixes the definition of 'place,' motion is not change of place. But perhaps, for Cavendish, there is something else, call it place*, such that place is change of *that*. Does she define or even loosely characterize such a place*? In the rest of this section, I will argue that she does not, although the argument cannot be fully completed until section 3.2, once we understand what Cavendish thinks that motion is.

To make this possibility clearer, it helps to recruit Descartes, whose discussion of place is more precise than Cavendish's or Hobbes's. Let us start by considering Cavendishian magnitude place and Hobbesian real space alongside what Descartes calls "internal place [*locus internus*]." A body's internal place, according to Descartes, is constituted by "the extension in length, breadth and depth" that is "exactly the same as that [extension] which constitutes a body."⁵¹ As Hobbes will a decade later, Descartes associates internal place with what he calls 'space.' Motion is not change of Cavendishian magnitude place for Cavendish, Hobbesian real space for Hobbes, or Cartesian internal place for Descartes. So how *do* Hobbes and Descartes characterize motion? Is motion change of some kind of place for *them*?

This is a complicated question for each of them, but a few comments will suffice to help situate Cavendish's position, beginning with Hobbes. As we saw above, Hobbes characterizes motion as change of place "the continual relinquishing of one place and the acquiring of another."⁵² But, according to Hobbes, place is a

⁴⁸PL 56–57; see also, PL 105.

⁴⁹PL 67.

⁵⁰OEP 36, PL 32.

⁵¹Principles, AT VIIA.45/CSM I.227. According to Descartes, a body's internal place is conceptually distinct from its extension. But Cavendish does not allow any conceptual distinctions between distinctions that are not found in re.

⁵²DC 8.2, 103.

phantasm,⁵³ while motion is undoubtedly real and in bodies; it must be, to do all the work that he needs it to do as the “one universal cause.”⁵⁴ The result is that Hobbes’s treatment of motion is somewhat unstable, which is apparent in some unclarities and changes in his account of motion. For example, given that Hobbes takes motion to be in bodies and fundamental to all other properties of bodies besides magnitude, perhaps he should not attempt to analyze motion in terms of place, and instead treat it as metaphysically primitive.⁵⁵ We might also read some tentativeness in Hobbes’s comment at *DC* 8.4 that the extension of a body and its magnitude are “that which some call *Real Space*” (emphasis added).⁵⁶ In any case, Hobbes is attempting to balance two demands: on the one hand, identifying motion as a fundamental feature of matter and, on the other, not reifying place as an accident of bodies. Divorcing motion from change of place would help him to square these demands, but despite Hobbes’s complex and changing views on motion, he does not seem to doubt that motion is change of place.

Descartes has (arguably) at least three different notions of place. He defines ‘place’ *simpliciter* as the position of a body specified relative to other bodies:

The difference between the terms ‘place’ and ‘space’ is that the former designates more explicitly the position, as opposed to the size or shape . . . when something alters its position, we always say the place is changed, despite the fact that the size and shape remain unaltered. When we say that a thing is in a given place, all we mean is that it occupies such and such a position relative to other things.⁵⁷

According to Descartes, motion “according to the truth of the matter” is

the transfer 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.⁵⁸

⁵³More precisely, it is a part of imaginary space, which Hobbes identifies as an abstraction and a phantasm. Imaginary space is a notion that Hobbes derives from Aristotelian scholastic philosophy; it is generated by a mind’s abstracting from the properties of a particular body. The topic of imaginary space and the ideality of space is treated at length in the literature. E.g. Grant argues that Hobbes “denied objective reality to space, which he described as a phantasm” (Much Ado about Nothing, 226). For an excellent analysis of Hobbesian imaginary space, its sources, its ideality and subjectivity, and an argument that imaginary space is somewhat less subjective than Grant argues, see Edward Slowik, “Hobbes and the Phantasm of Space.” For the role of imaginary space in defining motion, see Hendrik Leijenhorst, *The Mechanisation of Aristotelianism*, esp. ch. 3, “Space and Time.” I am grateful to Geoff Gorham for discussion.

⁵⁴*DC* 1.6, 18.

⁵⁵E.g. *DC* 8.3, 104. Doug Jesseph takes this view, writing that a “salient peculiarity of [Hobbes’s] approach is that, in seeking to define space and time in terms of magnitude (or extension) and motion, Hobbes seems to get the usual order of conceptual dependence backward. One would normally think that such terms as magnitude or motion should be defined in terms of space and time. . . . Hobbes, however, inverts this traditional order . . . , evidently thinking that the concepts of magnitude and motion qualify as more perspicuous and primitive than those of space and time” (“Hobbes on the foundations of natural philosophy,” 139).

⁵⁶As suggested by an anonymous reviewer, who sees this as evidence that Hobbes is distancing himself from the Scholastic account of the distinction between real and imaginary space. See also, Martine Pécharman, who argues that to overassimilate Hobbes’s account of space with Aristotelian Scholasticism “does not differentiate the definitive state of the doctrine of imaginary space in the *De Corpore* from the initial state of Hobbes’s arguments in *Anti-White*” (“La construction de la doctrine de l’espace chez Hobbes,” 414, my translation).

⁵⁷*Principles*, AT VIII.A.47/*CSM* I.228–29.

⁵⁸*Principles*, AT VIII.A.53–54/*CSM* I.233.

This is change of place, or distances relative to other bodies, but defined with respect to a special class of bodies—those in immediate contact with the body in question. Much like Hobbes, Descartes stresses that the difference between place and space is that, when a body moves, it retains its space but not its place. Besides place *simpliciter* and internal place, described above, Descartes identifies “external place [*locus externus*]” as “the surface immediately surrounding what is in the place.”⁵⁹ But although commentators sometimes write that Descartes’s view is that motion is change of external place, this is not obvious: Descartes privileges motion relative to the bodies that immediately surround it, but change of position with respect to them (place *simpliciter*) is not the same concept as change of the surface immediately surrounding.⁶⁰

Does Cavendish have something like Hobbesian and Cartesian place that a body can lose or gain in moving? Does she have something like the relative spatial position between some point and other bodies that can be vacated by a body, or something like the internal surface of surrounding bodies? Cavendish explicitly rejects Descartes’s distinction on the (amusingly equivocal) grounds that a body cannot have two places:

the distinction of interior and exterior place, is needless; because no body can have two places, but place and body are but one thing; and whensoever the body changes, its place changes also.⁶¹

But it may be that Cavendish still thinks of motion as something like Cartesian place or external place, and just calls it something different. Cavendish does not come out and say so explicitly, and so I think that we cannot answer this question definitively without turning to see what she says about motion, after which we can determine whether a suitable concept presents itself.

However, there is one preliminary reason to think that nothing could fill this role. When Cavendish writes that a body cannot gain or lose its place, she is expressing a much more general commitment that pervades her philosophy: a resistance in general to explaining changes in terms of a body’s gaining or losing some feature. This involves, she thinks, an illegitimate kind of abstraction: it involves treating the property or feature of a body as distinct in some sense from the body that has it, so that properties and substances that bear them can be rearranged while still retaining their respective identities. This is clear from her discussion of place specifically, as evidenced by this section, but her commitment to the principle is more general. To fully understand why she holds it would take us too far afield, but, in short, she thinks that if a body can gain or lose a feature, that feature is either annihilated or is passed to another body. But nothing in nature can be created or annihilated (e.g. *OEP* 154, 237), and nothing immaterial can separate from one body and join to another (e.g. *OEP* 36).⁶²

⁵⁹Principles, AT VIII.A.47/CSM I.229.

⁶⁰For reasons to think that Descartes does connect or identify motion with change of external place, see Garber, *Descartes’ Metaphysical Physics*; and Slowik, *Cartesian Spacetime*, 143. For arguments against, see Nick Huggett, *True Motion*, ch. 1. For a discussion of whether Cartesian motion is change of place at all, see Alan Gabbey, “New doctrines of motion,” 657.

⁶¹*OEP* 128; see also, PL 102.

⁶²This leaves open the possibility that accidents are material and can be passed from one body to another. I examine this view, but argue that Cavendish does not accept it, in “Cavendish on corporeal qualities.”

Cavendish thinks that if a body can gain and lose its place, so that the same place can be taken up by another body and the body can take up another place, this principle is violated. It is interesting that Hobbes, too, considers the notion of place as arising from abstraction—the abstraction of imaginary space. But he does not seem to think this threatens its usefulness in defining motion. Cavendish does.

Hobbes defines motion as change of place, and insists that a body and its place are separable, and that a body can change its place without any intrinsic change to either body or place. Whether or not this can be fully worked out given his definitions of place and motion is a question for another day. According to Descartes, too, a body can be separated from its place without either the body or the place losing or gaining any qualities: the body retains its size, shape, and perhaps its arrangement of internal parts, while the place, as a specification of position relative to other bodies, remains to be taken up by another body. Cavendish has no such commitment.

I hope I have shown in this section that Cavendish does not think that motion is loss or gain of place in any straightforward sense, and that there are some general considerations that suggest that she does not think that motion is loss or gain of anything at all. It may be change of place* in some special sense, but we can only decide that conclusively once we understand what she says about motion.

3. COMPOSITIONAL MOTION

In section 3.1, I will argue that, for Cavendish, actual motion is what I call ‘compositional motion,’ so that facts about motion are grounded in facts about division and composition. In light of that, in section 3.2, I briefly return to the question of whether motion can be understood as change of place.

But here is a preliminary objection: maybe Cavendish just does not have an account of what motion is.⁶³ Maybe she did not work it out or she did not decide between some options. Or maybe she thought that motion is a primitive concept that cannot be analyzed any further, as David Cuning suggested to me in a symposium on his book:

I actually think that Cavendish herself does not have much to say about . . . the nature of motion. She has clearly articulated views on some aspects of motion, for example, about whether or not motion can be transferred, but in the end I don’t think she wants to put forward a view of the essence of motion itself. I suspect that she thinks that we know well enough what it is but that it doesn’t admit of any further analysis.⁶⁴

According to Cuning, Cavendish thinks that there are limits to our understanding, and that it is important to “tackl[e] the pressing problems of philosophy and science, and not hold off on that project until we have a complete understanding of all our concepts and terms” or else we will “never get one step out of the gate.”⁶⁵ He also argues that Cavendish simply does not define the very basic terms of her system.

⁶³This possibility was suggested to me by an anonymous referee.

⁶⁴Cuning, “Reply to Comments,” 2017 Pacific Meeting of the American Philosophical Association, San Diego, CA, April 15, 2017.

⁶⁵Cuning, “Reply to Comments.”

I think these observations are true of Cavendish—at least not generally speaking. But despite them, and while Cavendish does not explicitly provide a definition of motion, I hope to show by the textual evidence that Cavendish’s commitment to the idea that natural change is reducible to change in parthood facts is quite deep and consistent throughout her writing, and that her reliance on division and composition to explain natural changes quite striking. This view also fits more comfortably with many aspects of her metaphysics and natural philosophy than does the view that motion is unanalyzable, for Cavendish.

3.1. *Motion is Compositional Motion*

In the Argumental Discourse of the *OEP*, Cavendish’s former thoughts, speaking on her behalf, remind us that place is among the features of body that are “one and the same with body,” along with color, figure, and motion. The latter thoughts object—understandably!—that “place cannot be the same with body . . . because a man may change his place . . . and yet retain his body.” If place is the same as body, what happens when a man moves? Cavendish answers:

though it be a vulgar phrase, that a man changes his place when he removes, yet it is not a proper philosophical expression; for he removes only from such parts, to such parts: so that it is a change, or a division and composition of parts, and not of place.⁶⁶

I think we should take Cavendish at her word here: she reduces motion—and so all natural change—to changes in mereological facts.⁶⁷

This is by no means the only place where Cavendish suggests that what is usually called change of place should instead be understood as division and composition of parts. Here are several representative passages:

we cannot perceive progressive local motion otherwise, than by change of distance, that is, by composition and division of parts, which is commonly (though improperly) called change of place.⁶⁸

a man sailing in a ship, cannot be said to keep place, and to change his place; for it is not place he changes, but only the adjoining parts, as leaving some, and joining to others; and it is very improper, to attribute that to place which belongs to parts, and to make a change of place out of change of parts.⁶⁹

a man goes a hundred miles, he leaves or quits those parts from whence he removed first; but as soon as he removes from such parts, he joins to other parts, were his motion no more than a hairsbreadth; so that all this journey is nothing else but a division and composition of parts, wheresoever he goes . . . for it is impossible for him to quit parts in general, although it be his choice to quit such or such particular parts, and to join to what parts he will.⁷⁰

⁶⁶OEP 37.

⁶⁷I use “mereological facts” synonymously with “parthood facts” or “facts about parts and wholes,” and do not mean to imply that Cavendish accepts the axioms of classical mereology.

⁶⁸OEP 136.

⁶⁹PL 106.

⁷⁰OEP 127.

In all of these passages, Cavendish does not just write that quitting and joining parts always accompanies motion or is always a result of motion. She implies that something's motion just is, or just is grounded in, its quitting some parts and joining others: she writes, for example, that it is improper to make change of place out of change of parts; that a man's journey is "nothing else but a division and composition of parts"; and that composition and division of parts is "improperly called change of place." Let us call a body's leaving some parts and joining to others 'compositional motion.' For a body *A* to move is for it to go from being a part of some larger body, *X*, to being part of a different larger body, *Y*.

Cavendish also repeatedly stresses that actual bit of matter's dividing from one body and joining to another is a single act. For example:

there is as much composition, as there is division in nature; and as soon as parts are divided from such or such parts, at that instant of time, and by the same act of division, they are joined to other parts, and all this, because nature is a body of a continued infiniteness, without any holes or vacuities.⁷¹

This strongly suggests that she is thinking of division and composition not just as an incidental result of local motion, but as motion itself. In Descartes's plenum, whenever a body parts from another body, or ceases to share a surface with it, it necessarily shares a surface with a new body or bodies, since there can be no empty space. So it is true for Descartes, just as for Cavendish, that a body is always "joined" to some new bodies when it leaves other bodies, at least in the sense that it always shares a new surface with new bodies. But on Descartes's view, this fact is incidental to the motion of the body. The motion of the body is caused by a different act—namely, the transfer of motion from another body that collides with it. In contrast, Cavendish stresses that the act of dividing and composing is "free and voluntary," and not simply the result of parts being "pressed" or "driven" into one another mechanically:

self-motion is the only cause of the various parts and changes of figures; and that when parts move or separate themselves from parts, they move and join to other parts, at the same point of time: I do not mean, that parts do drive or press upon each other; for those are forced and constraint actions; whenas natural self-motions are free and voluntary.⁷²

According to Cavendish, this act—the act of freely and voluntarily leaving some parts and joining to others—is the act of moving.

In addition to passages where Cavendish explicitly reduces motion to change of such parthood relations, there are even more passages where she simply circumvents appeal to motion, putting claims about natural change in general in terms of composition and division. These passages suggest that, although Cavendish often claims to reduce natural change to motion, she is in fact reducing natural change to change in parthood relations. Here are just a few examples, from among many:

the actions of self-moving matter are so infinitely various, that, according to the mixture or composition and division of parts, they can produce what figures they please; not by a new creation, but only a change or alternation of their own parts.⁷³

⁷¹OEP 127; see also, GNP 5 and OEP 32.

⁷²OEP 127.

⁷³OEP 238.

the parts of nature are always in action, working, intermixing, composing, dividing perpetually.⁷⁴

She also identifies “compositions and divisions” as the “particular effects” of nature in general, which she would normally describe as “motions”:

as for density, rarity, softness, hardness, etc. they were nothing but various compositions and divisions of parts, or particular effects.⁷⁵

And she sometimes directly attributes the variety in nature to composition and division, when she would normally attribute it to motion, as we saw in section 2 above:

nor can [Nature] rest, being self-moving; but she is bound to divide and compose her several parts into several particular figures, and dissolve and change those figures again infinite ways.⁷⁶

as there are infinite changes, compositions, and divisions in nature, so there must be of parts; there being no variety but of parts.⁷⁷

were there no dissolvings, and altering, there would be no varieties of particulars.⁷⁸

Similarly, one particular kind of natural change is the production and disappearance of creatures. But Cavendish frequently writes that creatures are produced by composition and disappear by dissolution:

composed figures which we name creatures, are produced by particular associations of self-moving parts, into particular kinds, and sorts; and particular creatures in every kind, or sort.⁷⁹

all creatures are composed-figures, by the consent of associating parts; by which association, they join into such, or such a figured creature⁸⁰

production is only a society of particular parts, that join into particular figures, or creatures: but, as parts produce figures, by association; so they dissolve those figures by division⁸¹

In fact, Cavendish claims quite explicitly in a number of places that “the chief actions of nature are to divide, and to unite.”⁸² In the *OEP*, she even lists this as the third principle of her philosophy: first, there is matter and self-motion; second, all parts of nature are living and perceptive; and third, “The chief and general actions of nature, are division and composition of parts, both which are done but by one act.”⁸³

⁷⁴OEP 131; see also, OEP 238, OEP 131, and PL 101.

⁷⁵OEP 30. See also, OEP 32, where she identifies effects, proprieties (or properties) and division and composition.

⁷⁶OEP 139.

⁷⁷OEP 18.

⁷⁸GNP 28–29.

⁷⁹GNP 27.

⁸⁰GNP 17; see also, OEP 55.

⁸¹OEP 78.

⁸²PL 434; see also, OEP 177, OEP 140, and PL 159.

⁸³OEP 190.

Now, there are some passages that might make us reluctant to reduce nature's motions to composition and division; in those passages, Cavendish cites composition as one among a variety of kinds of motions. For example, Cavendish classifies division and composition as "particular actions" along with others: "all particular actions whatsoever in nature, as respiration, digestion, sympathy, antipathy, division, composition, pressure, reactions, etc."⁸⁴ But while she frequently stresses the variety of nature's motions, she also stresses that they all share in common that they are motion, so there is no reason that motion in general may not be composition and division. The fact that Cavendish includes composition and dissolution in a list of less fundamental motions is a little confounding, but her ubiquitous lists are not always lists of like ontological entities. It is clear, for example, that pressure is not as fundamental as sympathy, for Cavendish, given the many roles that sympathy plays in her system.

Moreover, Cavendish sometimes provides reductions of the other motions she most commonly mentions: perception, respiration, and contraction and dilation. Perception is just a part of matter's sensitive and knowing rearrangement, occasioned by the arrangement of external matter. Respiration is the "reception and emission of parts" of a body,⁸⁵ especially an animal body; Cavendish says that there is "respiration in all parts of nature, as a general or universal action." But ultimately, "this respiration is nothing else but a composition and division of parts."⁸⁶ In the same section, she repeats that respiration as well as perception "depend upon the composition and division of parts." So do contraction and dilation:

Wherefore all contraction and dilatation consists of parts, as much as body doth; and there is no body that is not contractive and dilative, as well as it is dividable and composable.⁸⁷

Cavendish is relatively careful about the direction of causal relationships (relative to, for example, the direction of conditionals in arguments), so it seems that the extension of a body is less fundamental than "parts." Contraction and dilation can only occur in a complex body, and is a function of the "postures" of its parts. The reason is that Cavendish does not think that an indivisible and isolated bit of matter can change its volume, because she believes that matter and space are identical. When a complex body contracts or dilates, it must be a function of the internal motions, or the motions of its parts.

Before closing this section, I would like to address Cavendish's very occasional use of the word 'space.' In one spot, she seems to raise space as an alternative to place, writing "Space is change of division, as place is change of magnitude."⁸⁸ *Change of place* is change of magnitude, so if *change of space* is change of division, that provides some more evidence that Cavendish is thinking of motion in space in terms of composition and division. However, a few other comments that Cavendish

⁸⁴OEP 139; see also, OEP 173.

⁸⁵OEP 15.

⁸⁶OEP 15.

⁸⁷OEP 124.

⁸⁸OEP 128.

makes about space relate it not to composition and division, but distance—for example, when she writes that “space is only a distance betwixt some parts or bodies,”⁸⁹ or that “that which man calls space, is only a distance betwixt several corporeal parts.”⁹⁰ If Cavendish has an independent conception of distance, then perhaps we can understand the motion of a body as its traversing a certain distance in a certain time.

The biggest obstacle to turning to space or distance for a key to her views of motion is that she uses these concepts much less frequently than she does the concept of place and motion. But also, Cavendish does not provide an independent account of distance, reducing it, too, to parts:

we cannot perceive progressive local motion otherwise, than by change of distance, that is, by composition and division of parts, which is commonly (though improperly) called change of place.⁹¹

Distance is, perhaps, just a function of the parts in between two things.

Other times, Cavendish seems to treat distance as a *measure* concept, along with time. Cavendish has a wide-ranging critique of applied mathematics, to the effect that “mathematical rules, measures, and demonstrations, cannot rule, measure nor demonstrate nature.”⁹² So we should not expect Cavendish provide us with any resources for a quantitative treatment of physical change; it seems we can only say whether or not something is in motion and not, say, how fast it is moving or in what direction or over what distance. But as useless as such an account is for physics,⁹³ this is perfectly consistent with Cavendish’s words. Finally, Cavendish explicitly claims that place, along with time, is reducible to corporeal figurative motions, and not vice versa: “when I speak of place, and time, I mean only the variation of corporeal figurative motions.”⁹⁴ So I do not think that we have, in Cavendish’s use of ‘distance’ or ‘space,’ the resources for a different interpretation of what she means by motion.

Why might Cavendish be motivated to analyze motion in terms of division and composition?

Like many mechanical philosophers, Cavendish is committed to the claim that there is no creation or annihilation in nature. On the basis of this principle, she denies that modes are created or annihilated, including the mode of motion. She believes that one powerful way to explain natural change that avoids positing creation or annihilation is in terms of “rearrangement of parts.” For example, in the *OEP*, Cavendish writes that there is no annihilation and no death, but that “what is named death, is only a change from the dissolution of some certain figure, to the composition of another.”⁹⁵ A little later:

⁸⁹PL 57.

⁹⁰PL 454.

⁹¹OEP 136; see also, OEP 127.

⁹²PL 147; see also, OEP 101. For a detailed account of this critique, see Peterman, “Empress vs. Spiderman.”

⁹³Not only is motion not measurable, for Cavendish, but it is not clear that there will be a single answer to whether a body is in motion. A body is part of many wholes at once, and may be “moving” with respect to some—that is, dissociating from them—and not with respect to others.

⁹⁴PL 529.

⁹⁵OEP 225.

neither can there be any such thing as a new creation in nature . . . those are but changes into other figures, there being a perpetual inspiration and expiration, that is, composition and division of parts; but composition is not a new creation, nor division an annihilation.⁹⁶

Later in this passage, too, she makes clear that there can be no creation or annihilation of “figures or forms” any more than there can be creation or annihilation of matter.

Other philosophers who want to avoid positing creation and annihilations of modes—Bacon and Descartes, for example—accept rearrangement of parts as a kind of natural change but also accept translation as a kind of natural change. While it is not obviously fair to accuse them of thereby positing some new, mysterious mode, form, or quality that can be created and annihilated, Cavendish does seem to think that their way of thinking about motion does commit them to that. This is clearest in her critique of Descartes’s account of motion transfer: she accuses him (like other contemporaries) of reifying motion.⁹⁷ Of course, as far as avoiding positing some creation or annihilation goes, it is not obvious that Cavendish, who understands motion in terms of change in mereological relations, is in a better or worse position than someone who understands motion in terms of change of place. Much depends on the further question of how to ground claims about a thing’s mereological relations or a thing’s place. We have already talked about some of the options for grounding a thing’s place that Cavendish’s contemporaries explored. In the next section, I will talk about Cavendish’s options for grounding mereological relations.

3.2. *Motion and Place*

Now that we have an analysis of Cavendishian motion, we can complete section 2.2’s discussion of whether we can identify a sense of place such that motion is change of place after all. That section argued that Cavendish denies that motion is change of what she explicitly calls place, and offered some evidence that she does not think that motion is change of place*, where place* is something that might do the work of place.

But after the last section, a particular candidate for place* presents itself: if a body’s motion involves removing from some parts or from some whole and attaching to some other parts, then perhaps place* is the whole of which that body is a part, or the parts that the body is joined with.

Sometimes Cavendish does indeed suggest something just like this:

When I say, an animal or any thing else that has exterior local motion, goeth or moveth to such or such a place, I mean, to such or such a body; and when such a creature doth not move out of its place, I mean, it doth not remove its body from such or such parts adjoining to it.⁹⁸

Here, she sounds amenable to identifying the place of a body with the parts adjoining it.

⁹⁶OEP 236–37.

⁹⁷E.g. PL 97 and OEP 75.

⁹⁸PL 536.

However, at other times she seems to be contrasting her account of motion with change of place, writing that it is “a change, or a division and composition of parts, and *not* of place.”⁹⁹ Her reasons for doing so are consistent with the general considerations described at the end of section 2. Discussing a healing wound, Cavendish denies that the flesh that grows into a wound is in the same place as the former flesh. The reason is that

the parts not being the same, the places are not, but every one hath its own place. If the wound remains open, and is filled with air, the air or any thing else may be there, as new parts joining to other parts; nevertheless, the air, or that same body which is there, hath not taken the flesh's place, which was there before, but hath its own: but, by reason the adjoining parts remain, man thinks the place remains there also which is no consequence. 'Tis true, a man may return to the same adjoining bodies, where he was before, but then he brings his place with him again.¹⁰⁰

In a similarly icky example: “if a man's arm be cut off, you may say, there was an arm heretofore, but you cannot say properly, this is the place where the arm was.”¹⁰¹ And lest we think this applies only to organic beings:

say a house stands in such a place, if the house be gone, the place is gone also, as being impossible that the place of the house should remain, when the house is taken away; like as a man when he is gone out of his chamber, his place is gone too. 'Tis true, if the ground or foundation do yet remain, one may say, there stood such a house heretofore, but yet the place of the house is not there really at that present, unless the same house be built up again as it was before, and then it hath its place as before.¹⁰²

As we saw in section 2.2, for Hobbes and Descartes there is no reason that a new body could not come to occupy the place of one that has moved—indeed, they considered this essential to motion. But Cavendish denies that something new can come to occupy the place of a bit of flesh or a house. The original place would only be reconstituted if the flesh itself returned to join the arm or the house to the foundation. Cavendish thinks that for an arm + flesh to be the same as an arm + wound requires not just that all the parts be arranged in the same way, but that the parts be identical.

4 . MOTIVE FORCE

In this section, I will argue that Cavendish uses the word ‘motion’ with a second sense: to refer to nature's power to cause actual motion. I will call the second ‘motive force.’

To use ‘motion’ to refer to motive force would not at all be an unusual use of the word. In his discussion of motion, Descartes famously takes care to distinguish between the word's proper sense, which is the transfer of a piece of matter from

⁹⁹OEP 71, emphasis added; see also, PL 31.

¹⁰⁰PL 103

¹⁰¹PL 103. In a useful and detailed section on the interdependence of Cavendishian parts of nature (Cavendish, 142–55), Cunning puts the point nicely: “nature is not a collection of independent and swappable parts” (Cavendish, 148). But Cunning provides mechanistic explanations of a body's unity: “when we imagine a region of bodies as such, we are omitting reference to the bodies that press upon the region and help to provide it structure.”

¹⁰²PL 57.

the vicinity of some body to the vicinity of other bodies, and the vulgar sense of the terms, which is the action which brings about the transfer.¹⁰³ Cavendish is familiar with this section of the *Principles*, and with the point that Descartes makes there, that, in Cavendish's words, "it requires as much action or force to stay a ship, as to set it afloat."¹⁰⁴ It is not clear that she and Descartes are on *exactly* the same page here,¹⁰⁵ but what is important is that she distinguishes between the motion of something and the force or action that causes it. Bacon's use of the word 'motions' would also provide a ready model for using it this way, and Cavendish's way of talking about motions is, I think, indebted to Bacon: compare Bacon's motions of resistance, motions of connection, motions of aggregation, and so on to Cavendish's retentive motions, dispersing motions, and contracting motions.¹⁰⁶

Cavendish uses the word 'force' to describe artificial effects, 'actions' to describe nature's effects, and neither to refer to matter's causal powers. But it is clear what she takes the deepest causes in nature to be: especially in her later work, they are the self-motion and self-knowledge of the sensitive and rational parts of matter. Self-motion is the power that a bit of matter has to set itself in motion, and Cavendish frequently says that all actual motion is caused by self-motion. Self-motion "is the producer of all the varieties nature has within herself,"¹⁰⁷ as well as "the cause of all the variety of natural figures, and of the various compositions and divisions of parts; it is also the cause of all perceptions."¹⁰⁸ It is clear that self-motion is a cause or a principle, and not an effect, like compositional motion. This passage nicely illustrates what she thinks is the relationship between motive power, or self-motion, on the one hand, and compositional motion, or actual motion, on the other: "self-motion . . . is the cause of all the variety of natural figures, and of the various compositions and divisions of parts."¹⁰⁹ Self-motion, or motive power, is the cause of all actual motion, or "compositions and divisions of parts."

Cavendish often simply calls self-motion, "motion," for example, when she writes that "every body (though occasioned by another, to move in such a way) moves by its own natural motion; for self-motion is the very nature of animate matter."¹¹⁰ It is in *this* sense that Cavendish calls motion a principle of nature, even though actual figurative (compositional) motions are the effects of nature. So Cavendish uses 'motion' to refer to self-motion or motive power, which is the power that matter has to cause changes in itself, or to cause its effects, or to act.

The distinction between compositional motion and motive force has the nice result that it goes some way toward explaining how inanimate matter can be moved without self-motion. Cavendish writes, for example, that "inanimate matter, although it has no motion at all, yet it goes along with the animate parts wheresoever

¹⁰³Principles, AT VIII.A.53–54/CSM I.233.

¹⁰⁴Principles, AT VIII.A.53–54/CSM I.233.

¹⁰⁵Cavendish defines "retentive motions" at PPO 34 as those that "glue parts together"; she seems to be treating the relevant force here not as the force that stops the ship but as the force that holds it together.

¹⁰⁶See Guido Giglioni, Bacon on Motion and Power.

¹⁰⁷OEP 74.

¹⁰⁸OEP 138; see also, OEP 157.

¹⁰⁹OEP 49.

¹¹⁰PL 37.

they'll have it."¹¹¹ On the view that I have developed, inanimate matter removes from and joins with animate parts in virtue of their own motive power, or power to remove from or join parts.¹¹² This does not really explain why Cavendish claims that all motion is self-motion, or self-caused, since inanimate matter would seem to be an exception.¹¹³ But it does show that besides claiming that something can have motive power without actual compositional motion, Cavendish claims that something can have compositional motion without motive power.

Now, a primary motivation in identifying motion as the only causal principle in nature, at least for mechanical philosophers, is that it is sensible and intelligible—actual local motion is not a mysterious, hidden causal power. Does Cavendish share this motivation? Can motive power be reduced to actual motion: either to local motion or to compositional motion?

As for local motion, the answer is clearly 'no.' Section 2 showed that Cavendish denies that motion in any sense is change of place. But what about compositional motion? The answer here, I think, is 'no,' too. Cavendish is happy to say that a bit of matter retains a particular figure, place or motion even when it changes that figure, place or motion, by which she usually means that it retains the power to produce that figure, place or motion again. In the case of motion, for example, she says that when a man shakes his hand and then stops, the motion is still in the hand. But the actual compositional motion has stopped.¹¹⁴

It is tempting to respond that the power to produce a particular compositional motion is not, of course, grounded in *that* actual motion itself, but in *other* compositional motions. We already know that they cannot be the compositional motions of entirely distinct bodies—this is precisely the point of Cavendish's criticism of Cartesian transfer theory. Other bodies may serve as something like occasions, influences or even causes, if you like, but they are not the source of the body's motion itself. Cavendish is insistent: another body's motion cannot be the cause of a body's motion. But maybe the compositional motion of a body is caused by the compositional motions either of the whole of which it is a part, or the compositional motion of its own parts.

This is an interesting possibility, and a full treatment of it would take us beyond our project here. It requires grappling with one of Cavendish's most central puzzles: to what extent are explanations in nature top-down, and to what extent are they

¹¹¹"Wherefore, as several self-moving parts may be joined in one composed body, and may either act differently without hindrance and obstruction to each other, or may act jointly and agreeably to one effect; so may the sensitive parts carry or bear along with them the inanimate parts, without either transferring and communicating motion to them, or without any co-operation or self-action of the inanimate parts" (OEP 33).

¹¹²OEP 19.

¹¹³Cavendish addresses this in several places, seeming to rely on the doctrine of complete blending to do the job.

¹¹⁴In some recent studies of Cavendish's natural philosophy, there is talk of quantity of motion and its conservation: e.g. Detlefsen, "Reason and Freedom," 170; Cunning, Cavendish, 152; and Lascano, *Women Philosophers*. I do not think there is any evidence that Cavendish makes use of this concept or of a conservation rule. It also puts her in danger of falling prey to her own critique of Cartesian transfer theory: if a body can lose or gain a quantity of something, that thing must be matter, and so a body that is speeding up should gain mass. But Cavendish says that this is not consistent with our experience (OEP 128).

bottom-up?¹¹⁵ In the next section, though, I will say a little bit about that, and suggest that, ultimately, Cavendish seems to think that at least some compositional motion is a result of forces other than compositional motion itself.

5. GROUNDING PARTHOOD RELATIONS

To really understand Cavendish's claim that for a bit of matter to move is just for it to divide from some parts and join to others, we need to understand Cavendish's account of parthood: in particular, what makes one bit of matter part of some whole or other. I will not attempt to give a comprehensive answer to this question, because it connects up with many deep issues in Cavendish's system that are too big to wrangle here. Instead I will describe what I think are the options that Cavendish has for characterizing a piece of matter's parthood facts.

Cavendish does not, as far as I can tell, have precise views about the differences between grounding, truth-making, or identity. In fact, when Cavendish uses the term 'ground,' it is not only unclear exactly what relationship of metaphysical dependence she has in mind, but it is ambiguous between causal and metaphysical dependence.¹¹⁶ I do not think we can expect her to tell us, for example, whether parthood facts are "ontologically innocent" or whether the whole is something "over and above" its parts or whether composition is identity. So, leaving the exact nature of the metaphysical dependence relations open, I will be after the answer to the question: what does the world have to be like, for some particular part-whole fact to obtain?¹¹⁷ Take some portion of matter, *A*. For *A* to move, according to section 3.1, is for some fact of the form "*A* is a part of *X*" to go from obtaining to not obtaining and for another fact of this form—say, "*A* is a part of *Y*"—to go from not obtaining to obtaining.¹¹⁸ In virtue of what do these facts obtain?

The arguments of section 2 rule out one plausible answer: that what makes *A* part of *X* is having certain relations of local motion with the other parts of *X*. Cunning defends this view, arguing that parts make a whole by retaining what he describes as a proportion of motion and rest among themselves, à la Spinoza.¹¹⁹ Although Cunning marshals some suggestive passages, I think that they are not sufficient to show that Cavendish holds such a view.¹²⁰ In most of the passages, Cavendish simply writes that motions are related to binding a creature's parts together, but without knowing what motion is, this is not very informative. So even if Cavendish came straight out and said that what binds bits into one whole

¹¹⁵The most detailed and instructive treatment of this issue to date is Detlefsen, "Reason and Freedom"; see also, Cuning, Cavendish, ch. 3.

¹¹⁶E.g. OEP 47.

¹¹⁷Maybe, as Paul Audi has suggested to me, we can call this supervenience, according to those, like Jaegwon Kim, who think that supervenience is neutral about the underlying metaphysics (Kim, "Supervenience as a Philosophical Concept").

¹¹⁸The facts might also be of the form "*A* is part of a whole with *B*," so that what is specified are the other parts with which *A* is joined to create a whole. I do not think it makes a difference for the discussion that follows which one we adopt.

¹¹⁹Cuning, Cavendish, 160.

¹²⁰In correspondence, Cuning points out the following passage in support of the proportion view: "For every creature, if regularly made, hath particular motions proper to its figure, for natural matters wisdom makes distinctions by her distinct corporeal motions, giving every particular creature their due portion and proportion according to the nature of their figures" (PL 184).

is a relation of motion and rest that obtains among them, we would still be faced with elucidating what that means.

A second possibility is that parts of nature like creatures are made wholes by being identified with a single figure.¹²¹ As we saw in section 1, when Cavendish is willing to make distinctions among matter, figure, and motion, it sometimes sounds like what makes a bit of matter the bit of matter that it is that it has a certain figure. That suggests that, maybe, for *A* to be a part of *X* is for *A* to be related to *X*'s figure in a certain way. For example:

Infinite matter . . . being divided by self-motion into creatures or parts, these creatures or parts may have exact figures according to their proprieties¹²²

Given that there are many such passages, there is good textual evidence that Cavendish associates some bits of matter composing a whole with their making together one figure.

The question, however, just as above, is what it means for bits of matter to make one figure. Most of the times that Cavendish uses the word 'figure,' she is committed to nothing specific about what a figure *is*, over and above the essence or nature of a unified creature. If that is all we know about figure, then to say that what unites parts of matter into a single creature is that they share a figure or relate to a figure in a certain way is just to say something like that they participate in one thing with a single nature.

Now, a straightforward and informative interpretation of 'figure' does suggest itself: perhaps Cavendish just thinks that figures are geometrical figures. The only obvious way that this can help us to understand how parts are unified into a single whole is to say that the parts are all spatially circumscribed by a single figure.¹²³ However, it is clear that Cavendish does not think that what she calls the 'exterior figure' of a creature is what gives it its 'interior figure' or true nature.¹²⁴ The interior figure of a thing seems to refer to sets of motions or to the figures that the interior parts tend to take. As a result, I think that, while attending to what Cavendish says about figure can point us in the direction of what she thinks bind parts of matter into a whole creature, it is because it names the problem—what is it for parts to make one figure?—rather than offering a solution.

The solutions proposed so far suppose that parts of matter are bound into wholes by geometrical or spatial relationships, or relationships of relative local motion. But the more promising avenues are, I think, those that posit that the parts have something like causal relations among themselves. Two options are obvious

¹²¹I am grateful to an anonymous reviewer for encouraging me to address this very plausible possibility.

¹²²PPO 5; see also, PPO 6: "The several degrees of matter cause division by different motion, making several figures, erecting, and dissolving them, according as their matter moves."

¹²³That is not the only way that we could interpret what binds parts into whole in geometrical terms, but I believe that any other possibility reduces to the other possibilities that I will go on to entertain. For example, we might say that parts are parts of a whole in virtue of having similar geometrical figures. But that raises the question of what binds similar figures into one creature, and the plausible answer to that is sympathetic relations.

¹²⁴"[S]ince the exterior figures of creatures are not the same with the interior, but in many or most creatures quite different; it is impossible that the exterior shape and structure of bodies can afford us sure and excellent instructions to the knowledge of their natures and interior motions" (OEP 70).

here: first, that parts compose a whole insofar as they have certain sympathetic relations amongst themselves; and second, that parts compose a whole insofar as they have relations of sense and reason amongst themselves.

The first among these candidates for what grounds the unity of parts is the sympathetic relations among them. In Cavendish's earlier work, she attributes many natural phenomena to sympathetic relations among parts of matter. Natural sympathy is a complex concept that traces back to Stoicism (an important source of philosophical inspiration for Cavendish, especially in early work).¹²⁵ Roughly speaking, sympathy is a force arising from a kind of affinity between objects, often due to the fact that they are similar in some way or another.¹²⁶ Cavendish treats sympathy as operating both between parts of one individual and members of a kind.¹²⁷

In the work where sympathy plays a dominant explanatory role, there is no doubt that Cavendish thinks that special sympathetic relations obtain among parts of a whole; the topic of "sympathetical conjunction" is an important theme of the *PPO*. The question, however, is whether the sympathetic relations between bits of matter ground the fact that they form a whole, or whether they have those sympathetic relations in virtue of the prior fact that they are parts of one whole. Both views are represented in the literature: Detlefsen and O'Neill argue that sympathies ground parthood facts,¹²⁸ while Lascano writes that "The sympathy between the parts of nature is due to the fact that each is part of one whole."¹²⁹

Much of the evidence is indecisive, and the passages that do support one side over another are about equally frequent. For example, the passages that Detlefsen offers in support of the claim that sympathy grounds unity are, I think, ambiguous:

Again, your *author* asks, *what glue or cement holds the parts of hard matter in stones and metals together?* I answer, consistent or retentive corporeal motions, by an agreeable union and conjunction in the several parts of metal or stone.¹³⁰

What holds the parts of matter together is an "agreeable union"—but does the agreement, or sympathy, make the union, or does the union make the agreement? There are some passages that look a little more decisive; for example: "the several degrees of matter, motion and figure . . . [make] *faction* by sympathy and *fraction* by antipathy."¹³¹ But for each of these, there is another that supports the interpretation that the parts of nature come to act in sympathy in virtue of being part of the

¹²⁵See O'Neill's introduction to OEP xii.

¹²⁶For a very useful introduction to the concept of sympathy, see Eric Schliesser, *Sympathy*, esp. the introduction. For Stoic sympathy, which would be influential for Cavendish, see, from that volume, the essay by René Brouwer. Like Cavendish, the Stoics think that all the parts of the whole universe have a natural sympathy for one another (Brouwer, "Stoic Sympathy," 22).

¹²⁷E.g. *PPO* 36.

¹²⁸"A body's unity is explained by the sympathy among its parts" and that sense and reason play a role in this internal love or sympathy, "thus indicating that sense and reason, taken metaphysically, are responsible for the individuation of beings" ("Reason and Freedom," 168, 185). See also, O'Neill, introduction to OEP xxi; and Cunning, Cavendish, 126.

¹²⁹<https://philosophymodsquad.wordpress.com/2014/03/16/an-introduction-to-margaret-cavendish-or-why-you-should-include-margaret-cavendish-in-your-early-modern-course-and-buy-the-book/>

¹³⁰PL 167; see also, *PPO* 5, 75.

¹³¹*PPO* 5; see also, PL 290.

same whole: “there is a strong *sympathy*, and agreement, or affection (as I may say) betwixt the rational spirits, and the *sensitive spirits* joined in one figure.”¹³²

And while sympathetic relations are an importantly related to parthood relations in Cavendish’s early work, however, talk of sympathy largely falls out of her later work. In the *Observations on Experimental Philosophy* (1666), she mentions it only a handful of times. The *Grounds of Natural Philosophy* is published later than the *OEP*, in 1668, but it is a revised version of *Philosophical and Physical Opinions*, originally published in 1655. In place of sympathy, explanations in the *OEP* rely more heavily on the sensitive and rational capacities of matter, which she characterizes there as “general and fundamental actions of nature.”¹³³

Like sympathy, it is clear that Cavendish connects the perceptual and epistemic capacities of a bit of matter with its parthood facts:

there being an intercourse and commerce, as also an acquaintance and agreement between parts and parts, there must also of necessity be some knowledge or perception betwixt them, that is, one part must be able to perceive another part, and the action of that same part.¹³⁴

As it was with sympathy, it is not clear to what extent a creature’s unity explains the sensitive and rational capacities of its parts and to what extent the sensitive and rational capacities of its parts explain its unity. Cavendish frequently argues that at least some facts about what knowledge a particular part of matter has is a function of its parthood relations:

as a union or combination of parts, makes knowledge, so a division or separation of parts, makes ignorance.¹³⁵

But she also gives a role to sense and reason in establishing the union of parts of matter:

parts are regularly composed . . . by a conjunction or union of their particular self-knowledges and perceptions of each other.¹³⁶

The apparent tension here can be relieved by observing that Cavendish uses ‘sense’ and ‘reason’ in two ways: one to refer to the intrinsic capacities that matter has, and another to refer to “composed” sense and reason, or the knowledge or perception that a body has as a result of the sense and reason of the parts and their interaction:

For as the several compositions of several parts are, so are they: not that the bare composition of the parts and figures is the cause of perception; but the self-knowing and self-moving parts compose themselves into such or such figures; and as there are proprieties belonging to such compositions, so to such composed perceptions¹³⁷

The appeal of grounding parthood relations in terms of sense and reason is that Cavendish clearly posits that sense and reason are basic, inherent powers of matter.

¹³²PPO 14.

¹³³OEP 139.

¹³⁴OEP 143.

¹³⁵OEP 20, see also, OEP 163.

¹³⁶OEP 155; see also, OEP 39: “the sensitive many times informs the rational, and the rational the sensitive, which causes a general agreement of all the parts of a composed figure.”

¹³⁷OEP 184.

If we task them with grounding parthood facts, we do not take on any additional metaphysics.¹³⁸

Sympathetic forces, and sense and reason, may seem to be better candidates for *causes* of parthood facts or relations than for *grounds* of parthood facts or relations.¹³⁹ But while sympathies, or sense and reason, are part of the cause of the fact that parts come together to form a whole, that is consistent with the claim that for parts to be bound into a whole is for certain relations of sympathy, or sense and reason, to obtain among them. If that is right, then sympathies, or sense and reason, are both causes of parthood facts and grounds of parthood facts. Compare this to a causal account of composition, for example, to Van Inwagen's (I think plausible) view that "a set of objects adds up to something just in the case that its members bear certain relations (as it may be, causal or spatial) to one another."¹⁴⁰

We have talked so far about how Cavendish might ground parthood facts in facts about relative local motion or geometrical figure, and about how she might ground parthood facts in a force like sympathy or in facts about sense and reason. There are, however, two more possibilities. First, we might say that whether or not *A* is a part of *X* is simply determined by fiat—either God's fiat or Nature's. There is no further fact that grounds parthood relations other than that God or Nature dictate that those relations obtain. Although Cavendish often appeals to the wisdom of Nature in particular to explain harmony among the parts of nature, I do not think that we should take Nature's fiat to be what grounds parthood facts. Rather, while Cavendish does seem to think that some kind of top-down rational organization is responsible for the harmony or "regularity" in nature, she also attributes most of the execution of regular or harmonious behaviors and arrangements to the parts of nature themselves. Detlefsen has argued, I think convincingly, for this point at length, pointing out that it does not take heed of the role that the sense and reason of the parts of nature play in explaining their behavior.¹⁴¹

That leaves us, as far as I can see, with one more possibility: that parthood facts are primitive, for Cavendish. This possibility has some appeal, given the argument of section 3.1. I tried to argue there that Cavendish characterizes natural change in general to change in parthood relations. If she thinks that change in general is change in parthood relations, then it might seem appealing to think that she thinks that change in general is *fundamentally* change in parthood relations. If that is right, then it seems reasonable to take parthood facts as primitive.

It is worth briefly considering how all these options fare with respect to Cavendish's holism. But this is hugely complicated in two ways. First, whichever

¹³⁸In her introduction, O'Neill argues that sensitive matter in particular is responsible for making the parts of nature into wholes: "'Sensitive matter,' whose motions, like a 'labourer or workman,' carry along the inanimate matter, gives rise to the variety of configurations in nature and makes nature a single living body filled with diverse bits of sensitive knowledge" (OEP xxiv).

¹³⁹As an anonymous referee helpfully pointed out.

¹⁴⁰Van Inwagen, *Material Beings*, 23. Thanks to Paul Audi for discussion.

¹⁴¹"Reason and Freedom," 169–71. Detlefsen's article also suggests another solution for grounding parthood relations: the parts of nature by their own choice ground their parthood relations, in conjunction with facts about sense and reason. That fits nicely with quotes like these: "All creatures are composed figures, by the consent of associating parts; by which association, they join into such, or such a figured creature" (GNP 17).

we might plump for, there will still be many further questions to answer (to the extent that they are answerable) about what exactly these are and how they ground parthood relations. For example, say we decide that matter's sense and reason ground parthood relations. What, exactly, is sense and reason? Is it a monadic property, an intrinsic power of a body? Or is it irreducibly relational? If it is the former, it does not entail any kind of holism; if the latter, it may entail some kind of holism, depending on the sort of relation that it is.

Second, we have to specify in what sense(s) Cavendish is and is not a holist, and this is a task that goes well beyond the scope of this paper. But I will say a few words here.

Cavendish's official pronouncements about part-whole dependence in general are ambivalent. Sometimes she stresses that a whole and its parts are equally fundamental: "a whole is nothing but a composition of parts, and parts are nothing but a division of the whole."¹⁴² On the one hand, this is consistent with two more claims that she makes: that the distinction between a whole and the parts that compose is a distinction "only in the manner of our conception" and that a whole is identical with its parts.¹⁴³ On the other hand, she often stresses that the whole is the cause of its parts, that the part is "inferior" to the whole. On yet another hand, when she talks about the behavior and properties of "composed figures"—and "there is no figure that is not composed"—she treats them as dependent upon the parts and their relations.

Now, remember from section 1 that Cavendish denies that there can be 'single' parts in nature,¹⁴⁴ where a single part is a bit of matter that has "absolute subsistence" independently of nature as a whole.¹⁴⁵ But in what sense is this holism? Detlefsen, Cunning, Sarasohn, Lascano, and others have made strides in understanding the outlines of Cavendish's holism, but I think that there is still much more to be said about its exact nature. Detlefsen notes that, for Cavendish, "what appear to be distinct individuals are really just parts of larger and larger parts" and that nature makes "but one body."¹⁴⁶ (169). But the fact that every thing is a part of a larger whole does not make them metaphysically dependent on their wholes. It is clear that Cavendish thinks that the parts of nature are causally dependent on their wholes:

the parts of nature . . . consists of a composition of other parts. . . . For example: an eye, although it be composed of parts, has a whole and perfect figure, yet it is but part of the head, and could not subsist without it.¹⁴⁷

Here, the *causal* dependence between parts does not entail their *metaphysical* dependence. When Cavendish writes that the parts of nature must have "reference" to the whole, that sounds, perhaps, as if the fundamental properties or state of

¹⁴²OEP 32; see also, OEP 194.

¹⁴³OEP 31.

¹⁴⁴E.g. PL 175.

¹⁴⁵See also, OEP 31: All creatures are "parts of the one infinite whole, which is nature; and these figures being all one and the same with their parts of matter, change according as their parts change, that is, by composition and division."

¹⁴⁶Detlefsen, "Reason and Freedom," 169.

¹⁴⁷OEP 126.

any part of matter cannot be completely specified without reference to facts about the whole of which it is a part. But it is not clear exactly why she thinks that. Sometimes, she even seems to suggest that the claim that the parts of nature are inextricable from the whole is just the claim that everything is matter and is the effect of a common cause.¹⁴⁸

You might think that, because Cavendish thinks that the parts of nature are carved out by motion and owe their properties or features to motions, it does not make sense to in turn ground motion in properties of the parts.¹⁴⁹ But Cavendish treats nature as a whole in (at least) two different ways. First, matter could have existed without motion, in which case there would be no effective parts. The effective parts of nature, which are generated out of matter by motion, do not compose that infinite lump of matter, because they are generated in it by motion and are posterior to it. In this sense, what requires explanation is the generation of parts, not that they make a whole. This is nature as ‘one lump.’

However, once parts are carved out of nature by motion, it could have been that they were random and moved chaotically. But they are not—there are relations among the parts or between the whole of nature and the parts that ensure a “regularity” or “harmony,” and that is a source of a *different* kind of unity in nature:

several self-moving parts may be joined in one composed body, and may either act differently without hindrance and obstruction to each other, or may act jointly and agreeably to one effect.¹⁵⁰

This is nature as ‘one organism.’ Cavendish more frequently treats creatures as “composed” out of the parts of nature, rather than as carved out of one block of stuff. So I think that when she is thinking about nature as a whole and creatures as wholes, it is more often with this sense.

When we are thinking of nature as one lump, it is prior to its parts. But when we think about it as one organism, it is not obvious that Cavendish thinks that the whole is prior to the parts. It may be that it is facts about the parts, even intrinsic, monadic facts, that ground the fact that nature is one organic whole. So Cavendish’s holism would not rule out bits of matter having intrinsic variation in their powers (for example, their sympathies, or their sense and reason) that in turn ground parthood facts. But if Cavendish does turn out to be a holist, the option that parthood facts are primitive may look more appealing.

In this section, I have only tried to outline what I take to be Cavendish’s options for constituting parthood relations in nature. It may be that bodies form a whole in virtue of sympathetic relations among themselves, or that joint action makes some bodies into a whole, or that sense and reason unite the parts of a body. It may be that facts about parts and wholes are genuinely primitive, so that parts have sympathy or knowledge among themselves in virtue of being parts of the same whole. What I am most concerned to stress here is that parthood facts are not functions of local motion, and that Cavendish understands local motion in terms of changes in parthood relations, whatever those may turn out to be grounded in.

¹⁴⁸E.g. OEP 127.

¹⁴⁹As was suggested by an anonymous referee.

¹⁵⁰OEP 33.

6. CONCLUSION

I have argued that, according to Cavendish, motion is not local motion; it is not change in place, or spatial location. This is an interesting result, because Cavendish embraces the mechanist polemics of Descartes, Hobbes, and Boyle. But when they argue that matter and motion are the principles of nature, they are interested in appealing to the special simplicity and intelligibility of local motion. Cavendish makes no such appeal, and, in fact, she never defines or explains why she thinks that motion is the great principle of natural variety and change. While it has been widely appreciated that Cavendish differs from many mechanists by attributing intrinsic powers like self-motion and self-knowledge to matter, her claim that motion, along with matter, is the great principle of nature has been taken more or less at face value. But my arguments here show that her departure from mechanism is much more radical than that.

Instead, Cavendish offers what I think is a completely original account of motion, and appreciating this can help us to appreciate her natural philosophy in a new light. According to Cavendish, for a body to be in actual motion is for it to divide from one whole and unite with another. So when Cavendish says that all natural change is motion, she means that all natural change is dividing and composing of parts. This raises the question, of course, of how she understands parthood relations and how they change. Section 5 gave an account of what I take to be Cavendish's options for grounding parthood relations, although really figuring this out requires a much more sustained consideration of the precise nature of matter's power of sense and reason, or of sympathies and antipathies, and of the directions of the varieties of explanation that she appeals to in her natural philosophy.

Finally, I have argued that Cavendish uses the word 'motion' equivocally: sometimes it means actual motion, and sometimes it means motive power. Motive power is not reducible to facts about actual motion, which is a further way in which she sets herself apart from the central tenets of mechanism. Making the distinction between actual motion and motive power also alleviates some tensions in her philosophy, including the question of the motion of inanimate matter.

In all this, I have raised many more questions than I have answered. To really understand Cavendish's account of natural change, we must, as far as possible, decide exactly how she grounds mereological facts. This is a difficult but worthwhile task, because claims about the relationships between parts and wholes plays such a fundamental and interesting role in Cavendish's philosophy; as I have tried to show, she thinks that mereological facts ground the variety and change in nature.¹⁵¹

¹⁵¹I am deeply indebted to the intrepid philosophers who were into Cavendish, as it were, before she was cool. I am especially grateful to those of them that have helped me to learn about Cavendish, and who have given me extraordinarily generous feedback on this paper and others: Deborah Boyle, Karen Detlefsen, David Cuning, and especially Marcy Lascano, who is so giving of her insight and her expertise about early modern women philosophers. Thanks are also due to three extremely knowledgeable and perceptive referees at the Journal of the History of Philosophy, and to the editorial staff for enlisting them. I also had supportive and helpful feedback from Colin Chamberlain, Marcus Adams, Katherine Brading, Alison Simmons, Jim Van Cleve, Ed McCann, Patrick Connolly, Brooke Sharp, Jon Shaheen, Raul Saucedo, Bob Pasnau, audiences at the Lehigh University Philosophy Conference,

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