1.Space and Its Relationship to God

[[Note: Existing references will be brought into house style later.]]

1.1. Introduction

During the Scientific Revolution, philosophers intensely debated how best to understand space. Many debates revolved around the account Descartes advanced in his *Principles of Philosophy* (1644), and this paper treats it as a focal point. Descartes argued for a return to the Aristotelian view that there is no difference in reality between space and matter, entailing that empty space - space empty of matter - is impossible. Over the next century, all kinds of philosophers attacked this position, and we take their rejections of Cartesian space as a starting point for exploring alternative views.

Many important discussions of space emerged during this period, and we cannot cover them all.[1] We have chosen to present a varied selection in chronological order, from Henry More, Samuel Clarke, Isaac Newton, Catharine Cockburn, and Gottfried Wilhelm Leibniz. These philosophers are united in rejecting Descartes' account of space, and the breadth of theories they produce should demonstrate the metaphysical richness of this era. Newton and Leibniz are particularly important because the clash between their theories of space laid the groundwork for twentieth and twenty-first century debates between substantivalism and relationism that remain ongoing today. From the mid-seventeenth century, we will see that debate grew especially heated because of its theological implications—for many philosophers, the nature of space is deeply tied to the nature of God. Although the rejection of Cartesian space led to diverse accounts, we claim that there is nonetheless a deep agreement among these various alternatives: all the accounts agree on the *features* of space. As we explain below, this fundamental agreement effectively set the scene for Kant's theory of space, advanced after the Scientific Revolution had concluded.

1.2. Cartesian Space and its Controversies

Descartes sets out his substance-attribute-mode ontology in the *Principles*, as follows (CSM I 210-2; AT VIIIA 24-6). "By substance we can understand nothing other than a thing which exists in such a way as to depend on no other thing for its existence". Independent substances thus are contrasted with "modes"—dependent entities that affect or modify substances. Also, to each substance belongs one "principal attribute" that constitutes its nature or essence, and to which all its other properties are referred. Extension in length, breadth, and depth constitutes the principal attribute of corporeal or material substance; and thought constitutes the principal attribute of incorporeal or thinking substance. As God is immutable, there are no modes in God, merely attributes.

For Descartes, things can be distinguished in different ways, as follows (CSM I 213-5; AT VIIIA 28-31). A "real distinction" holds between substances: we know two substances are really distinct if we can "clearly and distinctly" understand one apart from the other. Meanwhile, a "conceptual distinction" holds between a substance and some attribute of that substance without which it is unintelligible, or between two attributes of a single substance. A conceptual distinction is indicated by our "inability to form a clear and distinct idea of the substance if we exclude from it the attribute in question". To illustrate, Descartes argues there is a real distinction between a person's mind and body—these are two distinct substances, and we can form a clear and distinct understanding of one without the other. In contrast, there is only a conceptual distinction between a material substance and its attribute of extension, so in reality an extension must be considered as the extended substance itself. Similarly, there is only a conceptual distinction between God and God's attributes.

[1] Our focus on philosophers responding to Descartes excludes figures such as Giordano Bruno, Francis Bacon, Pierre Gassendi, and Walter Charleton. Broader discussions of space in this period include Burtt (1924), Koyré (1957), Grant (1981), Pasnau (2011), Reid (2012), Thomas (2018), and Huggett & Hoefer (2018).

As there is only a conceptual distinction between material substance and its attribute of extension, Descartes then presents the following view of space:

> There is no real distinction between space… and the corporeal substance contained in it; the only difference lies in the way in which we are accustomed to conceive of them. For in reality the extension in length, breadth, and depth which constitutes a space is exactly the same as that which constitutes a body. (CSM I 227; AT VIIIA 45)

In other words, there is no difference in reality between space and material body. A consequence of this view is that there cannot be space "empty" of matter. Where there is matter, there is space. Where there is space, there is matter. The Cartesian material world is a matter-stuffed plenum.

Descartes probably did not think his account of space and matter would be controversial, since it is essentially the same as Aristotle's[2]. Yet it proved controversial throughout the seventeenth and early eighteenth centuries, and still provokes disagreement today[3].

Descartes' identification of space with matter was adopted in various ways by philosophers whose Cartesianism is well documented, including Jacques Rohault, Baruch Spinoza, and Nicholas Malabranche.[4] It can also be found far beyond that crowd. For example, in her *Grounds of Natural Philosophy*, the English philosopher Margaret Cavendish writes there cannot be any vacuum because "Body and Place is but one thing" (1668, 4). In his *Letters to Serena*, the Irish free-thinker John Toland (1704, 182–3) agrees there is no space distinct from matter. But, as we shall see, others rejected the view.

1.3. Henry More: Space as God

The Cambridge Platonist Henry More (1614–1687) is perhaps best known for his views on space, which evolved over the course of his career. Descartes exerted a significant influence over More's early work.[5] For example, More's 1646 *Democritus Platonissans* adopts the Cartesian positions that the material world is a plenum, that there is no space "unstuffd with Atoms," and that material bodies move in circular vortices (More, repr. 1878, 90). However, although More held that the material world is a plenum throughout his career, he never adopted Descartes's *identification* of matter and space. Indeed, More argues that there is infinite space beyond the finite material universe, and that it is possible for empty spaces to appear in the material universe. In a letter dated 5 May 1651 to Anne Conway, More writes that, unlike Descartes, he holds that the notion of "empty space"—space devoid of matter—is not a contradiction. More explains that, although the material world is a plenum, it is finite, effectively positing an island of matter floating in an otherwise empty infinite space. In addition, More asks us to imagine a world containing just two "plaines" (i.e., flat slabs) of marble. If these slabs of marble lay on top of each other, and then moved apart, More claims a vacuum would come between them (More, repr. in Nicolson & Hutton, 1992, 486-9).

More consistently rejected Descartes's account of space, but the details of More's own account evolved across the course of his career.[6] His mature account, for which he is best known, appears in his magnum opus, *Enchiridion Metaphysicum.* Recall that, according to Descartes, space is unconnected with God, since they are distinct substances. On More's account, by contrast, space *is* God. Using thought experiments, More argues against Descartes that there is everywhere "a certain immobile

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[2] Aristotle also identifies space with matter; see his *Physics* (216b2-15). Woolhouse (1994, 32) suggests Descartes' account of space deliberately alludes to Aristotle.

[3] Issues raised by Descartes' account include the following. How are bodies individuated - by motion, or someone other way? On this, see Normore (2008, 280) and Pasnau (2011, 153; 686). Are there many material substances in Descartes' universe, or should we see space as one giant material substance? On this, see Garber (1992, 181), Sowaal (2004), and Secada (2004, 242-3). Finally, are material bodies phenomenal? On this issue, see Lennon (2007) and Thomas (2015).

[4] On Rohault's theory of space, see Spink (2018); on Spinoza's extension see Shein (2018); on Malabranche's Cartesian metaphysics see Schmaltz (2017).

[5] See Lamprecht (1935), Patrides (1969, 29-31), Gabbey (1982), and Reid (2012, 23-6).

[6] See Reid (2012, 96-7).

extension diffused all round in all parts even to infinity and distinct from mobile matter" (trans. 1995, I 52; VII:15). More then goes on to use Descartes's substance-attribute-mode metaphysics in a decidedly un-Cartesian way, arguing that if we accept that extension is a real attribute of matter, we should also accept that extension is a real attribute of some other subject in the *absence* of matter:

> the real attribute of some real subject (*realis Subjecti Attributum reale*) can be found nowhere else except where in the same place there is some real subject under it. And, indeed, extension is the real attribute of a real subject (namely matter), which however is found elsewhere …. Therefore, it is necessary that some real subject be under this extension, since it is a real attribute. (More, trans. 1995, I 56-7; VIII:6)

Extension is an attribute of matter, *and* extension is an attribute of some other "real subject" distinct from matter. What might that other real subject be?

More contends that this "immobile extension" or space *must* be divine as it shares at least twenty of God's titles, including being one, simple, immobile, eternal, complete, independent, and existing from itself (trans. 1995, 57-60; VIII: 7-13). Hence, space is an attribute of God. But More follows Descartes in holding there is no real distinction between a substance and its attributes, so More also holds there is no real distinction between God and space. This sometimes leads More to write that space is a substance - implicitly the substance of God. For example, immediately following his discussion of God's shared titles, he adds "that infinite extension which is supposed by the common people to be mere space, is indeed a certain substance, and that incorporeal, or spirit".

Space is not God's only attribute. God is also omniscient, omnipotent, benevolent, and so on. More (trans. 1995, I 27; IV:4) argues that we cannot clearly conceive an attribute without conceiving the substance to which it belongs. As space is only one attribute of God, any attempt to consider space independently of God results at best in an unclear or confused *representation* of God. As More puts it, regarding the "internal space" occupied by an object:

> As when someone descries some object visibly, and, from a distance in the twilight, he apprehends it simply to be some opaque body, he does not know of what kind, animal, or tree, the backside of a horse … so, indeed, is the matter here. The object of our mind which we say to be internal space is only a slight and diluted, and general, shadow (*umbra*) representing the nature of the uninterrupted divine presence under the obscure light of our intellect. (More, trans. 1995, 67; VIII.13 Scholia)

More's understanding of the relationship between substances and attributes explains why he describes space as the *attribute* of God (conceptually we can distinguish between God the substance and God's attribute of immensity), the *substance* of God (in reality, there is no distinction between God's substance and God's attributes), and also as a confused *representation* of God (when we try to consider space independently of God, we are not fully apprehending space or God).

Whereas Descartes identified space with the least perfect of substances, matter, More identified it with the most perfect, God. More's account of space would prove just as controversial as Descartes's, and it was attacked by a range of thinkers, including Margaret Cavendish and Leibniz. However, More's account also proved hugely influential, and was used as a source by thinkers such as John Locke, Joseph Raphson, and Newton.[7] The next section argues that there are also deep similarities between Clarke's views and More's, although Clarke does not acknowledge them.

1.4. Samuel Clarke: Space as an Attribute of God

The famous Newtonian Samuel Clarke (1675–1729) argues for the divine nature of space in his first set of Boyle lectures, delivered in 1704 and published in 1705 as *A Demonstration of the Being and*

[7] On More's account of space and its influence more generally, see Reid (2012), Leech (2013), and Thomas (2018).

Attributes of God. There, Clarke writes that "Infinite Space" and "Infinite Duration" are "Attributes of an Essence Incomprehensible to Us"—God (1705, 79-80; §IV). This position is akin to that of More.

Clarke famously defended Newton's views from objections by Leibniz in a series of 1715–1716 letters, first published in 1717. In his side of the correspondence, Clarke seems to advance the same view as in his *Demonstration*. In his fourth letter to Leibniz, dated 26 June 1716, Clarke writes that extramundane space "is not *imaginary*, but *real*", and "*Space* void of Body, is the Property of an *incorporeal* Substance" (1717, 125-7; IV.7-8). Although Clarke now argues that space is a "property" of God, rather than an "attribute," he does not seem to mean anything by this shift (and in writings before and after, he uses the terms 'property' and 'attribute' interchangeably).

Clarke emphasizes that, on his view, space is a property of a substance, not a substance itself:

> Space *is not* Any kind *of* Substance… *Because* infinite Space *is* Immensitas, *not* Immensum; *whereas* infinite Substance *is* Immensum, *not* Immensitas… *It remains therefore, by Necessary Consequence, that* Space *is a* Property. (Clarke, 1717, 307; V.36-48)

For Clarke, God is the immense (*immensum*). Infinite space is not the immense, it is immensity (*immensitas*). Space is identified with God's attribute of immensity, not with God himself.

These kinds of statements appear to distinguish Clarke's view from that of More, who occasionally writes that space is God's substance. Arguably, however, there is no difference between them. More draws a conceptual distinction between God and space, not a real distinction. The same is true of Clarke. Since Clarke holds that space is an attribute of God's substance, and that there cannot be a real distinction between God and his attributes, in reality space is the substance of God.

1.5. Newton: Space as Independent

Clarke and Newton were colleagues and friends, and when Clarke began exchanging letters with Leibniz in 1715–1716, it was widely assumed that Clarke was acting on Newton's behalf. Leibniz himself wrote of their letters, "I am now grinding a philosophical axe with Newton" {Newton, 1976, 355}. Throughout the eighteenth century, philosophers working in various contexts—such as Émilie Du Châtelet (1706-1749) in France in the middle of the century and Immanuel Kant (1724-1804) in Prussia toward its end—regarded Clarke's famous exchanges with Leibniz as accurate representations of Newton's ideas about space, time, motion, and much else besides. Some modern scholars still read Clarke as a mere mouthpiece for Newton's views.[8] However, Clarke's *Demonstration* came several years before Newton published his own views on the relationship between God and space in the 1706 Latin translation of his *Opticks*, and in the second, 1713 edition of the *Principia*. Also, nowhere in Newton's writings is space described as a property or attribute of God. This raises doubts about identifying Clarke's side of the Leibniz-Clarke as an expression of Newton's own views.[9] More than anything, it was Newton's understanding of space that Leibniz found objectionable, especially the view of so-called absolute space presented in the Scholium following the Definitions that open his *Principia*, first published in 1687 (Leibniz took notes on the text, sent to him by Newton, in 1688). Newton's discussion in that text of absolute, mathematical, and true space—as opposed to relative, common, and apparent space—set the terms for thinking about space, time, and motion for the next three centuries. Indeed, it continues to shape philosophical debate to this day. Throughout most of that time, Newton's view has been contrasted with Leibniz's claim that space and time are not absolute but merely relative. Although most interpreters of the Scholium in the *Principia* have read the text and its arguments through the lens provided by the Leibniz-Clarke correspondence, it was actually written long before Newton had focused on Leibniz and his followers. Instead, the principal conception of space and motion contested by Newton's text is the view outlined in parts two and three of Descartes's *Principles of Philosophy* (1644). Indeed, Newton paraphrases Descartes's *Principles* in places and expends

[8] For example, Vailati (1997, 109) writes that Clarke's account of space and time is "virtually" identical to that of Newton.

[9] For more on Clarke's account of space, see Ferguson (1974), Vailati (1997) and Thomas (2018, 156-181).

considerable effort trying to undermine the Cartesian understanding of true motion. So Newton's view should first and foremost be contrasted with Descartes's.

In part two of his *Principles*, Descartes had distinguished between what he calls the *vulgare* or common conception of motion, according to which motion involves a change of place, and the proper conception, according to which motion involves a change of an object's "vicinity." Hence for Descartes, properly speaking the motion of an object is a function of its changing relationship with the bodies that surround it (its vicinity)—motion is relative in that precise sense.[10] Newton objects to this view because it severs the connection between true motion and its causes, a connection that is evident already in Descartes's own laws of nature. Consider what came to be known as the principle of inertia, a version of which is expressed in Descartes's first two laws: a body moving rectilinearly will continue moving in that way until it is caused to do otherwise (just as a body at rest will remain at rest until it is moved by some cause). This implies that a body's true motion is *not* a function of its relationship to its vicinity—a body moving rectilinearly cannot, for example, be brought to rest by surrounding it with particles so that they constitute a vicinity from which it is not transferred, as Descartes's proper conception implies. Since the law of inertia suggests that true motion is not a function of a body's changing spatial relationships with other bodies, one should realize that true motion is not a species of relative motion. Newton suggests instead that true motion is *absolute* motion. This last idea, of course, requires the notion of absolute space, the space in which all true motion takes place. In this way, Newton's conception of absolute space reflects what he takes to be a lesson from the laws of nature; namely, that true motion is not a species of relative motion. But the idea of absolute space was one of the most controversial in all of eighteenth-century natural philosophy.

It easy to see why the controversy began almost immediately. In order to articulate his view that true motion is absolute motion, Newton presented the idea that "absolute space, of its own nature without reference to anything external, always remains homogenous and immovable" (Newton 1999, 408-09). Thus, space is homogeneous and immovable independent of anything else (arguably with the exception of God). Consequently, Newton's readers thought he had conceived of space as a substance of some kind, for he had attributed two basic features to space and contended that it had those features independently of other things. As they quickly argued, space is a strange kind of substance: it is causally inert, which renders it imperceptible. For many early moderns—including, ironically, Newton himself, and certainly Leibniz[11]—a substance is inherently something that is active. Many doubted the coherence of the idea that space is both independent of everything else and the subject of predication, on the one hand, and inherently inactive, on the other hand. It seemed like a substance that is not really a substance. Newton's further implication that this quasi-substance is also *infinite* only served to muddy the waters. It brought Newton perilously close to saying there is something other than God that is independent of all matter, eternal, and infinite.

Newton knew very well that his conception of space raised difficulties that would be on the minds of many philosophers encountering his view. It therefore remains somewhat perplexing that Newton chose not to adhere to the strategy used in his unpublished anti-Cartesian tract, called *De Gravitatione* after its first words, in the published text of the *Principia*. Whereas he expends considerable effort in *De Gravitatione* to show the coherence of the contention that space is neither a substance nor an accident, and indeed that its relationship with God is not worrisome, he simply ignores these general philosophical issues in the *Principia*.[12] The Scholium to the Definitions does not

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[10] More precisely, Descartes says that, properly speaking, motion is the transfer of a body from its vicinity, which is regarded as being at rest, to a new vicinity. Paraphrasing Descartes's *Principles*, Newton sums up his objection to the Cartesian conception as follows: true motion "cannot be determined by means of change of position from the vicinity of bodies that are regarded as being at rest" (Newton 2004, 67).

[11] (Newton 2004, 21-22). For his part, Leibniz clearly thinks that substances must be active—see, e.g., the opening of the *Specimen Dynamicum* of 1695 (in the Ariew and Garber edition, 1989, 118).

[12] In *De Gravitatione*, Newton insists that space has its own manner of existing; that is, he denies that a philosopher is forced to think of space as either a substance or a property of some other substance, or else as nothing at all (Newton 2004, 21). To clarify his view, however, he decides to follow an element of the Cambridge Platonic view of space as an

broach the question of how to think about absolute space through the lens of a substance-based metaphysics. Although the General Scholium briefly discusses God's substantial omnipresence throughout infinite space, a view Clarke also defends, Newton there, too, ignores the philosophical problems arising from his view. The divine being is present substantially throughout space, but is space then a divine attribute, or a substance in its own right? If the former, is that not a problem? And if the latter, does natural philosophy really have room for two eternal and infinite substances? We know that Newton took these questions seriously in private because he discusses them in great depth in *De Gravitatione* after explaining his differences with Descartes, but he largely refrained from answering them in public. His silence did not quiet the philosophical uproar: nearly every major post-Newtonian philosopher, from Berkeley to Du Châtelet to Leibniz to Wolff to Kant, rejected absolute space on philosophical grounds.

The basic problem with understanding Newton's conception of space could not easily be escaped, since it arose directly from the physical laws of nature yet conflicted with the common understanding of substance, and Newton (publicly) proposed no new metaphysical principles to resolve the tension. In fact, the difficulties posed by Newton's conception of absolute space were still present at the end of the eighteenth century, when Kant complained in his *Critique of Pure Reason* that space and time for Newton are "Undinge" or non-entities (A39/B56). The problem, as Kant and others realized, was to find a coherent and useful alternative to Newton's view.

1.6. Leibniz: Space as Relations

Although Newton articulated his view of space by thinking through the problems with Descartes's, it was eventually Leibniz's view that became the most important alternative to Newton's.[13] Before he presented his alternative view, Leibniz frequently reminded Clarke of the problems with Newton's view. Leibniz calls "real absolute space" an "idol" of some modern English philosophers—using the famous term of Bacon's—and then notes that it seems "such a being must necessarily be eternal and infinite" (L 3: 2-3). Certainly, if space is independent of matter, then it is not contingent upon any material body, and for that reason might be considered eternal. To add insult to injury, Leibniz then reminds Clarke that if absolute space is eternal and infinite, it becomes difficult to understand its relation to God. Must one admit that space simply *is* the divine being, or perhaps one of God's "attributes" (L3: 3)? As noted above, such problems dogged the Newtonian view throughout the eighteenth century, and Newton's public silence did not help.

But Leibniz's attack does not rest there. Instead, his most famous arguments against Clarke's understanding of space employ a principle that Newton himself ignored, namely, the principle of sufficient reason (PSR), the tenet that there is a sufficient reason why every individual thing is how it is rather than otherwise. The classic form of his argument appears in the fifth section of his third letter to Clarke, and runs roughly as follows. If space is absolute, it is independent of matter, and if it is independent of matter, then it must have existed prior to the creation, which means that God faced the question of *where* to place created matter. However, since space itself is uniform—Newton says "homogeneous"—there could not be a reason for God to choose one region of space rather than another to place created matter. Anything that would count as a reason to place created matter "here" would equally count as a reason to place it "there." Therefore, either God did not create matter, which is anathema, or did so without reason, which violates the PSR. One can escape this dilemma by jettisoning its presupposition that space is absolute. If we follow Leibniz and think of space as nothing but the order of relations among material bodies, then there is no meaningful question as to where God ought to place created matter—to create matter is *ipso facto* to create an order of relations among material things, and therefore to create space itself. Problem solved.

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emanation from the first existing being (a view one might find in More), but the view is not easy to understand. See the debate between Carriero (1990) and McGuire (1990) on how best to understand it.

[13] The literature on the Leibniz-Newton debate concerning the nature of space and time is voluminous. See, e.g., the influential treatments in Sklar (1974), Earman (1989) and Vailati (1997). On broader disagreements between Leibniz and Newton, see especially Bertoloni Meli (1993).

For his part, Leibniz spent little time in his exchange with Clarke explaining the nuances of his own view, focusing instead on indicating how it evades the many difficulties Newton faces. But Leibniz certainly was prepared to explain them. On its face, the idea that space is just the order of relations amongst material objects seems problematic, for it seems to imply that if we have a finite amount of matter, then we are stuck with a space that is coincident with the outer bounds of that matter. That seems odd in at least one way: surely some material body that happens to be on the edge of the material universe could move further away from the bodies nearest to it, at least, as a matter of metaphysics (there may be *physical* reasons that it cannot do so that need not concern us here). Leibniz would agree. His considered view is arguably that space is not just the order of actual relations, but the order of actual and *possible* relations.[14] The furthest material body has actual relations with its neighbors, but could move further away from them because that would involve its *possible* relations.[15] In this way, independent of the size of the actual world of material objects, Leibniz's space can be arbitrarily large. (Whether it can be infinite is a separate question.) The idea of space as a relational order enables Leibniz not only to evade problems with the PSR, as he insists to Clarke, but also the more general metaphysical problems concerning substance-hood that seem to plague Newton's view. For Leibniz thinks that it is a mistake to regard space as a being or substance in any sense. Space depends on matter in the sense that it simply *is* the order of relations amongst material bodies. There is therefore no temptation to regard it as a substance, as an independently existing being. To take a favorite example of Leibniz's: just as it is a mistake to think of the Prussian army as a being distinct from the soldiers and horses and bayonets that constitute it, it is a mistake to think of space as a being distinct from all the relations among material bodies that constitute it. One has an army just in case one has soldiers and horses and bayonets, and one has space just in case one has material bodies and relations among them. This deflationary view was very influential in part because it seemed like a nice means for avoiding Newton's problems.[16]

1.7. Catharine Cockburn: Space as a Third Kind of Substance

Catharine Cockburn, née Trotter, (1679–1749) was an English philosopher once described by Toland as an "absolute Mistress of the most abstract Speculations in the Metaphysics" (1704, preface). She is best known for defending some of Locke's epistemological views, but also published on metaphysics. This section will consider her "Cursory Thoughts," prefixed to her 1743 *Remarks Upon some Writers on Morality*. Although Cockburn nominally defends Samuel Clarke's account of space, in fact her position is quite different. Her critique of Descartes leads her to a unique metaphysic, one so unusual that it warrants inclusion amongst our other, better known accounts of space. Cockburn (repr. 2006, 95-7) advances several arguments for realism about space, including the empiricist claim that, like the idea of matter, the idea of space is early imposed on the senses. If we accept the evidence of our senses regarding matter, we should accept it for space too.

We know that Cockburn holds space to be real. What is it like? Cockburn agrees with Clarke on many of the features of space: it is incorporeal, indivisible, implicitly partless (repr. 2006, 98); and it possesses a kind of infinity (repr. 2006, 104). However, as Cockburn's full argument for space reveals, she fundamentally disagrees with Clarke over the nature of space.

One of her starting points for realism about space is Cartesian dualism, the belief that two kinds of substance exist, material and immaterial. Another is the metaphysical view eponymized as the Great Chain of Being, on which every possible kind of being exists in a hierarchy, leading upwards from rocks, plants, animals, humans, spirits, to God. On this "chain" of beings, there is "gradual

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[14] See, e.g., L 4: 41. Belot (Belot 2011, 173-185) shows nicely why we should regard Leibniz as a modal relationalist.

[15] Leibniz apparently did not contemplate the even more abstract view of the 20th century that space may involve actual and possible *relations* and *objects*—see Sklar 1974.

[16] See, e.g., the helpful discussion in Chapter One of Earman (1989), which is on the origins of the modern debate about space and time in the debate between Leibniz and Newton. He also explains Leibniz's influence on modern-day relationists.

progress in nature," so the most perfect example of an inferior species comes very near to the most imperfect example of the superior species above.[17]

Cockburn combines dualism with the Great Chain to produce a novel argument concerning the existence and nature of space. She argues that dualism is an incomplete metaphysic—something must stand between material body and immaterial mind:

> there should be in nature some being to fill up the vast chasm betwixt body and spirit; otherwise the graduate would fail, the chain would seem to be broken. What a gap between *senseless material*, and *intelligent immaterial* substance, unless there is some being, which, by partaking of the nature of both, may serve as a link to unite them, and make the transition less violent? And why may not space be such a being? Might we not venture to define it, *an immaterial unintelligent substance, the place of bodies, and of spirits, having some of the properties of both* (Cockburn, repr. 2006, 97).

The idea is that body and soul do not differ from each other by sufficiently gradual degrees, so we must posit an additional kind of substance to fill the gap: space. On this view, space is a unique kind of substance, distinct from matter and from God. As such, Cockburn's position is quite unlike that any of her peers, including Clarke - whose view she is supposed to be defending. In the course of defending Clarke, Cockburn has developed a position on space that is wholly her own.[18]

1.8. Conclusion: Common Ground on the Features of Space

We have seen that early modern thinkers advanced radically different alternatives in the course of rejecting Descartes's view of space. However, in addition to wondering what space *is*, one might also ask, what are the basic features of space? That is, leaving aside the question of space's relation to matter, or to anything else, including the divine being, what features might we predicate of space? Intriguingly, once we ask this question, we find commonalities underlying the debates. For example, More, Clarke, Newton, and Cockburn agree that space is uniform or homogenous, the same everywhere. Importantly and perhaps surprisingly, Leibniz also holds this view. In the course of arguing against Newton and Clarke, Leibniz writes: "Space is something absolutely uniform, and without the things placed in it, one point of space absolutely does not differ in any respect whatsoever from another point of space." The double use of 'absolutely' may signal to the reader that Leibniz is simply stating an assumption or aspect of the Newtonian view here, but in fact he is not. For the very next thing he says is: "Now from this it follows (supposing space to be something in itself, besides the order of bodies among themselves)," which means that he has not supposed Clarke's view until this later step in the argument. This point is often overlooked, and it means that for Leibniz, space's existence and its features are distinct—only the former, but not the latter, depend on matter. Space exists just in case bodies exist; but if bodies exist, then what also exists is something absolutely uniform. And it should be obvious, in turn, that space's *uniformity* does not supervene on bodies (it depends on bodies only in the sense that it is a feature of space and the latter depends for its existence on bodies). After all, bodies are discrete, made of parts, moveable, and not uniform; they and their relations give rise to something that is absolutely uniform, continuous, immovable, and so on. In sum, the world could be arbitrarily different than it really is as far as the features of all the material bodies that exist are concerned, and space would still exist and remain absolutely uniform. That is normally regarded as expressing Newton's view, but it also expresses Leibniz's. This is a surprising area of agreement between them.

To understand the details of this agreement, let us return to Leibniz's army analogy. One has an army, presumably, only if one has soldiers and bayonets and horses; if one has a pile of marbles, then one might have a game, but not an army. So the higher level entity depends on the features of the lower level entities, as one would expect. That is *not* the case with space—once one has *any* set of

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[17] In the early modern period, this idea was held by many philosophers, including Ralph Cudworth and Locke. Lovejoy (1936) provides a book-length exploration of this idea.

[18] For further discussion, see Broad (2002, 158-163) and Thomas (2013).

material objects, whether an army or a pile of marbles or any set of two arbitrarily chosen objects, then one has space, and one can alter that set of objects in any arbitrary way without altering space's uniformity in the slightest (as long as one does not destroy the objects!). It is obvious that Newton—along with More, Clarke, and Cockburn—thinks of space as unique. But on reflection, it also seems that Leibniz thinks of it as unique: although he denies the independence afforded it by Newton, he contends that space's features do not supervene on the features of the objects on which it depends. Because this commonality between the views of Leibniz and Newton and the others is easy to miss, its philosophical significance has not been plumbed.[19] It certainly seems to suggest that despite their deep differences, Leibniz and Newton concur that space (along with time) has a kind of special status. In insisting that space is independent of matter, even as its status as a substance or property is unclear, Newton places space into a special category. And it can seem at times that Leibniz is striving precisely to *avoid* placing space into that category. Yet at a deeper level, Leibniz agrees that space has a special status: although its existence is contingent, its features are not.

This surprising underlying agreement leaves us with a pressing question: why does space have a special status? Why should it be the case that it has certain features regardless of what exists? It is precisely this kind of question that leads Émilie Du Châtelet to characterize space's special status in chapter five of her *Institutions Physiques* in 1740. By century's end, Kant had decided to give space and its representation pride of place in the first major section of the *Critique of Pure Reason* (1781, first edition). For Kant, it is precisely an analysis of the special status of space—which he thought neither Leibniz nor Newton nor any other thinker fully appreciated—that leads one to the philosophically revolutionary position of transcendental idealism. That position, in turn, brought the discussion of space and time to a new level of philosophical prominence and sophistication.

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[19] Perhaps Belot comes closest to making something like this point: "It seems clear here that space has the same structure at worlds in which matter is sparse as it does at worlds in which it forms a plenum with the structure of Euclidean space" (Belot 2011, 177). That is, Leibniz thinks that the structure of space is what it is independent of matter. It does not matter what matter is like, or as Belot says, it does not matter whether there is a plenum or not, because space's structure is invariant. So, for Leibniz, space's structure is a special feature of reality in just the sense that it is invariant with respect to the extent and properties of matter, an idea we would normally associate with Clarke and Newton.

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