LEIBNIZ WITHOUT PHYSICS

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THIS ESSAY IS ABOUT PHYSICS AND METAPHYSICS in Leibniz and Aristotle. More generally, it concerns the relation of early modern philosophy to the preceding traditions. The inquiry is conducted by way of a review of Christia Mercer's Leibniz's Metaphysics: Its Origins and Development.¹ We thus begin with the question of Leibniz's intellectual development.


What is the role of Leibniz's early work in the constitution of his mature philosophy? Conventional scholarship would emphasize 1686 as the point at which the Leibnizian philosophical system was in place, subsequent obscurities concerning forces and monads notwithstanding. In that year the Discourse on Metaphysics was completed, the Brief Demonstration of Leibniz's (1678) discovery of the conservation of living force was published, and the correspondence with Arnauld begun, leading to the 1695 publication of the New System and part I of its companion Specimen Dynamicum. On this forward-looking account, the early period recedes in importance. Against this rough but established consensus, Christia Mercer argues that far more weight needs to be given to Leibniz's early development—especially the period from 1668 to 1672—in the Aristotelian and Platonic eclecticism of seventeenth-century Germany. Daniel Garber's advertisement on the book jacket pertains: "Though it will be controversial, her position is one that must be reckoned with.... [I]t will be read and passionately debated for years to come."

Leibniz's Metaphysics "is really two books in one."² The first book is Mercer's 1989 Ph.D. thesis that was nearing completion when she "discovered Leibniz's youthful Platonism and the Platonism of his teachers," in the face of which she "was forced to rethink everything but the core of [her] original interpretation" and write the second.³ Owing to its two beginnings, the present volume implicates Aristotle and Aristotelianism (from the first beginning), as well as Plato and Platonism (from the second) in its account of Leibniz's development. These are four large specialties, and the number of reviewers competent to assess all the parts of her book will be small. I am not one of them and must refrain from comment on her important account of Leibniz's Platonism.

The basic outline of Leibniz's Metaphysics is as follows (the descriptions of the parts are mine; they are close to Mercer's but not identical):

Introduction: On First Truths and the historical terrain about to be excavated.

Part one (chapter 1): Conciliatory eclecticism and its associated rhetoric of attraction.

²LM, xi.
³Ibid.


Part four (chapters 7–10): Leibniz’s metaphysics on newly excavated foundations.

Conclusion: New truth about Leibniz.

Appendix I: Basic tenets of Leibniz’s mature philosophy.

Appendix II: The heretofore hidden original assumptions.

In the following, I survey parts one, two, and four of Leibniz’s Metaphysics, focusing especially on the question of natural philosophy or physics: Is physics important (my view) or unimportant (Mercer’s view) for Leibniz?

I

Conciliatory Eclecticism, Rhetoric of Attraction, and Leibnizian Novelty. Leibniz’s Metaphysics begins (chapter 1) with the question of a philosopher’s rhetorical strategy in the historical setting in which he finds himself. Related to rhetorical strategy is the issue of temperament or disposition: What does a thinker care about, victory or peace? Accordingly, is he temperate and irenic (Leibniz) or angry and agonistic (many of Leibniz’s contemporaries, especially Cartesian), and how might this affect his manner of writing for a given audience? Does Leibniz always say exactly what he believes, or does he—as Mercer claims—“present his discoveries with the right degree of rhetorical subtlety,” even such that “the mature Leibniz is rarely explicit about his underlying beliefs,” having “consciously hid[den] them beneath the surface of the text”? That Mercer is in some sense right is attested by the huge number of Leibniz’s private writings compared with the paucity of his publications.

Problems and pitfalls of alternative hermeneutics are familiar. At one extreme, we would read a philosophical text in the paranoid

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1 LM, 48.
2 LM, 24, 55, 462.
suspicion that its author does not say what he means, does not mean what he says. This would make nonarbitrary interpretation impossible, and so, surely, we should begin by taking philosophers at their word, as Mercer (and everyone) acknowledges. At the other extreme, we read the text in the historically mistaken belief that the conditions of communication and publication were the same at all times and places as ours today in the liberal-democratic West. Furthermore, we massively deny the pervasive evidence of our own permanently human experience in thinking that one could say whatever one believed to anyone, as if distorting anger is never triggered in us by opinions we do not agree with. As Leibniz wrote to Ernst von Hessen-Rheinfels in April 1686, "[a]s soon as anyone goes aside, however little, from the opinions of certain doctors, they break out in thunder and lightning." Thus, if Leibniz (or anyone) cared about not making a valued audience angry and ill-disposed, then he might avoid saying everything that he believed and even simulate more agreement with his readers than warranted by his true position.

Mercer argues persuasively that Leibniz practiced a type of rhetoric appropriate to his goals and to the historical context. Amid the tangle of conflicting philosophical, religious, and political positions in post-Reformation Germany following the devastation of the Thirty Years War, Leibniz was deeply committed to composing quarrels and harmonizing oppositions. This determined what Mercer calls Leibniz's "Rhetoric of Attraction." Leibniz employed a "style and mode of expression" designed to persuade, and then to attract, mutually hostile philosophical and theological schools to what might be

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6 How many Straussian does it take to change a lightbulb? They don't; the light is manifest by its absence.

7 LM, 466.

8 G 2:24. Hessen-Rheinfels was the intermediary between Leibniz and Arnauld. See Robert C. Sleigh, Jr., Leibniz & Arnauld: A Commentary on their Correspondence (New Haven: Yale University Press, 1990), chap. 2.


10 LM, 57.

11 LM, 112.
true—if appropriately interpreted—in the diverse teachings of their enemies. As early as 1669, he “intended to express in the proper conciliatory mode the profound interconnections between the thought of Aristotle and that of the moderns.”\textsuperscript{12} Mercer cites the following instructive remark from Leibniz’s unpublished \textit{De Summa Rerum} of 1676:

A metaphysics should be written with accurate definitions and demonstrations, but nothing should be demonstrated in it apart from that which does not clash too much with received opinions. For in that way this metaphysics can be accepted; and once it has been approved then, if people examine it more deeply later, they themselves will draw the necessary consequences. Besides this, one can, as a separate undertaking, show these people later the way of reasoning about these things. In this metaphysics, it will be useful for there to be added here and there the authoritative utterances of great men, who have reasoned in a similar way; especially when these utterances contain something that seems to have some possible relevance to the illustration of a view.\textsuperscript{13}

Mercer appeals to Leibniz’s Rhetoric of Attraction to clear up discrepancies between different descriptions of his intellectual evolution and philosophical system,\textsuperscript{14} statements ultimately shaped “to lead wayward souls to the philosophical truth.”\textsuperscript{15} Leibniz was thus a conciliatory eclectic \textit{par excellence},\textsuperscript{16} one of a group of teachers and scholars with whom he worked early in his intellectual career, from 1661–68. Jakob Thomasius was his main inspiration, but Johann Adam Scherzer, Johann Christoph Sturm, and Erhard Weigel at Leipzig and Jena were formative as well.

Indeed, in Leibniz, the term “system” comes to have a new meaning. One can rightly speak of the Cartesian system in the sense of a

\textsuperscript{12}Ibid.
\textsuperscript{14}\textit{LM}, 465.
\textsuperscript{15}\textit{LM}, 464.
\textsuperscript{16}But even Leibniz had limits: there would be no harmonization with Newtonian physics nor, as we shall see, with certain principles of Aristotle’s and Aristotelian physics, for example, soul. Given the large differences between Aristotelian and Newtonian physics, it is of interest to know what, in Leibniz’s understanding, they had in common that could not be tolerated within Leibniz’s otherwise inclusive system. It seems that each, in its own way, becomes entangled with metaphysics, and this violates Leibniz’s demand for the absolute autonomy of physics. This is discussed in section 7.
whole whose parts are interdependent for their intelligibility, or of Aristotle’s system, although in a looser sense, owing to the heterogeneity of the Aristotelian sciences. In Leibniz, however, “system” means bringing together opposed and previously irreconcilable accounts. Consider Leibniz’s extraordinary (attempted) reconciliations and harmonizations: Plato and Aristotle, Aristotle and the mechanists, Catholic and Protestant, Christianity and freethinking, East and West, the goodness of God and the evil of the world. If, as Mercer alleges, past scholarship on Leibniz has failed to appreciate this, then her book would be justified by that fact alone.

But Leibniz’s extraordinary harmonizations pose a large question for Mercer’s book. Can two opposed and seemingly irreconcilable accounts be synthesized without alterations fatal to one or both? Won’t the synthesis be on terms favorable to one over the other or be so novel that it makes little sense to designate the result in terms of any antecedent? Consider some features of Leibniz’s synthesis of Aristotle and mechanism: in Leibniz’s physics, the Aristotelian distinction between natural substances and artifacts is overcome because a natural thing, like a fish or a piece of flint, is God’s artifact with an actually infinite number of parts fully actual in the whole, where, on a sufficiently small scale of size, these parts are all alive, each with an immaterial source of unity and activity, like a soul (there’s Aristotle).

Add to this that, in what we call “death” according to ordinary experience and the visible appearances, the true organism gets invisibly small, so that in unseen reality, no true substance is ever by nature destroyed, and so, if we understand substance rightly, there is no substantial change in nature, and so we never die! Here, Leibniz’s way

17 See, for example, Descartes, Discourse on the Method, pt. 6, AT 6:76, CSM 1:150.
18 LM, 2, 9, 472.
19 Physics 2.1.192b9–23.
20 DM (1686), 9; G 4:433–4; AG, 42. To Arnauld, 28 November/8 December 1686, G 2:76, AG, 79. To Arnauld, 30 April 1687, G 2:99–100, AG, 88. To Arnauld, 9 October 1687, G 2:118. Primary Truths (1689–90); C, 523; AG, 34. NS (1695), 3, 4, 7, 9, 10; G 4:478–82; AG, 139–42. Note on Foucher’s Objection (1695); G 4:492; AG, 147. To Bernoulli, 18 November 1698; GM 3: 552; L, 512. To De Volder, 20 June 1703; G 2:251; L, 530; AG, 175–6. Considerations on Vital Principles (1705); G 4:544; L, 589. To De Volder, 19 January 1706; G 2:283; L, 530. To Des Bosses, 16 June 1712; G 2:451; L, 604. M (1714), 18, 19, 64–8, 73, 76; G 6:609–10, 618–20; AG, 215, 221–3. PNG (1714), 1, 6; G 6:598, 601; AG, 207, 209. To Remond, 4 November 1715; G 3:657; W, 554.
of composing mechanism with Aristotle removes what, for Aristotle and later Aristotelians, are essential boundaries between natural and artificial, living and nonliving, this life and the afterlife, and it radically alters Aristotle’s and Aristotelian accounts of form and matter, whole and part, act and potency, intelligible and sensible, not to mention the infinite. Leibniz’s panorganicism\(^{21}\) of infinitely nested, transformable but indestructible living machines is “Baroque quirkiness”\(^{22}\) with a vengeance. Has anyone other than Leibniz found this doctrine fully digestible?\(^{23}\) Leibniz’s panorganicism provides reason to examine carefully any claim that Leibniz’s metaphysics of substance is genuinely Aristotelian.

More generally, what are we to make of a thinker as unique, distinctive, and inventive as Leibniz? How are we to assess and place him in the history of philosophy? According to T. S. Elliot, “there is no philosopher with whom the problem of sources is less important than with Leibniz. . . . Leibniz’s originality is in direct, not inverse ratio to his erudition.” The overarching peculiarity of Mercer’s book is that she cites this quotation approvingly in her conclusion\(^{24}\) yet spends over two hundred pages on Leibniz as derived from Platonic and (she believes) Aristotelian traditions. This does not diminish the fascination of her book, but it might leave some uncertainty as to how she understands Leibniz in relation to his sources. Perhaps the following excerpt exemplifies the type of claim she is making:

Leibniz’s [theory of God and creation] is the result of a brilliant blending of materials from a diverse group of sources. What Leibniz does is to take an Aristotelian Metaphysics of Substance and Platonist Metaphysics of Divinity, apply them to a set of contemporary theological, physical, philosophical problems, and thereby create a fascinating Metaphysics of Divinity of his own.\(^{25}\)

As I understand it, then, Mercer would not deny that Leibniz is simply Leibniz, but she claims to have shown that he became his unique


\(^{22}\) *LM*, 471.

\(^{23}\) Microscopes notwithstanding, the doctrine was as strange to eighteenth-century readers as to today’s: see Benson Mates, *The Philosophy of Leibniz* (Oxford: Oxford University Press, 1986), 204 and n. 60, on one of Voltaire’s typical reactions.

\(^{24}\) *LM*, 463.

\(^{25}\) *LM*, 242; emphasis mine.
philosophical self earlier (by 1672), and along a significantly different path (more Neoplatonic) than previously recognized. Her methodology consists in placing a very broad range of Leibniz’s early writings “in their proper historical and philosophical context,” and then seeking a coherent interpretation.\textsuperscript{26} This is no easy task due to the large number and often deep obscurity of Leibniz’s writings and to the fact that no one text provides the whole truth of his philosophy.

Before discussing problems with Mercer’s argument (in chapters 2–4) for the Aristotelian character of Leibniz’s metaphysics of substance, let me put forward my own controversial claim about what is at stake in looking at Leibniz.

II

\textit{On Early Modern Philosophy and Leibniz.} The boundary between wishing and choosing is defined by the limits of our power. As Aristotle says, we can wish “for impossible things, like immortality,” but we actively choose what we judge to be within our power.\textsuperscript{27} Differing accounts of physical nature, for example, Aristotelian versus Newtonian, convey different implications concerning what is within our power, thus different implications for our pattern of choices and related desires. Here lies the meaning and force of early modern philosophy: In Bacon, Descartes, and Newton, laws of nature replace natural forms and ends as the fundamental intelligibles of physical science and imply a vast expansion of human power to predict, control, transform natural processes—for the prolongation of life and “the relief of the human estate.”\textsuperscript{28} The latest phase of this project is genetic science and its apparently radical possibilities for the transformation of human life. There is even talk of achieving bodily immortality—something impossible on grounds of Aristotle’s biological science of organic form, or soul, and its correlative matter.

Where does Leibniz stand on the mastery of nature? To use the above example, does his own account of form and matter—unlike Aristotle’s—permit bodily immortality, and was Leibniz aware of this? Would he have favored it? In view of Leibniz’s remarkable theory of

\textsuperscript{26} \textit{LM}, 381.

\textsuperscript{27} \textit{Nicomachean Ethics} 3.2.1111b21–6.
panorganicism, the question becomes whether he thought that future physicians could and should discover and then control the intricate mechanism of envelopment and unfolding in bodies, in order to prevent or reverse the shrinking transformation heretofore called “death.” If he did, then praxis, especially in medicine, would be of equal status or superior to theoria. It would then not be possible to classify Leibniz as a contemplative (however unique) of traditional, premodern type, as Mercer does. Rather, Leibniz would be—pace Voltaire and despite his sincere attachment to major themes of Greek and Medieval philosophy—a modern Enlightenment progressive, closer to Bacon and Descartes than to Plato, Aristotle, Neoplatonists and Medievals.

But isn’t my suggested interpretation a gross distortion? How could one attribute Prometheus intentions to a thinker who taught

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20 LM, 462, 472.

31 Leibniz, unlike Descartes, thought deeply about the traditional problems of individuation, unity, and the continuum. J. A. Cover and John O’Leary-Hawthorne, Substance and Individuation in Leibniz (Cambridge: Cambridge University Press, 1999) and Richard Arthur, The Labyrinth of the Continuum (New Haven: Yale University Press, 2002) are recent testimonies to the enduring value of Leibniz’s metaphysics and natural philosophy. Of Bacon Leibniz seems to have had a uniformly good opinion, in contrast to his severe criticisms of Descartes. Leibniz criticized Descartes on grounds of physics (Descartes is wrong about the nature of matter and the laws of physics) and theology (Descartes destroys the wisdom and providence of God), as discussed in the following, but to my present (imperfect) knowledge, Leibniz did not explicitly mention Descartes’s Baconian passage on mastery of nature in Discourse, pt. 6; AT 6:62; CSM 1:142–3.
that "the whole nature, end, virtue and function of substance is merely to express God and the universe."\textsuperscript{32} Surely such words are a resonant echo of Plato, Aristotle, Augustine, and Aquinas. In Leibniz, are we not called precisely to "a wonder-laden after-thinking of the creative thought of God"?\textsuperscript{33} Above all, everyone knows that Leibniz was notorious for trying to argue that this is the best of all possible worlds; hardly a call to mobilization for the conquest of nature and human nature. Surely then my thoughts are ill-founded and false to the meaning of Leibniz.

Perhaps. But if we are prepared to listen more carefully for what may be muted tones in Leibniz, the following passages begin to stand out:

I hold . . . that, according to these principles, in order to act in accordance with the love of God, it is not sufficient to force ourselves to be patient; rather, we must truly be satisfied with everything that has come to us according to his will. I mean this acquiescence with respect to the past. As for the future, we must not be quietists and stand ridiculously with arms folded, awaiting that which God will do . . . But we must act in accordance with what we presume to be the will of God, insofar as we can judge it, trying with all our might to contribute to the general good and especially to the embellishment and perfection of that which affects us or that which is near to us, that which is, so to speak, in our grasp.\textsuperscript{34}

It is appropriate to make this remark [about efficient and final causes] in order to reconcile those who hope to explain mechanically the formation of the first tissue of an animal and the whole machinery of its parts, with those who account for this same structure using final causes. Both ways are good and both can be useful, not only for admiring the skill of the Great Worker, but also for discovering something useful in physics and in medicine.\textsuperscript{35}

Witness the resuscitations of drowned flies buried under pulverized chalk, and several other similar examples which are sufficient to show that there would be many other resuscitations, and greater ones, if men were in a position to restore the machine.\textsuperscript{36}

\textsuperscript{32} DM, 35; G 4:460; AG, 66.
\textsuperscript{33} "Ein bewunderndes Nachdenken der Schöpfungsgedanken Gottes"; Gerhard Krueger, Einleitung, \textit{Leibniz Die Hauptwerke} (Stuttgart: Alfred Kroener, 1967), xii.
\textsuperscript{34} DM, 4; G 4:429–30; AG, 37–8.
\textsuperscript{35} DM, 22; G 4:447; AG, 54.
\textsuperscript{36} NS, 7; G 4:480–1; AG, 141.
In addition to the beauties and perfections of the totality of the divine works, we must also recognize a certain constant and unbounded progress in the whole universe, so that it always proceeds to greater development [cultus], just as a large portion of our world is now cultivated [cultura] and will become more and more so. . . . Because of the infinite divisibility of the continuum, there are always parts asleep in the abyss of things, yet to be roused and yet to be advanced to greater and better things, advanced, in a word, to greater cultivation. Thus, progress never comes to an end.37

The mind not only has a perception of God's works, but it is even capable of producing something that resembles them, although on a small scale. . . . and in discovering the sciences according to which God has regulated things (by weight, measure, number; etc.), it imitates in its realm and in the small world in which it is allowed to work, what God does in the large world. . . . nature itself leads to grace, and grace perfects nature by making use of it.38

Perhaps this is the best of all possible worlds not because the present order of things is most perfect but because God, in His wisdom and goodness, has chosen laws of physics that permit unlimited prediction, control, and transformation of natural phenomena by us. Thus, not only intellectual and moral improvement but also bodily enhancement are progressive without end.39 "The resurrection of the body and life everlasting" would then be achieved by the grace of physics in the minds of humans making use of nature.40 This would hardly be a traditional rendition of Christianity. And it would mean that physics was just as important for Leibniz as metaphysics. Mercer denies both of these possibilities. According to Mercer, Leibniz was "wedded to traditional theological doctrines,"41 and "[a]lthough he made significant contributions to early modern mathematics and science, he did not develop any of his ideas through the careful study of nature."42 The latter claim is deeply problematic in view of Monadology 80 (and related texts in the Theodicy), Principles of Nature and Grace 11, and in view of the importance of elasticity for Leibniz's

37 On the Ultimate Origination of Things; G 7:308; AG, 154–5.
38 PNG, 14–15; G 6:604–5; AG, 211–12.
38 Such progress would, of course, be contingent on the proper reception of Leibniz's philosophy.
40 The Apostle's Creed. Is this the meaning of Leibniz's obscure assertion that "moral perfection is in reality physical perfection with respect to minds"? (On the Ultimate Origination of Things; G 7:306; AG, 153.)
41 LM, 472, but see 332.
42 LM, 471.
doctrine of "no real influence" between created substances.\textsuperscript{43} I touch on these points in section 8, below, on physics and metaphysics in Leibniz.

Consider the following lengthy but instructive passage from Leibniz's unpublished \textit{Elements of Natural Law} (1670–71):

Now that we are conquerors of the world, there assuredly remains an enemy within us; everything is clear to man but man, the body to the mind, and the mind to itself . . . . We are ignorant of the medicine of bodies and of minds . . . . It is not surprising, therefore, that until now we have established no science of the pleasant, or the useful, or the just. The science of the pleasant is medicine, that of the useful is politics, and that of the just is ethics.

The physician should explore our structure, the position and motion of our parts, the causes of pleasures, so that he may conserve and produce them, and of our pains . . . so that he may remove and prevent them . . . . We possess an unbelievable mass of unusual observations, but they are crude, undigested, and without use except almost by chance. To what end has this material been gathered and made ready with so much study, if we are to postpone until another century the construction of our happiness? Why not strike a blow with combined forces against this persistence of nature in concealing herself? Why, I ask, unless it is because the blame for the imperfection of natural science must fall back upon the public, since they could improve it if everyone wished it, and if individuals wished that all should wish it in general? All will not do together, however, what individuals will and can do, unless the matter is attacked in the right way and on the basis of the secrets of true politics, by those to whom it is given to make a great part of mankind happy . . . .

Until now we have therefore been ignorant of, that is we have not consumed, nor have we imbibed the true fountains of the equal and the good.\textsuperscript{44}


\textsuperscript{44} A, series VI, vol. i, p. 460, hereafter A VI.i.406; L, 132; translation slightly modified in accordance with Mercer, 246.
Leibniz goes on in *Elements of Natural Law* to describe a science of right based not on sense perception and experience but on definitions and demonstrations, “[f]or since justice consists in a kind of congruity and proportionality, we can understand that something is just even if there is no one who practices it.” Justice is an ideal form, and Leibniz explicitly identifies the principles of his science of right with Platonic ideas.\(^{45}\)

Mercer discusses this text,\(^{46}\) quoting the first and the last sentences of the long excerpt above. She emphasizes Leibniz’s complaint that, despite progress in navigation, telescope, and microscopy, “the mind [remains unclear] to itself,” and she deemphasizes his parallel complaint that “the body [remains unclear] to the mind,” which is strikingly explicated by Leibniz in the bulk of the above excerpt, omitted by Mercer. Her interpretation ends up one-sided: she sees the Platonic side of Leibniz’s science of right but fails to see the Baconian side, namely, that a principal goal of Leibniz’s ideal political science (“the secrets of true politics”) is legislation that facilitates the progress of universal scientific humanitarianism. The core of this humanitarianism is not Platonic contemplation of the Idea of the Good but a practical medical science that enhances pleasure and eliminates pain. This is consistent with Descartes’s proclamation of the mastery of nature in *Discourse on the Method*, part 6. Perhaps Bacon is as important for Leibniz as he was for Descartes.\(^{47}\)

Let us turn to the origin and development of Leibniz’s understanding of substance, chapters 2–4 of *Leibniz’s Metaphysics*.

**III**

*Assessing Early Leibniz’s Aristotelianism.* Mercer’s intention is to show that, in light of his work through 1671, Leibniz’s eclectic doctrine of substance arises and remains on genuinely Aristotelian foundations—in spite of the universally accepted fact that Leibniz was

\(^{45}\) A VI.i.461; L, 133.

\(^{46}\) LM, 246–7.

“utterly committed to mechanical physics.” Can Aristotle and mechanism be conjoined in a synthesis that we could, in some legitimate sense, call Aristotelian? According to Mercer the best answer to this question is, in Leibniz, yes. In fact, Leibniz achieved “a brilliant melding of an Aristotelian approach to substance and a mechanical physics.” In arriving at this conclusion, Mercer commendably negotiates daunting interpretive complications. But she also assumes throughout part two (chapters 2–4) of her book that Aristotle’s metaphysics can be separated from Aristotle’s physics and recombined with Leibniz’s mechanical physics in a way that is faithful to Aristotle and Aristotelianism. *Does Aristotle’s account of substance permit this?* Now we see some daunting interpretive complications, and these are well covered by Mercer: The answer to the italicized question must take account of Leibniz’s own understanding of Aristotle and of Aristotelianism, which must be distinguished from what Leibniz wrote owing merely to his Rhetoric of Attraction. The answer also depends on Leibniz’s mechanical physics. And all of this is enormously complicated by “[t]he sheer variety of philosophical alternatives available at mid-century [and by] so many philosophers who (like Leibniz) are interested in ancient philosophy as well as the new natural philosophy and who sometimes make indiscriminate [or merely rhetorical] use of the various, incompatible notions.”

But the answer to the question of Leibniz’s relation to Aristotle and Aristotelianism must also take account of what Aristotle himself wrote and which remained definitive for later Aristotelianism, and this is not well covered by Mercer. Here is a symptom of the problem: In part two of *Leibniz’s Metaphysics*, the terms “Aristotle,” “Aristotelian,” “Aristotelianism” appear about 300 times, for an average of almost three per page. Yet there is no quotation from or citation of any of Aristotle’s works, and none is listed in the bibliography. Precisely because the problem of interpretation in this historical setting is so

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48 LM, 70.
49 LM, 17.
51 See LM, 485. Charlotte Witt’s *Substance and Essence in Aristotle: An Interpretation of Metaphysics VII–IX* is cited on 85 n. 56. In chapter 5, “Platonist Assumptions” on metaphysics of divinity, Mercer says, citing *De Anima* 3.7, that “[i]n *On the Soul*, Aristotle had claimed that to think something was in a sense to contain it.” *De Anima* 3.8 should be included, in which Aristotle famously says “the soul is in a certain way all the beings” (431b21).
complex, we need fixed points by which to take our bearings. Mercer’s “Aristotelian assumptions” of chapter 2 are, as we shall see, not sufficient to meet this need. (In positive contrast, chapter 5 on “Platonist Assumptions” contains many quotations from Plotinus, Philo, Proclus, and Augustine.)

Lacking cardinal points by which to navigate, there results an unnerving oscillation between affirmations and denials of Leibniz’s Aristotelianism. For example: Despite “Leibniz’s obvious abuse of key features of Aristotle’s philosophy,” we should “put aside our own prejudices about the incompatibility of the Aristotelian and the mechanical philosophies.”52 Leibniz “decided [against Thomasius] that Aristotelian metaphysics could be reconciled with mechanism.”53 Although Leibniz “sometimes goes beyond anything that Aristotle actually accepted. . . . beyond anything that twenty-first-century scholars might consider genuinely based on the texts of Aristotle,” we should look to “what he considered his Aristotelianism” for, “concerning substance . . . , Leibniz took himself to be a full-fledged follower of Aristotle. . . . and moreover [his views about substance] do correspond to the most fundamental of Aristotle’s views.”54 “[T]he substantial form for non-human substances is God[!]”55 “According to Leibniz [in his October 1668 letter to Thomasius], ‘Aristotle himself agrees remarkably well with Galileo, Bacon, Gassendi, Hobbes, Descartes . . . ![]’”56 “The philosophies proposed by mechanists like Descartes and Gassendi explicitly reject the foundations of the Aristotelian system.”57 “For Aristotle, the substantial form . . . is metaphysically prior and cannot be [reduced to magnitude, figure, and motion]. . . . Leibniz has . . . deprived substantial form of its causal and metaphysical priority. . . . By so neatly mechanizing the Aristotelian principles, he has shown that the physical explanations proposed by both the moderns and the reformers really do follow from Aristotelian principles.”58 “[B]ecause it is so difficult to see anything genuinely Aristotelian in Leibniz’s proposals [to Thomasius] so far, there seems little reason to

52 LM, 26.
53 LM, 44.
54 LM, 68, 96.
55 LM, 87.
56 LM, 91.
57 LM, 99.
58 LM, 117.
take Leibniz’s proclamations of the virtues of Aristotle seriously.”\textsuperscript{59} But such problems do not seem “too severe . . . against the historical and philosophical background.”\textsuperscript{60}

The culmination of this remarkable ride is Mercer’s acknowledgment that “[f]or the twenty-first-century reader, however, there may still be lingering doubts [since] Leibniz’s proposed conception of substance is so significantly different from that of Aristotle himself. . . . We may continue to feel uncomfortable about what one commentator called ‘a perpetual violence made on Aristotle.’”\textsuperscript{61} The commentator is Hannequin and he expressed his discomfort not in the twenty-first century but in 1908.\textsuperscript{62} Mercer then reverts to 1669 and the response of Thomasius himself, Leibniz’s most important teacher, who “point[s] out that the substantial form cannot be identical to accidental things like the figuration and magnitude of parts. . . . Although Thomasius rejects Leibniz’s conciliatory proposal, he does not find the position shocking.”\textsuperscript{63}

Among Mercer’s own statements, above, we can begin to find evidence that there is a genuinely serious problem with what Leibniz is doing to the whole–part relation in natural substances. For Leibniz “all the features of bodies . . . are reducible to and explained by the arrangement of their parts.”\textsuperscript{64} She and Thomasius should enable us (and her) to see that the reductionism of all the mechanists including Leibniz is incompatible with the holism of Aristotle’s and Aristotelian teaching on form in natural, as opposed to artificial, compounds.\textsuperscript{65}

We should expect this sort of thing from Leibniz in view of his warnings that synthesis comes at a price, as, for example, in the New System: “it was necessary to restore . . . the substantial forms . . . but in a way that would render them intelligible, and separate the use one should make of them from the abuse that has been made of them.”\textsuperscript{66} But instead of developing this issue, concerning the composition and

\textsuperscript{59}LM, 119.
\textsuperscript{60}LM, 120.
\textsuperscript{61}LM, 126.
\textsuperscript{62}Arthur Hannequin, “La première philosophie de Leibnitz,” in Études d’histoire des sciences et d’histoire de la philosophie, vol. 2 (Paris: Alcan, 1908), 49. Leibniz’s “violence” to Aristotle is only partial; there are genuinely Aristotelian elements in Leibniz, concerning matter and entelechy, as discussed at the conclusion of the present section.
\textsuperscript{63}LM, 127; emphasis mine.
\textsuperscript{64}LM, 92.
intelligibility of natural compounds in Aristotle and Leibniz, Mercer turns to the inconsequential point that Thomasius (and other eclectic contemporaries) did not “find the position shocking”—because they were “aware of this way of talking” for the sake of making peace. Look again at Leibniz’s instructive remark from De Summa Rerum: “In this metaphysics, it will be useful for there to be added here and there the authoritative utterances of great men, who have reasoned in a similar way [about causes of motion, for example]; especially when these utterances contain something that seems to have some possible relevance to the illustration of a view.” Is it not possible that Aristotle was one of these “great men,” useful for rhetorical purposes? Mercer raises this possibility herself: “Leibniz often takes a reference to Aristotle to constitute its own kind of rhetorical argument.” Mercer is right about Leibniz’s Rhetoric of Attraction but seems not to see the extent to which it complicates the task of determining Leibniz’s own true understanding of Aristotle and Aristotelianism.

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66 Mercer’s discussion of figura (91–3, 116–17, 125–7) exemplifies an insufficent appreciation of the whole–part problem. As explained by Mercer, Leibnizian figura is basically the pattern of (local) motions of the parts of a body, and, given Leibniz’s mechanist commitment to the reducibility of wholes to parts, it follows that the “nature of a body [is] an arrangement of parts of matter” and their corresponding motions (91 n. 75). Thus, according to Leibniz, the substantial form is constituted by magnitude, motion, and figura. Mercer cites (126 n. 91) Suárez, Disputationes Metaphysicae pt. 42, sec. 3, par. 15, “The various meanings of figure and form,” to show that Leibniz’s interpretation of Aristotle’s substantial form has a scholastic precedent in Suárez. But Suárez is discussing figure and form here as the fourth species of quality, the Aristotelian category of accident after substance and quantity. As such, figura and forma often mean the same thing, “a mode resulting in body from the termination of magnitude,” that is, the visible, tangible shape of a body. This does not mean that figura or form is an internal, constitutive principle of substance, as in Aristotle, Physics 2.1.192b21–3. See section 7, below, on Aristotle versus Leibniz on nature and substance, and Denis Des Chene, Physiologia (Ithaca: Cornell University Press, 1996), 110, on figure in late scholasticism.

66 NS, 3; G 4:478–9; AG, 139. Mercer cites another good example: a 1707 letter to Hansch in which Leibniz says that “to philosophize correctly, Plato must be combined usefully with Aristotle and Democritus, though a number of the principal doctrines must be stricken from each of them” (52; emphasis mine). One of these doctrines, as we shall see, is that of the Aristotelian soul (the form of an organic being) as a holistic principle that makes the parts be what they are so that the whole is prior to the parts.

67 LM, 127.

Mercer is also right about the importance of historico-philosophical context. The problem is that she gives us too much of what is inessential (Sturm, De Raey, and others) and too little of what is essential. I comment on two essential elements of historical background: (1) Aristotle on nature and substance (from the Physics, De Anima, Metaphysics); (2) the impact of Christianity on the reception and use of Aristotle’s philosophy. Mercer is deficient on the first but sheds light on the second. Both, however, are needed in order to make the comparisons and contrasts required for the interpretation of early modern philosophy. In the following sections, I follow Mercer’s lead on the significance of Christian Aristotelianism (4), consider two examples (5 and 6), and then take up Aristotle’s understanding of natural substance (7).

IV

Christian Aristotelianism, Descartes, and Leibniz. A principal goal of part two of Leibniz’s Metaphysics is to “show . . . that the foundation of Leibniz’s Metaphysics of Substance was laid in his attempt to solve the metaphysical problems posed by . . . theological doctrines [such as transubstantiation, incarnation] . . . in a way that would . . . remain consistent with the doctrinal pronouncements of the Council of Trent [1545–63].”\(^{69}\) Consider the titles of some of Leibniz’s unpublished early (1668–70) writings: Confession of Nature Against the Atheists, Catholic Demonstrations, On the Incarnation of God, On Transubstantiation. Mercer’s analysis of these writings establishes that “Leibniz begins to construct the details of his original metaphysics within the context of [an] elaborate set of theological demands and that at its center stands a reconsideration of the notions of substantial form and substantial nature.”\(^{70}\) Indeed, “the physics of Gassendi and Descartes violate the requirements of the Council of Trent [on transubstantiation] and are to be rejected on those grounds.”\(^{71}\) Leibniz of course rejected the physics of Descartes on multiple grounds, but Descartes’s difficulties with transubstantiation

\(^{69}\) LM, 63.
\(^{70}\) LM, 94.
\(^{71}\) LM, 83.
were especially conspicuous; see Arnauld's ominous concluding remarks in the Fourth Set of Objections.\textsuperscript{72}

In view of Mercer's account, it is clear that Leibniz's early metaphysics does not derive directly from Aristotle but from scholasticism, the combination of Greek philosophy (especially Aristotle) with Christian revelation and Catholic teaching. This is a richly diverse body of thought spanning half a millennium, in which, for example, important changes occur in the way concepts intend their objects.\textsuperscript{73} I restrict the focus drastically here to a single topic, but one that is directly relevant for the interpretation of Leibniz and Descartes. It is the doctrine of God's concurrent and providential Mind, both in the constitution and in the movement of nonhuman natural bodies—doctrines that are strange on grounds of Aristotle's texts, less so on those of Aquinas, and that finally take root in sixteenth-century scholasticism.\textsuperscript{74}

In Physics 2.8, Aristotle gives arguments for final causality in nature. Among these arguments is the following. In both production by


\textsuperscript{73} See Jacob Klein, "The World of Physics and the Natural World," in \textit{Jacob Klein Lectures and Essays}, ed. Robert B. Williamson and Elliott Zuckerman (Annapolis: St. John's College Press, 1985), 1–34, especially 5–10. In sixteenth- and seventeenth-century scholasticism, there is an increase in the use of reified abstractions, exploited by Descartes, criticized by Leibniz, for example, "quantity" (\textit{posotēs}) and "extension" in place of "the quantified" (\textit{to poson}) and "the extended." See Leibniz, \textit{Preface to an Edition of Nizolius (On the Philosophical Style of Nizolius)}; G 4:147–8; L, 126; also \textit{SD} II, 1; GM 4:246–7; AG, 130. The notion of substantial forms and real qualities as beings in their own right, which push around the bodies to which they are conjoined, is a particularly degraded example; see Descartes, \textit{Sixth Replies}; AT 7:441; CSM 2:297. See also Leibniz to Thomasius, 20/30 April 1669; G 1:22; L, 99.

\textsuperscript{74} Des Chene, \textit{Physiologia}, is especially helpful on the late scholasticism that formed the immediate context for Descartes. Gilson, \textit{Études sur le rôle de la pensée médiévale dans la formation du système cartésian}, 4th ed. (Paris: Vrin, 1975) is of enduring value.
human art and in natural development, there is a craftlike succession of stages, and this betokens final causes at work. He says:

This is clear most of all in the other animals, which make nothing by art, inquiry, or deliberation: for which reason some people are completely at a loss whether it is by intelligence or in some other way that spiders, ants and such things work... It is absurd to think that a thing does not happen for the sake of something if we do not see what sets it in motion deliberating.\textsuperscript{75}

In Aristotle, nonrational substances are moved to their ends without knowledge. No mind is operative in the spider's weaving of its web—just the being-at-work of spider-form, that is, spider-soul with the powers of local motion and sense perception. It is similarly clear from \textit{Physics} 8.4 that the nonliving elements are moved to their natural places without knowledge; such bodies do not even have organs of sense perception. Thus the heavy stone falls to its natural place through actualization of second potency, a type of motion that requires no concurrent cause in act—in \textit{Physics} 8.4 the form of the stone is only a passive principle of motion—and certainly requires no mind.\textsuperscript{76}

In plants and animals, then, the substantial form is mindlike only by analogy in that it is responsible for processes that, in their developmental stages, look like human production according to a design in the mind of the artisan. In nonliving things, for example, the stone, the substantial form is not mindlike at all. Thus Aristotle.

Thomas Aquinas comments as follows on \textit{Physics} 2.8:

\begin{quote}
[Aristotle] says... first that it must be pointed out that nature is among the number of causes that act for the sake of something. And this is important with reference to the problem of providence. For things that do not know the end do not tend toward the end unless they are directed by one who does know, as the arrow is directed by the archer. Hence if
\end{quote}


\textsuperscript{76} Apprehension requires sense organs: \textit{De Anima} 1.1.403a8–10, 2.2.414a26–7. On the natural motion of the elements: \textit{Physics} 8.4.255a32–256a3. Actualization of second potency is explicated by means of an analogy: if nothing prevents or obstructs, then an element, having been generated, is moved naturally just as a scientist, having been taught the science, investigates (8.4.255a32–b13). This analogy does not mean that a stone or its heaviness has science.
nature acts for an end, it is necessary that it be ordered by someone who is intelligent. This is the work of providence.\footnote{Aquinas, \textit{Commentary on Aristotle's Physics} (hereafter, "\textit{In phys}")}, trans. Richard J. Blackwell, Richard J. Spath, and W. Edmond Thirkel (New Haven: Yale University Press, 1963), n. 250 (p. 116).

Here, Aquinas explicitly diverges from Aristotle, on grounds of Christian teaching on the providence of the biblical God. Similarly, in the \textit{Summa Theologiae}, the archer analogy is applied to nonrational creatures, both living and nonliving. Nonliving things "have a natural desire [\textit{gravitas}, for example] without knowledge, as being directed to their ends by a higher intelligence."\footnote{Aquinas, \textit{Summa Theologiae I}, q. 6, a. 1, ad 2; English translation by the Fathers of the English Dominican Province, 5 vols. (Allen, Tex.: Christian Classics, 1948), 1:28.} In general, a nonrational creature is said to move or operate for an end, as though moved or directed by another thereto, as an arrow directed to the target by the archer, who knows the end unknown to the arrow.\ldots Wherefore, as the violent necessity in the movement of the arrow shows the action of the archer, so the natural necessity of things shows the government of Divine Providence.\footnote{\textit{Summa Theologiae I}, q. 103, a. 1, ad 1, ad 3 (English translation 1:505–6).}

In Aquinas, in contrast to Aristotle, nonrational substances (animals, plants, and the elements, the latter being completely without apprehension) are moved to their ends through knowledge—God's providential knowledge.

God's mind is, of course, not the substantial form of any body because, for both Aristotle and Aquinas, the form of a natural substance is an internal principle and cause of motion and rest. It is \textit{in} the mobile in a very special way, expressed by the words "primarily and \textit{per se} and not \textit{per accidens}" at \textit{Physics} 2.1.192b21–3, and explicated by Aquinas in notes 142–5 of his commentary on the \textit{Physics}. In particular, the form of a natural substance (1) depends on its correlative matter yet (2) cannot be adequately understood in terms of that matter.\footnote{\textit{Physics} 2.2.194a15, 194b9; \textit{In phys.}, n. 66.} For both Aristotle and Aquinas, God is the first cause of motion in the
universe, but God's mind is not the substantial form of a speck of dirt, an onion, a magpie.\textsuperscript{81}

This background, though brief and far from complete, nevertheless begins to help with some unusual statements by Leibniz and Descartes concerning the constitution and movement of nonhuman natural bodies. The following example from Descartes is relevant for Leibniz. It is Descartes's "autobiographical" story of his childhood error about the heaviness (\textit{gravitas}) of bodies.

V

\textit{Example: Descartes on Gravitas (Providence).} In point 10 of the \textit{Sixth Replies}, Descartes states his mechanist position on sensible qualities: "heaviness and hardness . . . and all the other qualities that we experience in bodies, consist solely in the motion of bodies, or its absence, and the configuration and situation of their parts."\textsuperscript{82} It is a fundamental error to judge that, say, color or weight are intrinsic properties of bodies. Color, for example, is an intramental representation arising in the mind in consequence of interactions between colorless corpuscles within and outside of our own bodies. Weight is more complicated and less subjective, involving vision, touch, and the physical effort of lifting against something that opposes us. In both cases, according to Descartes, our premethodical judgment of the cause goes badly astray.

But how does this large error—the attribution to bodies of qualities they do not possess—happen? Descartes provides a personal account of the genesis of this error. "From infancy I had made a variety of judgments about physical things in so far as they contributed to preserving the life that I was embarking on; and subsequently I retained the same opinions I had originally formed of these things."\textsuperscript{83} The Cartesian soul is indeed more needy than the Aristotelian soul because it is not a source of vital heat, not a life principle.\textsuperscript{84} As a result,

\textsuperscript{81} Compare \textit{LM}, 87, 89, 478–9, and Garber, "Leibniz: Physics and Philosophy," 273.
\textsuperscript{82} AT 7:440; CSM 2:297. See also AT 7:437; CSM 2:294–5.
\textsuperscript{83} AT 7:441; CSM 2:297.
\textsuperscript{84} \textit{The Passions of the Soul}, aa. 2–6; AT 11:328–30; Voss, 19–21.
it may be predisposed to overreact, in joy, say, to what seems beneficial to its body, in sorrow or apprehension to what seems harmful. Furthermore, continues Descartes, "at that [young] age the mind . . . was more firmly attached to [the bodily organs]; hence it had no thoughts apart from them and perceived things only in a confused manner." As a child, Descartes did not methodically distinguish what pertains to body independently of mind (extension) from what pertains to mind independently of body (thought). These perceptions are clear and distinct, whereas the experience of the mind–body composite is possibly clear—for example, pain—but never distinct. The neediness and confusion of the Cartesian soul in childhood results in a false attribution of mental characteristics to bodies—an unwitting, anthropomorphic projection of our own spiritual qualities, cognition and volition, onto the external world.

Descartes gives an illustrative example: his erroneous belief that heaviness (gravitas) inhere in solid bodies. Eventually, by his method of analysis, he came to realize that he had been projecting onto bodies something from his (confused) experience of the mind–body union, namely, the mind’s power to move the body, which we all clearly experience but whose ultimate nature is truly obscure. Now comes the passage relevant for our present purposes. It is an unusual statement concerning the movement of nonliving natural bodies:

> But what makes it especially clear that my idea of gravity was taken largely from the idea I had of the mind is the fact that I thought that gravity carried bodies toward the center of the earth as if it had some knowledge (cognitio) of the center within itself. For surely this could not happen without knowledge, and there can be no knowledge except in a mind.

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86 Passions, aa. 56, 61, 162; AT 11:374, 376, 454; Voss, 53, 54, 109. An adequate explanation of Descartes on the sources of error would lead us from Principles 1.35 and 1.71–4, to the correspondence with Elizabeth and Chanut, and deeply into The Passions of the Soul.

86 Sixth Replies, AT 7:441, CSM 2:297.

87 Sixth Meditation, AT 7:81, CSM 2:56.

88 See also Principles 1.71 and Garber, Descartes’ Metaphysical Physics (Chicago: University of Chicago Press, 1992), chap. 4, on Descartes’s rejection of hylomorphism.

89 Sixth Replies; AT 7:442; CSM 2:298.
For Aristotle, as we have seen, the fall of a stone to its natural place
and does happen without knowledge. It is Aquinas, not Aristotle,
who holds that things without apprehension are moved to their ends
through knowledge—knowledge not in the heaviness of the stone but
in the mind of the providential God. Descartes's attribution of knowl-
dge to heaviness seems odd. Did any scholastic ever teach that the
gravitas of heavy bodies had cognition or any sort of apprehension?
If so, then he might be a particular target of Descartes's general
criticism here of real qualities and substantial forms. If not, then the
target of Descartes's account of his error might be twofold: gravitas
and providence. In the neediness and confusion of childhood, Des-
cartes mistakenly attributed heaviness to the stone and providence to
the deity—he projected human intellect and will onto the nonhuman
world. In his methodically enlightened maturity, Descartes realized
that belief in the objective reality of gravitas is an error, along with
the archer analogy for divine providence and design teleology.

Leibniz understood Descartes in this way, that is, as denying the
goodness, wisdom, and providence of God. For Descartes indeed in-

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90 Descartes's remarks on gravitas here are part of his general attack on
scholastic real qualities and substantial forms. For example, he writes to
Mersenne on 28 April 1643 that "I do not suppose that there are in nature any
real qualities [like gravitas] which are attached to substances, like so many
little souls to their bodies, and which are separable from them by divine
power" (AT 3:648; CSMK, 216). The likening of either a stone's heaviness or
its substantial form to "a little soul" is, again, odd on grounds of Aristotle and
Aquinas since a stone has no organs of perception or reproduction. Garber,
Descartes' Metaphysical Physics, 162, notes that Descartes' "characteriza-
tion of scholasticism is quite clearly a rational reconstruction, and probably
also something of a caricature."

91 DM, 2; G 4:428; AG, 36; and notes 67–9. M, 46; G 6:614; AG, 219. Letter
to Molanus(?) (c. 1679); G 4:299; AG, 242. Two Sects of Naturalists; G 7:333;
AG, 282; Theodicy, 176, 185, 186; G 6:219, 227–8; H, 236, 244–5. Leibniz's po-

tion in Theodicy seems somewhat ambiguous, but see Adams, Leibniz, 190.
In these texts, Spinoza is usually mentioned along with Descartes, but, given
his influence, it is Leibniz's response to Descartes that is most important.
Note that, according to Leibniz, Descartes practiced his own type of rhetoric:
"Descartes took care not to speak so plainly [as Hobbes], but he could not
help revealing his opinions in passing, with such address that he would not
be understood save by those who examine profoundly these kinds of sub-
jects"; Leibniz to Christian Philip, end of January 1680; A II.1506.
sisted that intellect and will cannot be distinguished in any way in God, in whom

understanding and willing does not happen, as in our case, by means of operations that are in a certain sense distinct from one another; we must rather suppose that there is always a single identical and perfectly simple act by means of which he simultaneously understands, wills and accomplishes everything.\(^{92}\)

Accordingly,

it is impossible to imagine that anything is thought of in the divine intellect as good or true, or worthy of belief or action or omission, prior to the decision of the divine will to make it so. I am not speaking here of temporal priority: I mean that there is not even any priority of order, or nature, or of 'rationally determined reason' as they call it, such that God's idea of the good impelled him to choose one thing rather than another. For example, God did not will the creation of the world in time because he saw that it would be better this way than if he had created it from eternity; nor did he will that the three angles of a triangle should be equal to two right angles because he recognized that it could not be otherwise, and so on. On the contrary, it is because he willed to create the world in time that it is better this way than if he had created it from eternity; and it is because he willed that the three angles of a triangle should necessarily equal two right angles that this is true and cannot be otherwise; and so on in other cases.\(^{93}\)

Here we have Descartes's notorious doctrine of the divine creation of the eternal truths, which first appeared in his letters to Mersenne of April and May 1630.\(^{94}\) According to this unorthodox teaching, we cannot say that God wills the good, but only that whatever God wills is good, so that, as Leibniz puts it, "he would be equally praiseworthy in

\(^{92}\) Descartes, *Principles* 1.23; AT 8A:14; AT 9B:35; CSM 1:201.

\(^{93}\) Descartes, *Sixth Replies*; AT 7:431–2; CSM 2:291.

doing the exact opposite." This makes theodicy impossible. On grounds of Descartes's extreme notion of God, the fundamental principles of nature and knowledge—including the principle of noncontradiction—are brute facts resulting from an unintelligibly arbitrary decree. Accordingly, the created universe cannot be said to follow from the wisdom of the creator in any humanly meaningful (analogical) sense. For Leibniz, Descartes's theology stands in marked contrast to the Christian theological tradition deriving from Augustine. Indeed, in his influential Question 46: On the Ideas, Augustine says,

in fact the ideas are certain [original and] principal forms of things, i.e., reasons, fixed and unchangeable, which are not themselves formed and, being thus eternal and existing always in the same state, are contained in the Divine Intelligence. . . . This having been established and conceded, who would dare to say that God has created all things without a rational plan (irrationaliter)?

And so we return to the archer analogy in Aquinas and to the priority (however problematic) of divine intellect to divine will, so emphatically denied by Descartes: "[I]t is the archer that directs the flight of the arrow to a definite mark . . . [God] acts, not by a necessity of His nature, but by his intellect and will." Hence, "God brought things

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96 DM, 2; G 4:428; AG, 36; also Theodicy, 176; G 6:219; H, 236.
96 Theodicy, 185; G 6:227; H, 244. Menn, Descartes and Augustine, 342 n. 4, argues that Descartes's God is not beyond the principle of noncontradiction, also Martial Gueroult, Descartes' Philosophy Interpreted According to the Order of Reasons, trans. Roger Ariew (Minneapolis: University of Minnesota Press, 1984), 2:19–22. Others have argued that, for Descartes, there are uncreated eternal truths, which would include the principle of noncontradiction. These are worthy endeavors but hard to reconcile with Descartes's own statements on the creation of the eternal truths. Of course Suárez was a principal target of Descartes; see Gary Hatfield, "Reason, Nature, and God in Descartes," in Essays on the Philosophy and Science of Rene Descartes, ed. Stephen Voss (New York: Oxford University Press, 1993), 269–77. But the eternal truths doctrine cuts deeper for it removes any reason for predicating "good" of God.
into being by His wisdom. Excluded hereby is the error of those [see Summa Contra Gentiles 1.87 and 3.97] who said that all things depend on the simple will of God, without any reason.\textsuperscript{98} Therefore, “to say that justice depends upon the pure and simple will of God is to say that the will of God does not proceed according to the order of His wisdom, which is blasphemy.”\textsuperscript{100} And Leibniz agrees: “It is thus clear that an absolute will which does not depend on the goodness of things is a monstrosity.”\textsuperscript{101}

From Leibniz’s agreement with this theological tradition derives his commitment to the correction of Descartes’s error by giving an account of the universal harmony of God’s wise creation or God’s choice of the best.\textsuperscript{102} This is a central component of Leibniz’s philosophy and one that needs to be seen against the essential philosophical and historical background of Aristotle, Augustine, Aquinas, and Leibniz’s instructive reading of Descartes. Mercer’s analysis would benefit by some attention to this, but all she says is that Leibniz “complains [in the letters of 1671] about the fact that because contemporary philosophers want to explain everything mechanically, they . . . ignore the real rationale [of the world] in which the wisdom of the author shines forth.”\textsuperscript{103} For Leibniz, however, Descartes did not ignore the divine wisdom, he eliminated it. This piece of historico-philosophical context does not contradict Mercer’s valuable interpretation of Leibniz’s Platonism on God and creation;\textsuperscript{104} it complements it.

\textsuperscript{99} SCG 2.24.4 and 7; Pegis 2:72.
\textsuperscript{100} Aquinas, De Veritate, q. 23, a. 6.
\textsuperscript{101} Leibniz to Wedderkopf, May 1671; A II.i.118; L, 147.
\textsuperscript{102} This in no way precludes the derivation of “all corporeal phenomena . . . from efficient and mechanical causes” and the resulting technological progress. It is of the essence of Leibniz that we can be masters of nature even while “we contemplate the ends which divine wisdom had in thus ordering” the laws of physics (SD I, 13; GM 6:243; AG, 126. Also DM, 21; G 4:446–7; AG, 53–4; and Theodicy, 345; G 6:319; H, 332). See Garber, “Leibniz: Physics and Philosophy,” 319–21, 325–8.
\textsuperscript{103} LM, 168.
\textsuperscript{104} LM, 225–43.
VI

Example: Early Leibniz on Universal Form (God). According to Mercer, for the early Leibniz, “the substantial form for non-human substances is God.” See also Garber, “Leibniz: Physics and Philosophy,” 273.

No body apart from a concurring mind has a principle of action within itself . . . Whatever is taken with concurrent mind is Substance; whatever is taken apart from it is accident. Substance is union with mind. Thus the Substance of a human body is union with human mind; the Substance of bodies that lack reason is union with the universal mind or God.

This is an unusual statement about the constitution of nonhuman natural bodies. Looking at it solely against the background of Aristotle and Aquinas, we wonder what to make of it. But there is other relevant context, regarding which I mention four points.

First, what is of immediate concern for Leibniz is the problem of transubstantiation: can his metaphysics here show its possibility? It can because if the substantial form of the bread is God’s mind, then should God change his mind—from the idea of bread to the mind of Christ—the substance of the bread would become that of Christ.

(Questions arise as to the adequacy of Leibniz’s theory.)

Second, Mercer’s detailed analysis of On Transubstantiation is aimed at finding seeds of Leibniz’s mature theory of substance, for example, that substantial form or entelechy is a mindlike principle of self-sufficiency and activity in, for, or related to bodies, which she then further develops in the remainder of part two, on the metaphysics.

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106 On Transubstantiation, points 4 and 8; Mercer, 84, 86; L, 116.
107 Mercer notes (82, also 290) that “the difficulty was never more politically acute than after the pronouncements of the Council of Trent [1545–63].” LM, 86.
109 LM, 94.
ics of substance. For example, self-sufficiency is a defining characteristic of Leibnizian substance.\(^{112}\) Now if God’s mind is the substantial form of something, then that thing has neither being nor operation in its own right; it is not self-sufficient. So another concept of substance is needed (chapter 4). Mercer writes—oddly—as if it took Leibniz a while to figure this out,\(^{113}\) but it is immediately obvious. Mercer also shows—helpfully—the Platonic side of early Leibniz’s account of universal Mind and substantial forms. This is supplied in part three, on the (Platonic) metaphysics of divinity.\(^ {114}\)

Third, late scholasticism seems to strengthen the originally Thomistic teaching that all teleology is design teleology,\(^ {115}\) but, unlike Aquinas, it may do so at the expense of formal causality in nature. According to Des Chene,

> everything except rational agents, and in a quite limited way, animals, is acted on by ends only as an instrument of God. . . . final causality is, for the [16th- and 17th-century] Aristotelians, always dependent on rational cognition, human, angelic, or divine. . . . It follows . . . that knowledge of the ends of nature is not, as it would have been for Aristotle, a knowledge of one sort of intrinsically natural property among others; it is instead knowledge, however deferred and uncertain, of the mind of God.\(^ {116}\)

As Mercer observes, “[t]he texts of 1669–70 provide abundant evidence that there is no distinction in Leibniz’s mind between substantial form and mind.”\(^ {117}\) Thus Aristotelian (and Thomistic) soul—the substantial form of plants and animals—has been for Leibniz banished from nature. This is of course a hallmark of mechanism, as previously noted, and its implications pose difficulties, discussed below, for Mercer’s assumption that an Aristotelian metaphysics can be made the basis of Leibniz’s physics of reductionist mechanism.

Fourth, formal causality in nature comes under especially heavy attack from the Christian Cartesian, Malebranche, whose doctrine of occasionalism was an important target for Leibniz. The doctrine of the formal cause is among “[t]he most dangerous errors of the philosophy of the ancients” because it implies “sharing with God the force

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\(^{112}\) Ibid.

\(^{113}\) *LM*, 134.

\(^{114}\) *LM*, 211, 232, and n. 63.

\(^{115}\) In *phys.*, n. 250.

\(^{116}\) Des Chene, *Physiologia*, 200; emphasis mine.

\(^{117}\) *LM*, 153.
and power essential to Him. . . . [N]atural causes are not true causes; they are only occasional causes that act only through the [immediate] force and efficacy of the will of God.\textsuperscript{118} On this account, Aquinas and Leibniz would be dangerous men for they both teach that nature is a realm of causes and principles accessible to natural reason. Aquinas and Leibniz disagree on what principles are known by natural science. For Aquinas they are preeminently Aristotle's natural forms and ends, of visible, tangible substances irreducible to their parts; for Leibniz, they are the mathematical laws of derivative force, what we today call the laws of conservation of energy and momentum, in material systems reducible to particles not directly given in sense perception. Let us turn finally to the problems of form and matter, whole and part, act and potency, intelligible and sensible, and the limits of human power in Aristotle and Leibniz.

VII

\textit{Aristotle versus Leibniz on Nature and Substance.} "[S]ubstance [is] the most real thing"\textsuperscript{119}—this is universally agreed. The fundamental questions whose answers are in dispute are: (1) What are the characteristics of substance? (2) What is a good example of a substance—can we see one with our eyes and point at it with our finger? Mercer maintains that Leibniz's answer to the first of these questions qualifies his metaphysics of substance as legitimately Aristotelian, regardless of well-known problems regarding the second question. My criticism of Mercer on Leibniz's Aristotelianism is the subject of this section. But a few words on the great importance of the second question, above, are required.

Indeed the second question—what is \textit{a} substance?—leads directly into one of the richest issues in Leibniz: the meaning and status of simples and compounds. Are the true substances exclusively the monadic simples of, say, \textit{Monadology} 1–30, or are the true substances corporeal compounds on the model of an animal? As reviewed by


\textsuperscript{119} Leibniz to De Volder, 23 June 1699; G 2:182; W, 163.
Mercer,\textsuperscript{120} most recent commentators uphold the metaphysical primacy of simple substances. Garber dissents, and defends the reality of corporeal substances by arguing, rightly in my opinion, that careful attention must be given to Leibniz's theory of force in the dynamical writings.\textsuperscript{121} Force indeed spans the obscure divide between the phenomena of bodies, or spatio-temporal process, and the metaphysical realm of simples or first entelechies, which are prior to space and time.

There is solid textual support in Leibniz for both interpretations. Mercer takes Leibniz's panorganicism as a version of the first interpretation (ultimacy of simple substances), which she supports, and finds its origin (chapter 7) in writings of 1670–72, which is impressive. That Leibniz never abandoned such an account is clear from his \textit{Metaphysical Consequences of the Principle of Reason} of around 1712:

All bodies are finally resolved into living things, and... what in the analysis of substances exist ultimately are simple substances—namely souls, or, if you prefer a more general term, monads, which are without parts. For even though every simple substance has an organic body which corresponds to it—otherwise it would not have any kind of orderly relation to other things in the universe, nor would it act or be acted upon in an orderly way—yet by itself it is without parts. And because an organic body, or any other body whatsoever, can again be resolved into substances endowed with organic bodies, it is evident that in the end there are simple substances alone.\textsuperscript{122}

But in parallel with this account we have another. Consider, for example, Leibniz to Remond in 1715: “A true substance, such as an animal, is composed of an immaterial soul, and an organized body; and it is the compound of these two which is called \textit{unum per se},”\textsuperscript{123} Similar texts can be found, and the issue does not seem to be a matter of

\textsuperscript{120} \textit{LM}, 255–6.
\textsuperscript{122} Leibniz, \textit{Metaphysical Consequences of the Principle of Reason} 7; C, 14; P, 175.
\textsuperscript{123} Leibniz to Remond, 4 November 1715; G 3:657; W, 554.
Leibniz's holding different positions at different times. The problem of the metaphysical status of simples and compounds turns perhaps on the question whether the simples are themselves substances—able to be independently of anything else except God—or only the constitutive principles of substances. This seems not unlike the scholastic problem of the human soul as both the constitutive principle of one hylomorphic substance and a substance in its own right. Unfortunately, this difficult but central issue in Leibniz lies beyond the scope of the present essay. I turn to the subject of this section, my criticism of Mercer on Leibniz's Aristotelianism.

Aristotle gives four characteristics of substance. Substance is that which: (1) endures through change in the categories of quantity, quality, and place; (2) is the subject of predication that is not predicated of another; (3) has internal principles of change and stability; (4) is independent or separable. We can find roughly analogous versions of each of these in Leibniz. But every analogy is lame; we need to see the difference or disanalogy as well as the similarity.

126 The idealistic interpretation (God and created simple substances are ultimate) has a strange aspect. Imagine an infinite array of brains in vats, each receiving divinely programmed electrochemical stimuli. Each would be the seat of a unique stream of experience, a progression of internal states, divinely well regulated. Suppose one of brain B's internal states is the perception of a handshake with some person c. What difference does it make whether there is another brain, C, with a corresponding state of shaking hands with a person b? God of course knows the functional relation (one-to-one correspondence) he has preestablished between states of B and C, but this relation does not seem to add anything to the experiences within either brain; a divinely well-regulated dream is perfectly self-contained. Perhaps there is more perfection with God's coordination of the progressions of states of all the brains than without it. See Mercer on harmonized plenitude (184, 479).
127 (1) Physics I.7.190a32–7, Categories 5.4a10–15; (2) Physics I.7.190a37, Categories 5.2a12; (3) Physics 2.1.192b21–3, 34; (4) Metaphysics 7.1.1028a35, 7.3.1029a28.
128 See Cover and O'Leary-Hawthorne, Substance and Individuation, 101 n. 19, for a brief summary of the corresponding notions in Leibniz.
Most helpful here is Aristotle’s answer to the second question on substance, what is a substance? He says, “a man or [horse or] plant or something of this sort . . . we most of all say are substances.”\(^{129}\) A living thing presents itself to our senses as having a privileged unity and special pattern of behavior—it even reproduces—unlike an artifact, which, according to Aristotle and Aristotelianism, is only \textit{unum per accidens}, not \textit{unum per se}.\(^{130}\) In a living substance, the whole is ontologically prior to the parts in the sense that the parts are what they are and act as they do only in terms of the whole they compose. The holistic principle in such a substance, responsible for the unity and activity of the compound, is the natural form, which is in the compound \textit{“per se primarily and not per accidens.”}\(^{131}\) In contrast, the parts of an artifact—say the gears in a clock—are what they are independently of the whole. They are fully actual in the whole, whereas the parts of one living substance are only potentially in the whole.\(^{132}\) Despite the obscurity of this teaching, it clearly follows that, for Aristotle and Aristotelianism, one substance cannot be composed of many substances, for the parts of one substance are not themselves substances; their being falls short of substantial being.\(^{133}\) Wholes are prior and irreducible to their parts. This is Aristotle’s holism, and it is incompatible with the reductionism of all versions of mechanism in early modern philosophy and classical physics. Where does Leibniz stand on these essential points?

Leibniz rejects the reliability of unassisted sense perception in providing access to substance and its principles. For example: “Far from understanding only sensible things, it is precisely these we understand the least. And although they are familiar to us, we do not understand them any better for it.”\(^{134}\) Leibniz rejects the priority of physical wholes to their parts. For example: “All the phenomena of bodies

\(^{129}\) \textit{Metaphysics} 7.7.1032a20, \textit{Categories} 4.1b27, \textit{Categories} 5.2a13; my translation.

\(^{130}\) \textit{Metaphysics} 5.6.1015b17, 5.6.1016a5, 5.26.1023b35–8, 10.1.1052a15–27; \textit{In phys.}, nn. 14, 108, 149.

\(^{131}\) \textit{Physics} 2.1.192b21–3, my translation; see also \textit{Physics} 2.1, \textit{Metaphysics} 7.10.1035b23–5, and \textit{Politics} 1.2.1253a20–4.


\(^{133}\) \textit{Metaphysics} 7.13.1039a4–6. This statement revises and corrects the earlier, looser formulation at \textit{Metaphysics} 7.2.1028b10.

can be explained mechanically, that is, by the corpuscular philosophy . . . without troubling oneself over whether there are souls or not."135 Leibniz rejects the doctrine of parts being potentially in the whole. For example: "I believe that monads always have full existence and that we cannot conceive of parts being said to be potentially in the whole."136 And Leibniz’s panorganicism, previously noted, obviously rejects the Aristotelian doctrine that one substance cannot be composed of many substances. Leibniz thus rejects Aristotle’s understanding of sensible and intelligible, form and matter, whole and part, and an important sense of the potentially being. Most conspicuous is Leibniz’s pervasive rejection of the reality of substantial change, specifically, the natural generation and corruption of living things, the class of phenomena most important for Aristotle’s teaching on natural form and matter.137 For example: “I do not admit any generation or corruption in substance itself.”138 Finally, Leibnizian substances are (mutually) self-actualizing. For example: “[F]orce does not consist in a simple faculty, with which the schools seem to have been content, but is further endowed with conatus or nisus, attaining its full effect unless it is impeded by a contrary conatus.”139 For Aristotle, in fundamental contrast, “it is always by a thing in actuality that another thing becomes actualized from what it was potentially.”140 Aristotelian potentials are actualized by causes already in act, and because of this (and the impossibility of infinite regress), Aristotle’s physics ascends by its own inner necessity to metaphysics. That is: in Aristotle and Aristotelianism, the answers to certain questions encountered within the study of nature necessarily involve immaterial sources of motion, ultimately God, transcending nature. For Leibniz, physics indeed calls for metaphysics because a mathematical physics, however applicable to nature it may be, can never be philosophically adequate to na-

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135 To Arnauld, 28 November/8 December 1686; G 2:78; AG, 80.
136 To Des Boses, 16 June 1712; G 2:450; L, 604.
137 Physics 2.1.193b9, 2.1.193b12. It is also conspicuous that, for Aristotle, form determines the natural kinds or species of things while matter is the principle of individuation. For Leibniz, in contrast, “the substantial form is the principle of individuation”; On Transubstantiation, point 31, L 117, Mercer 235. See Cover and O’Leary-Hawthorne, Substance and Individuation, 249.
138 To De Volder, 20 June 1703, G 2:249, AG 175.
139 SD I, 1; GM 6:235; AG, 118.
ture. But in its internal doings, Leibnizian physics is completely self-sufficient and autonomous of metaphysics. The answers to questions and solutions to problems in physics do not transcend the mathematical terms of (basically) classical mechanics, like mass, velocity, momentum, kinetic and potential energy.

Leibniz’s autonomous and reductionist physics has a practical implication. His anti-Aristotelian theory of the physical whole–part relation makes it possible “to penetrate little by little into the essence of body.” Indeed, according to Leibniz and as noted above, “because of the infinite divisibility of the continuum, there are always [actual] parts asleep in the abyss of things, yet to be roused and yet to be advanced to greater and better things... Thus, progress never comes to an end.” For Aristotle and Aristotelianism, the substantial whole cannot be explained in terms of the parts because the term “part” means one thing when incorporated in the whole and another thing when irreversibly isolated from it; that is, taking a natural substance apart not only destroys the whole, it changes what the parts are. In particular, there are limits to the alteration, manipulation, and transformation of bodies by separation and recombination of their parts. Aristotelian form is thus not only a source but also a limit to our knowledge and control of nature. Leibniz, accordingly, rules out any use of forms, primitive forces, or entelechies “in the details of physics... to explain particular phenomena.” In fact, if a physicist “uses... a soul [the Aristotelian form of an organism], or something else of this [nonreductionist] nature, he is raving.” Despite his appropriation of Aristotle’s term, *entelecheia*, Leibniz radically transforms its content. And there will be no conciliation with the most essential meaning of Aristotelian substantial form.

Thus unlimited by the natural forms of things, the limits of human technological possibility seem, in Leibniz, quite open—as noted above concerning bodily immortality. This would accord with the fact that Leibniz, in contrast to Aristotle, offers an ethics of inner intention or the (proto-Kantian) good will:

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141 LM, 127.
142 *On the Ultimate Origination of Things*; G 7.308; AG, 154–5.
143 *Metaphysics* 7.11.1036b31–2.
144 *Metaphysics* 5.17.1022a5–10, 7.4.1030a12–13, 7.7.1032b2.
145 *DM*, 10; G 4.435; AG, 42–3.
[A]lthough the outcome [of our action] might perhaps demonstrate that God did not wish our good will to have effect at present, it does not follow that he did not wish us to act as we have. On the contrary, since he is the best of all masters, he never demands more than the right intention, and it is for him to know the proper hour and place for letting the good designs succeed.\footnote{\textit{DM}, 4; G 4:430; AG, 38.}

This is another striking difference between Aristotle and Leibniz. Aristotle’s is an ethics of character and prudence (\textit{phronēsis}), in which not only intentions but also practical outcomes matter. This has something to do with the fact that, for Aristotle, our power is limited and we are mortal beings by nature.\footnote{\textit{Nicomachean Ethics} 2.6.1106b36–7a2, 3.2.1111b20–31, 3.3.1113a11, 6.5.1140b21, 6.7.1141a21–2, 7.14.1154b21–2, 10.7.1177a18–28.}

According to Mercer, the heart of Leibniz’s Aristotelianism is the self-sufficiency of substance:\footnote{One might with greater likelihood list unity, simplicity, uniqueness, and self-activity as the primary characteristics of Leibnizian substance, but for purposes of the present critique, let us take Mercer on her own, more Aristotelian terms.} \"[b]ecause a substance is causally autonomous, it depends on nothing else (besides its divine source) either to be what it is or to be understood.\"\footnote{\textit{LM}, 94, 445, 477.} Autonomy is indeed strongly normative for the Aristotelian hierarchy of being: “that which is itself derived from itself always takes precedence in responsibility over that which depends on both something else and itself.”\footnote{\textit{Physics} 8.5.257a30; Sachs, 202.} But, for Aristotle, “both human being and the sun beget human being.”\footnote{\textit{Physics} 2.2.194b14; Sachs, 53. Quite generally, “the natures of things in the Aristotelian world are bound together through relations of finality”; Des Chene, \textit{Physiologia}, 393.}

Trusting ordinary sense perception, Aristotle and Aristotelians believe (like most of us) that the biological depends on the astronomical. As a result, Aristotelian substances are not self-sufficient; they do not contain all the causes or the complete \textit{ratio} of their being and their activities. There is only one Aristotelian substance that possesses the degree of self-sufficiency attributed by Leibniz to every substance: God, the First Intellect and Unmoved Mover.

In the face of these fundamental differences between Aristotle and Leibniz on nature and substance, and despite Leibniz’s various assertions to the rhetorically attractive contrary, it is far more wrong
than right to call Leibniz's metaphysics of substance Aristotelian. Mercer and others, who maintain that the break between the early moderns (specifically Descartes and Leibniz) and the Aristotelian tradition has been exaggerated, are wrong. They have not yet understood adequately Aristotle's (not to mention Francis Bacon's) philosophy of nature.\textsuperscript{162}

It is not the case, however, that there is nothing Aristotelian about Leibniz. There is something of central importance for Leibniz that derives from Aristotle's account of body, motion, and causality. Leibniz accepts the seminal Aristotelian argument, based in \textit{Physics} 6.4–5 and 7.1, that we cannot by the analysis of the universal nature or common ratio of body, or matter, arrive at the active principles of motion in nature.\textsuperscript{153} Therefore, there must exist immaterial (indivisible, \textit{per se} unextended, and immovable) sources of motion. On this major point both Aristotle and Leibniz agree. The large question that extends down the history of philosophy is then, what exactly are these immaterial principles, and how are they related to the bodies whose changes and activities they cause? For Aristotle and Aquinas, they are the natural forms—for example, dog-soul—and then, ultimately, God. For the mature Leibniz, they are the first entelechies or primitive active forces. That is: in Leibniz, Aristotle's physics of form and matter, act and potency, and natural ends is eliminated by reduction to a corpuscular-mechanical physics, whose mathematical laws require further grounding in metaphysical (non-spatio-temporal, nonquantitative) notions of form, primitive force, entelechy—non-Cartesian principles of bodily activity and passivity for which Aristotle is the


\textsuperscript{153} For example: NS, 3–4; G 4:478–9; AG, 139–40; \textit{On Nature Itself} 11; G 4:510–11; AG, 161–2. I have argued that the meaning of Aristotle's famous principle, "all that is moved is moved by something (distinct from the moved)," in \textit{Physics} 7.1, is that what all bodies have in common, namely, divisibility and \textit{per se} mobility, cannot be a source of self-motion. Therefore, according to Aristotle and the Aristotelian tradition, there must exist indivisible and \textit{per se} immovable sources of natural motion. See my "Thomas Aquinas on \textit{Phys.} VII.1 and the Aristotelian Science of the Physical Continuum," in \textit{Nature and Scientific Method}, 109–56.
chief historical precedent. But Leibniz's metaphysics of substance is not Aristotelian, it is Leibnizian.

VIII

Concluding: Physics and Metaphysics in Leibniz. According to Mercer, Leibniz "did not develop any of his ideas through the careful study of nature."\(^{154}\) Since physics and metaphysics go hand in hand in Leibniz, it is difficult to know what to make of this assertion. Let us try the following. Mercer finds in Leibniz a "core metaphysics"\(^ {155}\) that is in place by 1672 and remains for the duration of his career. It is, not surprisingly, an idealistic metaphysics: simple, mindlike substances and their internal series of appetitions and perceptions coordinated by God through the preestablished harmony are ultimate. As Leibniz wrote to De Volder in 1704:

And if anyone concedes to me that there is an infinity of percipients, in each of whom there is a fixed law of the progression of phenomena, that the phenomena of these different percipients correspond with each other, and that there is a common reason for both their existence and their correspondence in the thing that we call God, this is all that I claim in the matter, and all that I think can be claimed.\(^{156}\)

Mercer's achievement is her discovery of the surprisingly early development of this conceptual structure. But can we then conclude that, on grounds of Leibniz's early rising and long-standing core metaphysics, the detailed inquiry into the nature of bodies and the laws of physics contributes nothing of significance to the Leibnizian system? We cannot because of the mutual dependence of physics and metaphysics in Leibniz. We need not solve the large problem of the precise logical relations between physics and metaphysics in order to make essential points against Mercer's claim for the irrelevance of physics in Leibniz.\(^ {157}\) It suffices to ask, is the core metaphysics identified by Mercer,

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\(^{154}\) *LM*, 471.

\(^{155}\) *LM*, 385–6.

\(^{156}\) Leibniz to De Volder, 21 January 1704; G 2:265; L, 535.

which includes notions of substance as the self-active, mind–body and mind–mind parallelism, and preestablished harmony, compatible with just any mechanical physics? Is it compatible with Descartes's physics? Consider briefly Monadology 80, Principles of Nature and Grace 11, and Leibniz's theory of elasticity in Specimen Dynamicum, part II.

Monadology 80 treats in its four sentences of soul, force, and laws of nature. The laws in question are Descartes's law of conservation of quantity of motion (size times speed) and Huygens's law of conservation of vector momentum (mass times velocity) in collisions. According to Leibniz, Descartes's law permits soul (that is, Cartesian mind) to cause bodily motion by changing the direction of motion, thus velocity, of a body (size and speed remaining constant). Specifically, Cartesian mind can affect the curvature of the trajectory of the pineal gland in the brain cavities of humans. How exactly this works is unexplained by Descartes, and Spinoza says it cannot work because there is no quantitative ratio of the volition of unextended mind to the motion of extended matter. Be that as it may, Descartes's famous doctrine of the pineal gland and animal spirits is the scientific (and hypothetical) basis of his account of the mind–body composite in the Sixth Meditation and The Passions of the Soul. For present purposes, the essential point is that psycho–physical (mind–body) parallelism—the series of mental states and the sequence of bodily motions in a human being do not "touch" causally—is not compatible with Descartes's laws of nature. Therefore, a theory of preestablished harmony (between the series of mental states and the sequence of bodily motions) is ruled out of Descartes's philosophy. Conversely, Leibniz's theory of preestablished harmony requires a physics that entails psycho–physical parallelism, that is, soul or mind cannot affect in any way the motion of bodies and vice versa. In the context of Leibniz's reductionist mechanics, the conservation of vector momentum is necessary in order to meet this requirement. This is the point of Monadology 80, also discussed in Theodicy 59–61

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158 G 6:620–1; AG, 223.
159 See also Theodicy, 60–1; G 6:135–6; H, 156.
and 345–6. Clearly, if mind–body parallelism and preestablished harmony are elements of Leibniz’s core metaphysics, as Mercer maintains, then physics is centrally implicated in the completion of that metaphysics.

We should note, in defense of Mercer’s early dating, that the Huygens collision laws were known to Leibniz by 1670. In general, however, as *Principles of Nature and Grace* 11 (not to mention the more technical *Specimen Dynamicum*) makes clear, not only the conservation of vector momentum but also, and especially, the conservation of living force are necessary to the formation of the Leibnizian system. Now Huygens’s collision laws include the conservation of living force (the constancy of the sums of masses times the square of speeds of the colliding bodies), but Leibniz did not derive his own, more general theory of living force until later, upon combining Galileo’s description of free fall and pendulum motion with the principle of quantitative cause–effect equivalence. This is, of course, a main topic of *Specimen Dynamicum* I.

Finally, in *Specimen Dynamicum* II, we get Leibniz’s theory of universal elasticity (no body is perfectly rigid). The attendant analysis of collisions in the center-of-mass frame leads to Leibniz’s exclamation that

> every passion of a body is of its own accord, that is, arises from an internal force, even if it is on the occasion of something external [so that it suffices] for us to derive the passion in the one from its own action, and we do not need any influx of the one into the other.

In his *Primary Truths* of 1689–90, paragraph 12, Leibniz says that this result of physics illustrates the metaphysical doctrine that there can be no real influence between created substances. The loose term “illustrate” does not make clear exactly how this piece of collision dynamics governing corpuscular masses, which are merely aggregates and not true substances, is related to the metaphysics governing sim-

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164 SD II, 5; GM 6:251; AG, 134–5. Leibniz may be referring to the fact that in an elastic collision (in current terminology) and in the center-of-mass frame, each body exits the collision with the same kinetic energy it had initially.
165 C, 521; AG, 33. See also NS, 18; G 4:486; AG, 145.
ple substances ("the monads have no windows"). In spite of this obscurity, it is safe to say that the physical account of elasticity is related in a significant way to the metaphysical no-real-influence doctrine in Leibniz.

In conclusion, Leibniz’s Metaphysics contains an immense amount of work on the early and previously unexamined origins of the Leibnizian system. Mercer has persuasively shown the surprisingly early (1668–72) birth of abiding motivations, commitments, and ideas in Leibniz. But the completion of the system depends in an essential way on later developments in Leibniz’s understanding of physics. Leibniz without physics is not really Leibniz. (And Leibniz’s metaphysics of substance is not really Aristotelian.)

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M, 7; G 6:607; AG, 214.