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Primitive and Derivative Forces in Leibnizian Bodies

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I

It is well known that Leibniz believes that the motion of bodies is caused by an internal force.¹ Moreover, he distinguishes between two kinds of force that are associated with bodies, which he calls primitive and derivative forces respectively. My aim is to explain Leibniz's account of the relation between these two kinds of force, and to address a puzzle that arises in connection with this relation.

In fact Leibniz speaks of two different kinds of derivative force. The first, and most fundamental, kind of derivative force is the momentary tendency to move from one perception to another within a simple substance, or monad. Sometimes these are called "appetitions".² The second kind are the forces of bodies that are found in the mechanical explanations of Leibnizian Dynamics.³ We shall be concerned primarily with the latter in what follows. However, the derivative forces of monads will also play an important role in the discussion.

As one might expect, Leibniz holds that derivative forces are *derived from* the primitive ones. This idea is more usually expressed in terms of the notion of *modification*. Thus, derivative forces are said to be "nothing but the modifications and results of primitive forces"⁴ and to "arise as shapes arise from modification of extension".⁵ Here it is natural to assume that Leibniz understands the relation between primitive and derivative force in something like the way in which Descartes understood the relation between modes of extended and thinking substances and the substances themselves, namely as particular ways of being an extended or thinking thing that inhere in their subjects.⁶

Although this account of derivative forces as modifications of primitive forces may seem plausible at first, difficulties arise when we try to understand how it could apply to the derivative forces in Leibnizian bodies. For it seems to be in conflict with two further aspects of Leibniz's philosophy. Both can be found in the following passage from a letter to De Volder of 1705:

Derivative forces I relegate to the phenomena, but [...] primitive forces cannot be anything but the internal tendencies of simple substances, because of which [...] they pass from perception to

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perception.⁷

The first thing we learn here is that Leibniz regards the derivative forces of bodies as phenomena.⁸ From the 1680s onward, it is clear that phenomena are regarded as having their being

¹ For example, see GP II, 171; and GP II, 251.

² Cf. GP II 262; GP VI, 609; A VI vi, 173.

³ Cf. GP II, 262.

⁴ GP II, 251. Cf. GP II, 184; GP II, 257; GP II, 262; GP II, 269-70. Similar ideas are found in a number of other pieces, dating back at least as far as 1695. For example, see the draft of the *New System* from 1694(?) (GP IV, 473), the *Specimen of Dynamics*, from 1695 (GM VI, 236), and an untitled piece from 1702 (GP IV, 396).

⁵ GM III, 552. Cf. GP II, 270; GP III, 457.

⁶ Cf. Kenny (1968, 134) and Garber (1992, 68-69).

⁷ GP II, 275.

⁸ Cf. GP II, 171; GP II, 250-51; GP II, 281-82; and GP II, 281n.

in some perceiver or other,⁹ and I take this to mean that phenomena are the intentional objects of the perceptual states of simple substances or monads.¹⁰ In contrast, we learn that primitive forces “cannot be anything but the internal tendencies of simple substances, because of which [...] they pass from perception to perception”, or in other words, attributes of monads in virtue of which they *come to have* perceptual states with such objects.¹¹

The problem with which we must deal is as follows: How can an *intentional object* be regarded as a modification, or something which inheres in, a primitive force, given that such forces are themselves *aspects of perceivers* that give rise to perceptual states which have such objects? To borrow Cartesian terminology, Leibniz appears to be claiming something that is analogous to the claim that the objective reality of a certain idea is a modification of that which has the idea, considered with respect to its formal reality.¹²

I shall consider three approaches to solving this difficulty below. First, I shall question the assumption that primitive forces are attributes of simple substances. Second, I shall turn to a solution presented by Robert Adams.¹³ In my view, neither of these two options is satisfactory. Instead, I shall advance a third, which depends on a revision of the notion of “modification”. More precisely, I shall argue that there are grounds for thinking that inherence is not an essential feature of Leibniz’s understanding of this notion.

II

It is arguable that our problem would not arise were Leibniz to sanction *phenomenal* primitive forces *in bodies* along with the primitive forces of monads. If both derivative and primitive forces of bodies were intentional objects, then it might seem reasonable to say that the one modified or inhered in the other. For within our representations there could be one thing which was represented as modifying another.

There are some passages that suggest that Leibniz was thinking in this way. He often speaks of a primitive active principle that is “in bodies”.¹⁴ And on one occasion Leibniz is prepared to sanction “mechanical reasons that are developed in bodies”.¹⁵ Also, in a draft of the final letter to De Volder, from 1706, Leibniz refers to a “primitive [...] force which is conceived in extension or mass as outside of perceivers” as “a phenomenon like extension itself”.¹⁶ This suggests that there are primitive forces in the bodies that we find in our phenomenal representation of the material world.

Although it may be tempting to think that Leibniz considered such a conception of primitive forces, I do not think that this view can be upheld. The only *explicit* support that is found for a primitive phenomenal force is from a draft of the last letter that Leibniz wrote to De Volder. But in the final version of the letter, the idea has disappeared altogether.¹⁷ And while it is true that Leibniz speaks of “mechanical reasons which are developed in bodies” on one occasion, he is quick to add that they are “united and concentrated in souls or entelechies and indeed, *have their sources*

⁹ In a letter to Arnauld, from 1687, they are called “beings of imagination and perception” (GP II, 96).

¹⁰ Cf. Adams (1994, 219), also see Furth (1967, 172).

¹¹ Cf. GP II, 251.

¹² See Hoffman (1996, 115) for a similar characterization of the difficulty.

¹³ Cf. Adams (1994, 382-93).

¹⁴ Cf. GP II, 184; GP II, 187; GP II, 241; GP II, 250; GP II, 257; GP II, 263; GP II, 269.

¹⁵ GP IV, 562.

¹⁶ GP II, 281n.

¹⁷ Cf. GP II, 282. The notion of primitive force is also absent from a later draft of this paragraph that is omitted by Gerhardt (cf. LBr 967, Bl. 93).

there”¹⁸ Furthermore, although Leibniz is prepared to speak of a primitive force that is conceived of as being *in bodies*, it is far from clear that he intends this force to be distinct from the primitive force that properly belongs to

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monads. A series of definitions from *The Metaphysical Foundations of Mathematics*, written in 1714-1716, includes the following:

We say that an entity *is in* [*in esse*] or is an *ingredient* of something if, when we posit the latter, we must also be understood, by this very fact and immediately, without the necessity of any inference to have posited the former as well.¹⁹

This definition indicates that Leibniz holds that for a given thing, *a*, to “be in” another, *b*, is for it to be required for the existence of *b*. But there is nothing which suggests that there are constraints on the ontological status of *a* or *b*.²⁰ Finally, we cannot ignore the texts that drive the problem with which we began. On an overwhelming number of occasions the primitive force of bodies is identified with entelechy, soul, or something analogous to soul,²¹ or said to be substantial.²² Such characterizations are clearly inappropriate for anything phenomenal in Leibniz’s sense.

All of these considerations push toward the conclusion that the primitive force in bodies can be nothing other than the primitive force that we have already examined, namely an attribute of simple substances, or monads. The remaining two solutions that I consider will retain this assumption.

III

Robert Adams has tried to solve the problem of how we should understand the claim that the derivative forces of bodies are modifications of primitive forces by appealing to passages from Leibniz’s correspondence with Christian Wolff. In order to understand Adams’ treatment of the issue we must follow him in assuming a number of aspects of Leibniz’s conception of bodily motion that I have not yet mentioned. More precisely, we must recognize: (1) that all bodies are either organic bodies (i.e., the bodies of corporeal substances) or they are composed of such bodies; (2) that the motions of all bodies are composed from the motions of organic bodies; (3) that every organic body (and hence, every body) is moved by a motive force that is internal to it; and (4) that organic bodies bear a special relation of domination to the “souls” or entelechies with which they constitute a corporeal substance - a relation of domination which is ultimately grounded in the fact that these bodies represent the intentions of their dominating monad through a series of motions.²³

With these assumptions in mind, let us turn to the correspondence with Wolff. In a letter from 1711, Wolff had broached the very issue with which we are concerned, observing: “if derivative

¹⁸ GP IV, 562 - italics added.

¹⁹ GM VII, 19. Also see A VI iv, 990.

²⁰ See Rutherford (1990, 538-44) for further discussion of the notion of ‘in esse’ in Leibniz.

²¹ Cf. GP II, 171; GP II, 194; GP II, 250; GP II, 258. Other pieces from around this time also support this, e.g., the *Specimen of Dynamics*, from 1695 (GM VI, 236), and *On Nature Itself*, from 1698 (GP IV, 512-13).

²² Cf. GP II, 184; GP II, 275.

²³ For reasons of space I shall not examine the support for these claims here.

forces are to be regarded as modifications of primitive forces, an explanation is still to be given".²⁴ Leibniz's initial reply was hardly helpful.²⁵ But Wolff pressed more and received a fuller answer:

It is necessary that the conatus and impetus, and the actions that follow from these, since they are accidents, be modifications of something substantial or permanent that must itself be active, lest there be more in the modification than what is modified [...]. It should be known, however, that forces do not cross from body to body, since any body whatever has in itself the force it exerts [...]. For example, when a ball at rest is struck by another, it is moved by an implanted [*insita*] force, namely by elastic

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force, without which there would be no collision. Moreover the elastic force in the body arises from an internal motion invisible to us. And the entelechy itself is modified corresponding to these mechanical or derivative [forces]. Therefore it can be said that force is already present in every body, and is determined only by modification. Furthermore, primitive force in fact is neither increased nor diminished, but only determined in different ways.²⁶

The key for Adams solution lies in Leibniz's observation that "[the] entelechy itself is modified corresponding to these mechanical or derivative [forces]".²⁷ Adams suggests that this passage be understood as expressing the claim that the relation between the primitive forces of monads and derivative forces of bodies is representative in nature. More precisely, he claims:

[T]his "correspondence" suggests intra-monadic and physical derivative forces *express* one another. A modification of the primitive force of a substance is in the first instance the present tendency to pass to certain immediately future perceptions. The successive perceptions of a substance, however, are expressed by the successive states of its organic body. It follows that the changes in the substance's perceptions are expressed by the changes in the organic body, which are motions. Moreover the substance's successive tendencies to change will be expressed by whatever successive tendencies produce the motions of the organic body. But the latter forces [...] are motive forces internal to the organic body.²⁸

According to Adams, the derivative forces of organic bodies *express* or *represent* the primitive forces of their dominating monad through the mediation of the appetitions, or the derivative forces of that monad. To use a more concrete example, Leibniz would claim, on Adams' reading, that as I type on the keyboard the successive states of my body are represented in my perceptual states. This in turn would imply that the changes in my body are represented by the changes in my perceptions, and furthermore that the tendencies to change in my body are represented by the tendencies to change in my soul. Finally, given that the tendencies to change within my soul represent an aspect of my monadic nature, or my primitive force, it would follow by the transitivity of representation that the derivative forces of my organic body express or represent the primitive force of my soul.

This account provides a model of how the derivative forces of bodies are related to the primitive forces of monads. But it is not yet clear why physical derivative forces should be regarded as

²⁴ LW 128. All translations of LW are taken from Adams (1994, 383-85).

²⁵ Leibniz simply asserted: "The explanation of the modifications of primitive force is just the same as the explanation of the laws of motion. And it is intelligible indeed, but not from mathematical considerations." (LW 129).

²⁶ LW 130-131.

²⁷ LW 131. Cf. Adams (1984, 384).

²⁸ Adams (1984, 384).

modifications of primitive forces. Adams tries to fill this lacuna by appealing to two facts. First, the fact that the forces within monads are the causes of their perceptual states; and second, the fact that the phenomena of monads include Leibnizian bodies and their derivative forces. With these facts in mind, Adams suggests it may be possible to have “a sort of identity of intra-monadic and physical derivative forces”.²⁹ He observes that Leibniz must hold that “the motions of phenomena are caused, at bottom, metaphysically, by the current tendencies of substances to pass from current perceptions to future ones”.³⁰ In other words, the motions of phenomena are ultimately caused by the appetitions, i.e., the derivative forces of the monads having the perceptions. When combined with the claim that “the derivative forces of physics are by definition the causes of physical motions”,³¹ this interpretation is taken to support the *identification* of the two kinds of derivative force. Adams observes: “Thus one and the same derivative force would have both an intra-substantial effect, the passage from current to future

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perceptions, and a phenomenal effect, the physical motions.”³² And since *this* derivative force is readily understood as a modification of monadic primitive force, our difficulty is supposedly solved.

As things stand, however, I do not think that we have been given grounds for even a “sort of identity” between intra-monadic and bodily forces. Adams has suggested that we *identify* the ultimate momentary causes of the changes in the perceptual states of substances with the causes of some of the momentary changes in the world represented in those states. But as we saw earlier, Leibniz explicitly calls the derivative forces of bodies “phenomena” or intentional objects, whereas intra-monadic derivative forces inhere in simple substances and produce perceptual states which inhere in those substances as well. The divide between the two seems to me to preclude identity of any sort. It is true that the intra-monadic forces produce monadic states which have the motions of bodies as their objects. But this is not the same as claiming that they are the cause of what is represented in these states. In other words, Adams does not provide sufficient evidence for the claim that “the motions of phenomena are caused, at bottom, metaphysically, by the current tendencies of substances to pass from current perceptions to future ones”.³³ And, without this claim his solution cannot get off the ground.³⁴

In fact, Adams himself broaches another worry. As he points out, his account leaves Leibniz open to the charge that changes within any given organic body would be caused by the appetitions of *all* the monads with states that contained this phenomena, or, in other words, all the monads in the universe.³⁵ Adams responds, by suggesting that Leibniz might appeal to the divine ordering of the world, in order to give preeminence to the primitive forces of dominant monads in *explaining* the behavior of their organic bodies.³⁶ But while this response may mitigate against the charge that all monads have an equal claim to provide a causal explanation of the motion of each organic body, Adams himself thinks it must ultimately fail. For, as he admits “in another way the physical behavior of the organic body can be seen as produced by the perceptual tendencies of all the substances that perceive it.”³⁷

²⁹ *Op. cit.* 385.

³⁰ *Ibid.*

³¹ *Ibid.*

³² *Op. cit.* 386.

³³ *Ibid.*

³⁴ In fact, I think that it can be argued that this claim is false. However, I do not have the space to do this here.

³⁵ Adams (1994, 386).

³⁶ *Ibid.*

³⁷ *Op. cit.* 387.

Adams believes that his account “is probably a correct interpretation of Leibniz’s views”³⁸ and ultimately he suggests that Leibniz himself may have retreated from the claim that derivative forces of bodies are modifications of primitive forces in his later years. But, at the same time, Adams recognizes that Leibniz continues to talk this way.³⁹ This is obviously an uncomfortable interpretation, especially in light of the further objection that I have raised. In the final section I shall explain how I think we may be able save Leibniz from his apparent confusion.

IV

While I have criticized Adams’ approach to our problem, it is difficult to see any other way that one might provide a solution. How else could one explain how derivative forces could modify primitive ones, where modification is being understood as inherence in a subject? I want to suggest that an answer will emerge if we are prepared to accept that the Cartesian account of modification is inappropriate when considering Leibniz’s views here. In the space that remains, I will provide an

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answer to the original puzzle which relies on a more liberal conception of the relation between modifier and modified.

Let us begin by turning to what Leibniz himself says about the relation that holds between modifier and that which is modified in a letter to De Volder of 1703:

A modification is merely a limiting variation, and modes merely limit things but do not increase them and hence cannot contain any absolute perfection that is not in the thing itself which they modify.⁴⁰

For Leibniz, the defining feature of a modification is that it is a “limitation” of that which it modifies.⁴¹ The claim that a modification is a limitation is not inconsistent with the view that modifications are beings that inhere in subjects. However, it does not entail inherence either.

Apart from the passages mentioned above, I have been unable to find any places in which Leibniz explicitly addresses the nature of modifications. So at this point we must turn elsewhere for help. One interesting piece of evidence regarding the nature of modifications comes from Leibniz’s first philosophical publication *Meditations on Knowledge, Truth, and Ideas* from 1684. Here Leibniz observes: “It is necessary not only that there be in God an idea of absolute and infinite extension but also that there be an idea of each shape, which is nothing but a modification of absolute extension”.⁴² We learn that the divine mind contains an idea of infinite absolute extension and that it contains distinct ideas of all shapes, which are *modifications* of absolute extension. In the *New System* of 1695 Leibniz goes even further, describing mathematical points as “modifications of extension”.⁴³ Whatever view one takes of Leibniz understanding of the nature of divine ideas, it is hard to see how the divine ideas of shape could be said to *inhere in* the divine idea of absolute

³⁸ *Op. cit.* 386.

³⁹ *Op. cit.* 387.

⁴⁰ GP II, 257. Also see A VI vi, 63.

⁴¹ Cf. GP II, 257.

⁴² A VI iv, 591.

⁴³ GP IV, 478. Also see a letter to Des Bosses, from 1709, where mathematical points are described as “modifications of matter” (GP II, 370).

extension as a Cartesian modification inheres in the substance it modifies. And it is even harder to understand the relationship between mathematical points and extension in these terms.

Another important passage is to be found in Section 14 of the *Discourse on Metaphysics* from 1686: “Now, first of all, it is very evident that created substances depend on God, who preserves them and who even produces them continually by a kind of emanation, just as we produce our thoughts”.⁴⁴ This passage suggests that Leibniz regards the relationship between God and creatures and the relationship between creatures and their states in the same way. He does not say anything about how we should classify either of the dependence relations here, but it is natural to regard the thoughts of creatures as *modifications* of those creatures. It is also clear from the surrounding context that the relationship between God and creatures is one that involves ontological distinctness. In Section 8 of the *Discourse*, Leibniz goes to great length to explain the grounds for distinguishing the actions of God from those of his creatures by introducing the notion of an individual substance.⁴⁵ And in subsequent sections it becomes clear that God and creatures are to be regarded as distinct substances.⁴⁶ Whatever the complexities of Leibniz’s discussion here, there is no suggestion that finite substances *inhere in* their creator.

Given this, I want to suggest that the passage from Section 14 of the *Discourse* is evidence that the modification relation that obtains between ourselves and our thoughts (or perceptions) does not follow the Cartesian model. If it is to be analogous to the relation between God and his creatures, it should not

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be the case that the thoughts *inhere in* us. Rather, they will depend on us and consist in a limited manifestation of our nature.

In the present context these claims must remain somewhat speculative. But it is worth noting that Leibniz also appeals to the notion of emanation in section 14 of the *Discourse*. As Christia Mercer has observed,⁴⁷ by the mid-seventeenth century there was a tradition that derived from the writings of certain renaissance Platonists of understanding the relationship between God and creatures as modifier and thing modified. Creatures were said to emerge through a process of emanative causation and the relationship was not supposed to preclude ontological distinctness. According to Mercer “*the divine substance-mode relation* [...] assumed that the mode was a limitation of the substantial essence in the sense that it was an inferior manifestation or instantiation of the essence.”⁴⁸ Furthermore, Mercer also suggests that this way of understanding the relation between God and creatures is the one that was adopted by Leibniz’s teacher Jakob Thomasius.⁴⁹

Mercer argues that it is precisely this notion that is in use when Leibniz describes creatures as modifications of God in essays that date from his time in Paris.⁵⁰ But in subsequent writings Leibniz eschewed all talk of creatures as modifications of God.⁵¹ Nonetheless, it appears to me that Leibniz’s understanding of the relation between God and creatures in *Discourse* section 14 does not deviate in anything but name from the earlier Platonic model. Thus, I want to suggest we

⁴⁴ A VI iv, 1549.

⁴⁵ Cf. A VI iv, 1539-41.

⁴⁶ Cf. A VI iv, 1541-42; and A VI iv, 1546-49.

⁴⁷ Cf. Mercer (1999, 284).

⁴⁸ *Op. cit.* 284.

⁴⁹ *Op. cit.* 287-89.

⁵⁰ *Op. cit.* 290-92. Here Mercer makes the further claim that the divine substance-mode relation frees Leibniz of the charge that he went through a phase during which he adopted Spinozistic pantheism. She does not appear to consider the possibility that Spinoza himself was working with a Platonic model of the modification relation.

⁵¹ Mercer suggests that the move away from the Platonic terminology may have been a result of the association of this doctrine with Spinoza (1999, 295).

understand the analogy between finite substances and their modifications and God and creatures as reflecting this earlier view. On this reading, modifications may be ontologically distinct from that substance, provided they are a limited instantiation of the essence of the substance that they modify.

Let us suppose that this view of Leibnizian modifications is correct. Modifications need not inhere in the things they modify, they need only be limitations of a substance, in the sense that they manifest or instantiate the essence of the substance in an inferior way. How does this help with our original puzzle? Here we need to return to Adams' account.

As we saw above, Adams suggests that the derivative forces of organic bodies are represented by the appetitions, or the derivative forces of their dominating monad, which are in turn represented by the primitive forces of these same monads. By the transitivity of representation, it follows that primitive forces represent *both* kinds of derivative forces.

The final step in my argument should be apparent at this stage. I want to suggest that the representation relation that Adams isolates between the primitive forces of monads and the derivative forces of their organic bodies *is a relation of modification*, where modification is understood in the Platonic sense. On this view the force that moves my hand toward the keyboard is to be regarded as a limited instantiation of the appetite in my soul that caused the movement of the hand, which in turn is a limited instantiation of my appetitive nature in general.⁵² And, in fact, Leibniz seems to make this very point in his 1702 reply to Bayle. Considering a body which is moving in a curve, he observes that at a given moment any point in a body "because it has no memory can have of itself only the tendency to move along

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the [...] straight line" whereas its "entelechy will express the pre-established curve" that it will follow.⁵³ The appetite, or derivative force, of the entelechy causes and indicates future perceptions in a way that is mirrored by the fact that the momentary states of bodies contain a derivative force which causes and indicates the motion that the body will undergo. However, the bodily derivative force, because it lacks a cognitive aspect, is a limited manifestation of this tendency.

Abbreviations

- A *Sämtliche Schriften und Briefe*. Darmstadt and Berlin: Berlin Academy, 1923-. Cited by series, volume, and page.
- GP *Die philosophischen Schriften von G. W. Leibniz*, 7 vols. Ed. by C. I. Gerhardt. Berlin (1875-90). Reprinted. Hildesheim: Georg Olms (1978). Cited by volume and page.
- GM G. W. Leibniz. *Mathematische Schriften*, 7 vols. Ed. by C. I. Gerhardt. Berlin (1849-55). Reprinted. Hildesheim: Georg Olms (1962). Cited by volume and page.
- LBr *Der Briefwechsel des Gottfried Wilhelm Leibniz in der Königlichen Öffentlichen Bibliothek zu Hannover*. E. Bodemann. Hannover: Hahn (1895). Reprinted Hildesheim: George Olms (1966).

⁵² Although I follow Adams' analysis, the appeal to intra-monadic derivative forces may be redundant at this point. But space does not permit an argument to this effect in this paper.

⁵³ GP IV, 558.

LW *Briefwechsel zwischen Leibniz und Christian Wolff*. Ed. by C. I. Gerhardt. Halle: H. W. Schmidt (1860). Reprinted. Hildesheim: Georg Olms (1963).

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