

one is willing to grant to mathematics a physical (or mechanical) subject matter, or even physical (or mechanical) axioms. For example, Bacon appears to take mathematics to include a theory of physical measuring devices (Jalobeanu, 55–60). Hobbes takes the objects of geometry to be bodies (Garber, 152). Newton regards geometry as relying on mechanics for the construction of its objects, resulting in a broader subject matter for geometry than Descartes would have allowed (Smeenk, 312). One may begin to wonder whether what is going on is a mathematization of nature or a physicalization of mathematics (see Smeenk, 314). Of course, both descriptions may be correct. A corollary of the considerations in this paragraph is that it is not always possible to take an early modern natural philosopher's claims to be mathematizing nature at face value, because that natural philosopher may have a conception of mathematics quite at variance with contemporary conceptions (see Garber, 153).

I will say by way of critical appraisal that there is a bit of a mismatch between the volume editors' very general historiographical goals and the much more targeted contributions of the individual authors. Those hoping for investigations of how one might best write the history of seventeenth-century science, or even for general discussions of the appropriate role a mathematization of nature should play in such a history, will come away largely disappointed. Partly as a consequence of this mismatch, many readers will not have a compelling reason to read the entire collection and will instead wish to focus on the chapters and figures that interest them.

Nonetheless, the quality of the papers in the collection is generally excellent, and the introduction helpfully sets up the larger historiographical issues for those who wish to pursue them. For readers who are interested in the history of science or philosophy, and especially those interested in the figures treated in the individual chapters, this anthology is well worth the effort.

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Charles T. Wolfe. *Materialism: A Historico-Philosophical Introduction*. Dordrecht: Springer, 2016. Pp. ix+134. \$54.99 (paper).

Materialism affirms that all that is, is ultimately material—including our minds. This may be a simple-seeming assertion for a good many of us moderns, but in fact it is a loaded affirmation, endowed with a long, complex history. Especially

at a time when the neurosciences have taken over a large portion of the questions asked within philosophy about the status of the human mind, there is a strong need for a historically, historiographically, and philosophically informed examination of the materialism that inevitably underlies the study of the mind by way of the study of the brain. This is exactly what Charles T. Wolfe provides, via a series of articles that partake in the history and philosophy of science, political theology, and philosophy, revised and brought together into this slim but tightly argued volume, and that constitute a coherent whole. At once sensitive to the issues inherent in the “hard problem” of consciousness, and immensely versed in the early modern and modern texts and arguments underlying the debates around materialism and its discontents, Wolfe constructs a historical epistemology that is of much help in clarifying how we should think about what the mind sciences do today and why the past is so crucial to understanding where we are—and where we might be heading.

Aware, in his words, of “the impossibility of a linear and/or cumulative ‘tradition’ or ‘history’ of materialism,” Wolfe has organized the chapters along conceptual as well as chronological lines, with Diderot and La Mettrie as pivotal historical figures in a debate that took on an ethical dimension insofar as materialism was associated with political liberalism and even libertinism (95). Materialism, earlier encapsulated in Hobbes’s “that which is not body is no part of the universe,” could thus be a counterestablishment stance of a political nature, as well as the motor and condition for the development of modern science—twin aspects of a concept that aimed at freeing both the social world and our understanding of what made it up from the strictures of political theology (44). Contemporary questions regarding the explanatory scope of naturalism are continuous with this double function of materialism. Wolfe shows how and why the scientific study of matter still requires today, as it did already in Aristotle’s day, a metaphysics of matter—indeed, that the very deployment of empirical investigation as a heuristics supposes a metaphysics.

The opening chapter on Aristotle thus serves as an intellectual provocation to rethink how his hylomorphism—matter in relation to form, change, and chance—serves a methodological and explanatory purpose. For Aristotle, Wolfe reminds us, nature “is not the way it is because it *became* that way; rather, it *becomes* so because it *is* so” (28). There is no room for random chance here—and this is why Aristotle’s biologism is far removed from the evolutionarily open-ended, ultimately Darwinian model that we associate with modern biology. Wolfe shows how Aristotle developed his metaphysics in contrast to “Empedocles’s vision of a chaotic cosmology of perpetually reconfigured parts” (28). For Aristotle, “chance and accident cannot explain the presence of a properly physiological ‘for the sake of.’ Not only do various ‘events’ or ‘processes’ in Na-

ture illustrate the presence of final causality; so does the constitution of a living organism,” organized into the form from which matter derives—soul being the form of the matter that is body. The final cause of matter is what enables us to account for its very existence. Matter, for Aristotle, is intrinsically teleological.

Aristotle’s teleology had a long afterlife until the so-called Scientific Revolution, and that is why it is important to begin with him: modern materialism, specifically the forging of a new conception of matter in early modernity, supposed the upending of Aristotelian teleology and the elaboration of theories that would accommodate the centrality of chance in the formation of life, taking their cue in large part from Lucretius and Epicureanism. And so there is much throughout the book that partakes of the philosophy of science—on determinism in a world of perpetual change, on the structural need for reductionism, and on how materialism relates to (reductive) physicalism. Wolfe writes about what he calls “the metaphysics of transformism,” that is, the nature and significance of material change, and the question of whether “Nature and its chance occurrences exhaustively explain the nature of reality,” as determinists would have it (36). Diderot, Wolfe reminds us, was close to Empedocles in accepting the unpredictability of “a universe of chance and ceaseless combination of organic parts”—a far cry from Aristotelian order—as well as a Lucretian determinist for whom the universe consisted of atoms in motion. For Diderot, the world—Wolfe quotes from Diderot’s unpublished *Elements de physiologie*—was “a giant gambling-den in which I’ve spent my sixty-odd years with the dice-cup in hand, *tesseras agitans*,” and it did not reduce “to predictable, mechanical laws” (39–40). Yet this did not mean there was no such thing as free will either but simply that we did not “know the fundamental laws of nature” of our actions (40). In other words, one could be a reductionist without being a full-blown determinist. Wolfe calls this position that of “*embodied* determinism,” which is “not a Laplacean vision in which the universe is composed of basic particles which could then be mapped out exhaustively in a mathematical form, but instead, a biologically and psychologically complex account of what it is to be an embodied agent, acting in the midst of a variety of causal chains, some fully internal, some external—like Hobbes’s ‘endeavours’ or La Mettrie’s vision of our state of desire as uneasiness as like ‘a bird on the branch, always ready to take flight’” (39).

It remains difficult today to reconcile materialist reductionism in biology with an account of embodied mind that takes on board the full phenomenology of subjective experience. This “hard problem” of consciousness could be understood as a rearguard resistance against the Weberian “disenchantment” that the materialist stance has historically been perceived to unleash—and this is where the ethical dimension of the story of materialism comes in. This is also

why Wolfe's book is so useful, since it traces the connections between the early modern fears of scandalous social disorder (incarnated in de Sade, for instance), political upheaval, and religious crises associated with materialism, on the one hand, and contemporary anxieties regarding the bounds of scientific accounts of human nature, on the other. Wolfe invites us to pinpoint continuities by adding historiographic heft to cutting-edge debates around conceptual entanglements whose historical roots are usually absent. "In our time," he writes, "we need to understand the brain in order to understand how we think, feel, perceive and remember the world." But this "undeniable interplay between mental and biological life should not, however, force us to deny that mental life might constitute an autonomous level of explanation" (103).

Philosophy, in other words, is all the more necessary today as questions constantly arise regarding the status of scientific investigations of mind-as-brain, indeed, regarding the very nature of the identity of mind and brain. Wolfe devotes a chapter to a detailed analysis of the so-called identity theory developed from the 1950s in Australia by U. T. Place, J. J. C. Smart, and D. A. Armstrong and that posited a merely "contingent relation between mind and brain." It then gave way to functionalism, which regards "mental life as a set of functions or patterns that are contingently implemented in the human brain" and could as well be implemented on a computer (92). Computational functionalism, simply put, kicks the biology out of materialism—as if, in the apt words of Siri Hustvedt, it were of no matter that "flesh-and-blood human beings are wet, not dry creatures." "Computational theory of mind," Hustvedt writes, "with its concept neurons and its notion of the 'mental' as an information-processing machine that may be considered independently of brain function, mechanizes and 'dries' the mind into comprehensible algorithms" ("The Delusions of Certainty," in *A Woman Looking at Men Looking at Women* [New York: Simon & Schuster, 2016], 283).

Yet Wolfe does not want to replace the identity theory or its functionalist heirs with what he views, using a phrase of Gilles Deleuze, as "the mysticism of the flesh" favored by Merleau-Ponty and his followers (117). He does not fear reductionism, such as it was analyzed by the identity theorists, because "the basic program of the original mechanical philosophy of the seventeenth century rested on the notion that natural phenomena are the result of interactions between material particles governed by those laws treated in the science of mechanics" and because it can take a variety of forms (92–93). He cites La Mettrie's dictum that "s/he who wishes to know the properties of the soul must first search for those which manifest themselves in the body," an entreaty, as Wolfe points out, "to start with the body" rather than a denial of the soul's existence. A central concept in Wolfe's historiographic work here—in effect, a history of

the Spinozist “naturalization of the soul” (81)—is what he calls “materialist embodiment,” with which, in his words, he aims “to correct some misconceptions about the poverty of the materialist outlook on embodied, affective, fleshly, sensing agents” (43). These misconceptions view materialism as “an outgrowth of mechanism,” caricaturing La Mettrie’s “man-machine” as “the Cartesian *bête-machine* extended to humans” (45) and resulting ultimately in cybernetics. But this, for Wolfe, is in fact “an atomistic, reductive, depersonalized way of relating to our bodies, to the fact of our embodiment.” It undergirds the association of mechanism with a loss of value or meaning and the reduction of materialism to mechanism. And it ignores the distinctions within Epicureanism that include a “fully substantialist view of the soul in material terms, and a reductionist view which makes soul, if it exists at all, a functional property of a particular material arrangement” (80). Wolfe defines embodiment in contrast to “traditional computational approaches,” presenting “our cerebral life as necessarily occurring within a body, understood both as a dynamic system and as something fundamentally my own in the sense of Merleau-Ponty’s *corps propre*. The emphasis here is usually on how an embodied agent inhabits the world, not as one body amongst others . . . but as subject in her own environment” (46).

Although he does not name them, this is an approach shared by a number of so-called enactive philosophers and cognitive scientists today, the likes of Dan Zahavi, Shaun Gallagher, and Alva Noe, who seek to escape the problems posed by a stark, ultimately dualist notion of the mind as embedded somehow within a disembodied brain, by emphasizing how our brains participate in our bodies, which in turn participate in the world. In a chapter around the phenomenon of phantom limbs and the notion of embodiment it supposes—on a continuum with materialism—Wolfe refers to the philosopher Andy Clark and to his notion of “scaffolding,” according to which we are constituted of brain-body-world interactions and wholly embedded within our environment. As Wolfe writes, “If we demystify or deflate some concepts of self and subjectivity by relating such concepts to the reality of the brain . . . , we shouldn’t then turn the brain itself into a mysterious substance which explains everything, some sort of ‘Wonder Tissue.’ . . . If mind and body belong together, as do body and brain, so do brain and *world*” (118). The revision of the history of materialism thus returns us to our present: “No living being,” Alva Noe writes, “is merely a mechanism, even though every biological system can be viewed as merely physical and so, in some suitable sense, as merely mechanical” (*Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness* [New York: Simon & Schuster, 2010], 39). Enactivism, which corresponds also to new neuroscientific approaches to the brain as significantly embodied within the body and embedded within the environment, is histori-

cally continuous with the “vital materialism” Wolfe wants to emphasize. This vital materialism differs from a mechanistic understanding of nature “because of its more fluid, passionate understanding of bodily function, or also its hedonism.”

Wolfe shows well how the historical narrative that for a long time emphasized a contrast between vitalism and mechanism needs to be upended, insofar as it reflects a misguided understanding of reductionism—of, say, Diderot’s “wherever I read soul I replace it with man or animal.” He provides “further reflection on the different relations between mechanistic *ontology* (really, ontologies) and mechanistic *analogies*” (48), through a richly textured genealogy that reminds us how constant is the human mind at work upon its own nature and how much contemporary neuroscience can be enriched by the best thinkers of early modernity.

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Delphine Antoine-Mahut and Stephen Gaukroger, eds. *Descartes' "Treatise on Man" and Its Reception*. Dordrecht: Springer, 2016. Pp. vi+304. \$109.00 (cloth); \$79.99 (e-book).

Treatise on Man, or *L'homme*, is one of Descartes's most challenging texts. The work appeared posthumously first in 1662 in a Latin translation by Florentius Schuyf; it was revised in 1664, and then in that same year it appeared in an edition in the original French by Claude Clerselier with extensive comments by the physician and philosopher Louis de La Forge. Despite Clerselier's claim that his edition was based on a reliable autograph, establishing a definitive text is proving problematic. Equally problematic is the link with *The World*, the aborted treatise to which *L'homme* was meant to be a sequel, and other texts discussing the human body. The eighteen contributions included in this volume are grouped in different sections focusing on editions and translations of the work, its early reception, its relations to early modern anthropology, and its current role in psychology and neuroscience and in the recent historiography.

Aspects of the introductory contribution by Delphine Antoine-Mahut on the story of *L'homme* and Stephen Gaukroger's brief essay “*L'homme* in English”—placed in the section on editions and translations of the Cartesian text—can