

# The embodied Descartes: Contemporary readings of *L'Homme*

Barnaby R. Hutchins (Department of Philosophy, Bar-Ilan University)<sup>1</sup>

Christoffer Basse Eriksen (Department of Philosophy and History of Ideas, Aarhus University)

Charles T. Wolfe (Sarton Centre for the History of Science, Ghent University)

## Abstract

A certain reading of Descartes, which we refer to as ‘the embodied Descartes’, is emerging from recent scholarship on *L'Homme*. This reading complicates our understanding of Descartes’s philosophical project: far from strictly separating human minds from bodies, the embodied Descartes keeps them tightly integrated, while animal bodies behave in ways quite distinct from those of other pieces of extended substance. Here, we identify three categories of embodiment in contemporary readings of Descartes’s physiology: 1) bodily health and function, 2) embodied reflex and memory, and 3) embodied cognition. All present more or less strong versions of the embodied Descartes. Together, they constitute a compelling reading of a Cartesian natural philosophy that, if not expressly antidualist, is an awfully long way from the canonical picture.

## 1. Introduction

The canonical understanding of Descartes portrays him as perhaps the most radical denier of the body in favour of the mind, in the history of philosophy. After all, according to the Second Meditation, “in the strict sense,” each of us is “*only* a thing that thinks.”<sup>2</sup> By emphasising that the mind is essential while the body can be doubted away, Descartes’s cogito appears to make the body disposable. And given that the cogito’s separation of the mind from the body is Descartes’s solution to the epistemological problems of the (bodily) senses, it is no wonder that the mind looks like the proper topic of Cartesian philosophy, while the body looks like little more than a tiresome, forgettable impediment. It is precisely this that allows for celebrated reconstructions of Descartes as conceiving, inter alia, of the mind as simply a “ghost in the machine” (Ryle), the

---

<sup>1</sup> Part of this research was supported by ISF grant 469/13.

<sup>2</sup> AT VII, 27/CSM II, 18 (our emphasis).

machine being the extended body.<sup>3</sup> This position has recently been updated by Hacking, for whom the Cartesian standpoint means positing the body as ‘other’, wholly “an assemblage of replaceable parts.”<sup>4</sup> In that regard, not the *Treatise on Man*—hereafter *L’Homme*—but its summary in the *Discourse* is already something of a counter-argument, since Descartes explicitly warns there, and then, later, in the *Meditations*, that we should not conceive of the mind in the body like a pilot in a ship,<sup>5</sup> thus defusing one giant and persistent phenomenological objection against him in advance.<sup>6</sup>

Nevertheless, on the received view, Descartes is hopelessly naïve in regarding the human body as simply a mechanical automaton hosting a disembodied mind, and by extension, he is often seen in more historical disciplines, but also throughout the humanities, as the classic ‘objectifier of nature’, as in Sawday’s otherwise elegant study of early modern anatomy: “As a machine, the body became objectified; a focus of intense curiosity, but entirely divorced from the world of the speaking and thinking subject.”<sup>7</sup> Sutton nicely observes that here,

[Descartes’s] objectification of the human body is . . . but one symptom of the mechanistic violation of an earlier enchanted world. Where once holistic herbalists and natural magicians embraced analogy and sympathy over representation and intervention, coupling earthy bodily realism with organicist ecologism, the Cartesian birth of modernity enforced divisions of philosophy from biology, science from history, power-mongering manipulators of nature from

---

<sup>3</sup> Ryle, *The Concept of Mind*; Williams, *Descartes*. For a critical discussion of this caricature, see Reiss, “Denying the Body?” A related, and influential caricature of Descartes (at least in the later decades of the twentieth century) was that of Richard Rorty, for whom Descartes committed the “original sin of epistemology,” by introducing the modern idea of representation through clear and distinct ideas, thus installing epistemology at the foreground of early modern philosophy while bracketing of matters such as the relation between the body and soul as “not something for philosophy” (Rorty, *Philosophy and the mirror of nature*, 60–61; see discussion in Sutton, *Philosophy and Memory Traces*, 50–55 and in Introduction to Brown, *Descartes and the Passionate Mind*).

<sup>4</sup> Hacking, “The Cartesian Body,” 13.

<sup>5</sup> “It is not sufficient for [the rational soul] to be lodged in the human body like a helmsman in his ship . . . but that it must be more closely joined and united with the body in order to . . . constitute a real human being” (AT VI 59; CSM I 141); cf. Geir Kirkebøen, “Descartes’ Embodied Psychology: Descartes’ or Damasio’s Error?,” 181.

<sup>6</sup> For a reconstruction of an ‘embodied Descartes’ based not on *L’Homme* but (primarily) on the Sixth Meditation, see Brown, *Descartes and the Passionate Mind*.

<sup>7</sup> Sawday, *The Body Emblazoned*, 29, cf. also 22, 37. For a critique of this narrative, see Snider, “Cartesian Bodies.”

the dead ecology which they exploit, and of active rational male observers from passive fragmented female bodies.<sup>8</sup>

But a spate of recent literature has started to take the Cartesian body seriously as a subject in its own right, reversing the trend that privileges the foundationalist metaphysics found notably in the *Meditations*. Recall that in a prefatory letter to the *Passions of the Soul*, Descartes wrote, “My intention was to explain the passions only as a natural philosopher [*physicien*], and not as a rhetorician or even as a moral philosopher.”<sup>9</sup> As James has put it, “[b]y treating the *Meditations on First Philosophy* as Descartes’ philosophical testament, scholars have created a one-sided interpretation of Cartesianism in which the division between body and soul is overemphasized and sometimes misunderstood”<sup>10</sup> But for some, James included, *L’Homme* is at least as central to Descartes’s philosophy as the first two Meditations, and the body is at least as indispensable as the mind.

In this chapter, we distinguish four main ways in which the scholarship has reunited Cartesian philosophy with the body: (i) health and function, (ii) memory and reflex, and (iii) embodied cognition.<sup>11</sup> Of those, (iii) applies to bodies united with minds, while (i) and (ii) also apply to Cartesian bodies in themselves, in the absence of minds (whether the body–machines of *L’Homme*, described in isolation from the minds with which God could unite them, or animals and plants which, for Descartes, would always lack minds). The literature has tended to focus on each of these aspects independently: each highlights a certain way in which human and animal (and, largely implicitly, plant) bodies look a little odd, a little different, compared to the rest of the material world. It would also be possible to focus on the passions, which are transversal here as animal passions match points (i) and (ii) while properly human passions belong in addition to point (iii). This chapter is not an exhaustive review of the literature, but points to conceptually coherent components in recent approaches to Descartes’s treatment of bodies, and aims to show how they have built up a picture at odds with the one-sided, mind-privileging view of Descartes’s philosophy. We refer to this picture as ‘the embodied Descartes’—a reading of Cartesian philosophy in which bodies are not understood as alienated bundles of spare parts (*pace* Hacking

---

<sup>8</sup> Sutton, “The Body and the Brain,” 697–698, elaborating on Sutton, *Philosophy and memory traces*, 82f.

<sup>9</sup> AT XI, 326/CSM I, 327.

<sup>10</sup> Susan James, *Passion and Action: The Emotions in Seventeenth-Century Philosophy*, 106.

<sup>11</sup> ‘Life’ does not rate its own independent category here, notably because Descartes adopts such a deflationary attitude towards it. Further, our analysis is different from more standard treatments such as Duchesneau’s (*Modèles du vivant*), which discusses Descartes’ approach to organic life, while we are concerned with a revision of the historiographic and philosophical categories with which Descartes has been interpreted.

and many others) but are truly inhabited; and in which they are not simply lumps of extended substance but have their own peculiar properties that do not seem to be shared with the rest of the material world.

In the following, we first address the scholarship's treatment of the machine-bodies of *L'Homme* considered in isolation from any mind or soul. Then, we turn to the subject of the missing section of *L'Homme*: the soul and its union with the body. In the absence of this section from the extant text, the literature has looked to its recapitulation in the *Meditations* and *Treatise on the Passions of the Soul*, and has found an account of truly embodied cognition, in which the mind, while in principle ontologically distinct and separable from the body, is utterly bound up in their union.

## 2. "Living" bodies

Before addressing the ways in which the literature has picked out the peculiarities of human and animal bodies, it is worth saying a little about what kind of bodies we are dealing with. There are, of course, two major senses of 'body' in Descartes's philosophy. There are human and animal (and perhaps even automaton<sup>12</sup>) bodies—bodies, that is, with some autonomy; bodies that we might well call 'living'. These are the bodies we are concerned with here. And then there are bodies in general—that is, material bodies, or, rather, bits of extended substance. The latter have enjoyed a somewhat longer period of attention, reflecting an emphasis on Descartes as natural philosopher.<sup>13</sup>

For Descartes, 'living' bodies<sup>14</sup> are a special class of material bodies. He is quite clear that all physiology is purely material, and thus that a human or animal (or plant) body is nothing but a

---

<sup>12</sup> The human bodies that are the subject of *L'Homme* are ostensibly 'just' automata that God is capable of creating. Given that, automata (or, at least, certain kinds of automata) clearly belong in the same category as human bodies. In addition, it seems unlikely that Descartes has any principled means of distinguishing between animal bodies and automata (see Hutchins, "Descartes and the Dissolution of Life").

<sup>13</sup> Thus prominent scholars such as Gaukroger (*Descartes' System of Natural Philosophy*) and Garber (*Descartes Embodied*) have called attention to the treatment of material bodies in Descartes' natural philosophy, stressing that Descartes's work should be understood as that of a natural philosopher (see also the essays collected in the volume *Descartes' Natural Philosophy*).

<sup>14</sup> Exactly what life consists in for Descartes, or if, indeed, it consists in anything at all, is an ongoing problem in the literature; see most recently, Detlefsen, "Descartes on the Theory of Life" and Hutchins, "Descartes and the Dissolution of Life." Here, we use the term 'living' only to provide a convenient means of distinguishing between human, animal, and plant bodies and other bits of extended substance.

piece of matter, albeit a mechanically rather complex one. In the opening of *L'Homme*, Descartes describes the body as “just a statue or a machine made of earth.”<sup>15</sup> In that particular case, the body he describes is an analogue of the human body; like *Le Monde*, *L'Homme* is built around the rhetorical conceit of a thought experiment in which God creates a mechanical world, and (in the latter) mechanical humans to populate it. His aim is to show that a mechanical, material human body is metaphysically possible—that it is the kind of thing that God could create—without explicitly committing himself to the position that our own bodies really are purely material and mechanical.

That machine made of earth, he goes on to write, contains “inside it all the parts needed to make it walk, eat, breathe, and imitate all those functions we have which can be imagined to proceed from matter and to depend solely on the disposition of our organs.”<sup>16</sup> The prevailing conception of a living body at the time was an Aristotelian one, in which the body's operations depended on immaterial souls. The hypothetical machine of *L'Homme*, though, does everything a human can, and yet it is nothing but matter. Later (by the time of writing the *Meditations*, *Principles of Philosophy*, *Treatise on the Passions of the Soul*, and *Description of the Human Body*), Descartes drops the pretence that the mechanical body is merely an analogue, and he explicitly upholds that actual human and animal bodies really are nothing but extended substance.

So, for Descartes, living bodies are pieces of matter, just like rocks, or bits of metal, or any other body in general. But, living bodies are not *just* like any other body. As Sutton puts it, “[t]he earthen machines described in *L'Homme* are importantly unlike the clocks and simple automata with which they are conceptually analogous, for their capacities far outstrip those we usually imagine or ascribe to them.”<sup>17</sup> Yes, we are machines made of earth, like statues, but “these ‘statues’ are animated, these machines dream.”<sup>18</sup> Some object that if animals are just machines, how can they possess memory? And the answer is that there is a vast conceptual space between the automatic and the non-physical,<sup>19</sup> as we discuss in section 3.2. Minimally, “The difference between an animal as traditionally conceived and a Cartesian automaton is not a difference

---

<sup>15</sup> AT X, 120/TM, 99. As Gaukroger points out in his translation (TM, 99, n. 3), ‘earth’ here refers to Descartes's third element, rather than to macro-scale dirt, mud, clay, etc.

<sup>16</sup> TM 99.

<sup>17</sup> Sutton, “Body and Brain,” 700.

<sup>18</sup> Sutton, *Philosophy and memory traces*, 56. For more on the fruitfulness of the body-machine analogy see Wolfe, “Le mécanique face au vivant.”

<sup>19</sup> Sutton, *Philosophy and memory traces*, 81, critiquing Marjorie Grene's claims in her study, *Descartes*, 47-48.

between soft, fleshy organic entities and clockwork robots, but a conceptual difference between how physiological processes are to be modelled.”<sup>20</sup>

We aim in this chapter to examine how Descartes' recognition of how living bodies differ from 'mere' bodies yields a (cumulatively developed) interpretation of the 'embodied Descartes'. In the case of humans, they are bodies united with minds; the union, it has been argued in the literature, makes a significant difference to both the mind and the body. Human, cognition is, it turns out, affected by the body. And unlike minds in themselves, which cannot be divided (and so cannot be destroyed or harmed), unions of mind with bodies are capable of health and disease. They also have sensations. But such properties are not (or at least seem not to be) restricted to bodies united with minds. Animal bodies, and human bodies considered in isolation, present us with properties peculiar to them and absent from the rest of the material world—properties that make them worthy of separate study. Animals seem just as capable of health and disease as humans, they appear to be functional, and they exhibit the bodily aspects of both memory and a certain kind of sensation.

### 3. Living bodies in isolation

Embodiment discussion in the humanities (including cultural studies, gender studies, and history) tends to focus on 'my own sense' of my body, and, equally, of its historicity and constructed status. It does not focus specifically on embodied cognition, as in the field of that name within cognitive science. Yet in the Cartesian context, talk of embodiment does mean embodied cognition, albeit in a very broad sense, i.e. that thought, specifically, is not separate from body, and conversely, that many sensorimotor functions do not involve thought, for Descartes. Strictly speaking, the bodily machines of *L'Homme* are incapable of cognition in themselves. Thoughts are modifications of thinking substance (i.e. soul or mind), and thus bodies (i.e. extended substances) cannot, by definition, think. So, whatever those machines do themselves, without the input of a soul, cannot be cognitive. In addition, given that Descartes is consistently explicit that animals are nothing but machines, and never have souls, this also means that there is no such thing as animal cognition for Descartes. And yet, the machines of *L'Homme* are capable of “movements [. . .] just like the movements in us that testify to malice, timidity, inconstancy, tardiness, and ruthlessness”<sup>21</sup> (amongst many other things). Cartesian bodies, by themselves, are also perfectly capable of self-preservation, raising their arms to break a fall, with

---

<sup>20</sup> Gaukroger, “The resources of a mechanist physiology and the problem of goal-directed processes,” 386-387.

<sup>21</sup> AT XI, 167/TM 141.

no intervention from the mind; and soulless sheep can identify a wolf and flee from it.<sup>22</sup> While all these activities are non-cognitive for Descartes, they bear more of a resemblance to the behaviour of humans than to that of water, or salt crystals, or magnets. And this, after all, is Descartes's entire point in *L'Homme*: such complex, human-like behaviour can be produced by purely material bodies, in the total absence of any soul.

While no more immaterial than any other piece of extended substance, then, Cartesian living bodies behave in ways that other bits of matter cannot—ways that others might want to identify with cognitively-influenced behaviour. The scholarship has picked out a range of such ways of behaving. We categorise them here under two main categories: living bodies are healthy and functional (or unhealthy and dysfunctional)<sup>23</sup>, and they have memory and reflexes.

### 3.1 Health and function

Bodies seem to present Descartes with a significant problem of teleology. A large part of his opposition to Aristotelianism is his rejection of teleology in the natural world. The natural world is the world of extended substance, and teleology is the preserve of minds. Because Descartes takes extended substance to be incapable of self-direction, and because he takes whatever intentions God might have had in creating the world to be utterly inscrutable to us,<sup>24</sup> ends are off-limits to Cartesian natural philosophy. And yet, his descriptions of living bodies are full of teleological terms, such as *usus/usage* and *officio/office*, as in *L'Homme*, where he speaks about the “the functions of the waking state,”<sup>25</sup> the “normal bodily function,”<sup>26</sup> and the “functions that I have attributed to this machine,”<sup>27</sup> or when, in a letter to Elisabeth, he speaks of the “office” of the liver,<sup>28</sup> and, in the *Passions*, the “office” of the stomach (which CSM render as “function”).<sup>29</sup>

---

<sup>22</sup> Fourth Replies (AT VI, 230/CSM II, 161). Cf. Rorty, “Descartes on thinking with the body,” 377–379.

<sup>23</sup> Health and function might appear to be an outlying category here, in that it seems less obviously pseudo-cognitive than, say, memory. But health and function are goal-directed processes, and, for Descartes, only minds can be goal-directed.

<sup>24</sup> See Meditation Four (AT VII, 55/CSM II, 39) and Fifth Replies (AT VII, 374–375/CSM I, 258).

<sup>25</sup> AT X, 197/TM 165.

<sup>26</sup> AT X, 144/TM 119.

<sup>27</sup> AT X, 201/TM 169. See also *Discourse*, AT VI, 53/CSM I, 138 (the function of respiration).

<sup>28</sup> Descartes to Elisabeth, May 1646, AT IV, 407.



This apparent teleology is a problem for purely material Cartesian bodies. The machines of *L'Homme*, considered in isolation from any soul, are precisely the kinds of things that cannot have intrinsic ends. But, as it turns out, living bodies are very difficult to explain (at least for Descartes), without recourse to teleology. Most obviously, it is very difficult for him to discuss health and illness without involving ends in the matter—the resources of extended substances seem to allow little prospect for explaining just what it is that makes a living body either healthy or ill. And health was an important part of Descartes's own understanding of his natural-philosophical project. In a letter to the Marquess of Newcastle from October 1645, he wrote that “the preservation of health has always been the principal end of my studies,”<sup>30</sup> and medicine takes up a prominent place in the tree of knowledge described in the preface to the French edition of the *Principles of Philosophy*, as one of three principal branches of philosophy. This commitment to medicine makes it problematic that Descartes has such difficulty establishing a way to distinguish the normal, or healthy, from the pathological, or unhealthy. As Lisa Shapiro puts it, “[t]he problem stems from the conflict of two principles: first, the natural world is to be conceived non-teleologically; and second, the norms that constitute our concept of health are essentially teleological.”<sup>31</sup>

Some scholars have identified this problem in Descartes's medical thought without attempting to save him from his own apparent inconsistency<sup>32</sup>, whereas others have tried to give explanations for how Descartes can maintain a concept of health without unsettling his mechanical system of natural philosophy. Here, we will examine three possible solutions, namely intrinsic structure, reciprocal dependency, and projectionism.

Shapiro proposes an account of Cartesian health that attributes a non-teleological form of health to living bodies themselves. The bodies of animals and plants, and the machines in *L'Homme*, she argues, each have a “stable intrinsic structure” which makes that particular machine the particular machine it is, without appealing to any extrinsic purposes (such as those of the body's

---

<sup>29</sup> Passions II.98, AT XI, 402/CSM I, 363. For further discussion of teleological concepts in Descartes, see Simmons, “Sensible Ends” (on sensation), Brown, “Cartesian Functional Analysis” and Distelzweig, “The Uses of *Usus*” (on biology and medicine).

<sup>30</sup> AT IV, 329/CSMK 275.

<sup>31</sup> Shapiro, “Health of the Body-Machine,” 424.

<sup>32</sup> E.g. Distelzweig, “The Uses of *Usus*.” On the charge of inconsistency overall see Sutton, McIlwain et al., “Applying intelligence to the reflexes,” 99n., referring to Grosholz, *Cartesian Method*, Shapin, “Descartes the Doctor,” and Des Chene, *Spirits and Clocks*.



creator).<sup>33</sup> Shapiro characterizes a stable structure as a structure that must be maintained in order for the machine to carry out some consistent kind of work. To use her example—and Descartes's—a clock is characterized by its parts being organized in such a way that it shows the time. The clock maintains that activity as long as it maintains the structure that enables that activity, and there is no need to refer to the intentions of its designer for that to be the case. The same goes for living bodies: the idea here is that health is a structural norm; it is simply the stable persistence of the particular structure that allows the body to continue operating. This notion of a stable structure, Shapiro argues, allows Descartes to speak of health without involving teleology. Or, rather, it would have allowed Descartes to do so, had this been the position he upheld. For Shapiro, stable intrinsic structure is a “way out” of the antinomy of mechanism and teleology, but she shows through textual evidence that it is not the way out that Descartes chooses. Rather, his notion of health is not purely mechanical: according to the Sixth Meditation, it is based on the union of the soul and body.<sup>34</sup>

In a 2012 paper, Brown, like Shapiro, also aims to provide Descartes with an objective, naturalized account of an apparently teleological aspect of living bodies—in this case, function rather than health.<sup>35</sup> Brown focuses on Descartes's attempt to produce a fully mechanical account of embryogenesis.<sup>36</sup> The problem implicit in embryogenesis was how to explain the consistent production of consistently-formed foetuses from formless seed through nothing more than efficient causation between pieces of matter, and thus without recourse to final causes. Brown

---

<sup>33</sup> Shapiro, “Health of the Body-Machine,” 435. In part, Shapiro is responding to Des Chene (*Spirits & Clocks*, 125ff.), who floats the idea of a dispositional unity of the body (in which its unity is given by the arrangement of its parts), but concludes that, for Descartes, living bodies themselves cannot be fully understood without appealing to teleology, and “[e]nds cannot be entirely supplanted by dispositions, even in animals” (ibid., 140). Shapiro argues that stable intrinsic structure circumvents this, although it is not clear that the stability required really is definable without reference to ends. One can also take elements from Des Chene and Shapiro, namely, his idea of a “dispositional unity” in the mechanistically understood body, as a form of emergent unity contained in the parts, and her notion of “structural integrity.” The heart, lungs or liver do not function on the basis of a predetermined end but in accordance with an almost morphogenetically understood law of spatial disposition. In a formula, the mechanical is the functional: a material arrangement of parts (a clock, a bodily organ, a body) is disposed to act in a certain manner. Descartes speaks—to be sure, in strongly spatialist terms—of the “disposition of our organs,” but precisely in order to derive “functions” from them (Descartes, *L'Homme*, AT XI, 120, 202 and *Description du corps humain*, AT XI, 226); cf. Des Chene, *Spirits and Clocks*, 116, 120–121, and Wolfe, “Teleomechanism redux.”

<sup>34</sup> Shapiro, “Health of the Body-Machine,” 437. This “way out” is the projectionist reading discussed below.

<sup>35</sup> Brown, “Cartesian Functional Analysis.”

<sup>36</sup> The account is found in the final section of the *Description of the Human Body*, a late manuscript in which Descartes reworks the explanations of *L'Homme*.

notes that Descartes's account, spurious though it may be, relies on reciprocal dependencies<sup>37</sup> between different parts of the developing foetus in order to avoid teleology: "*nothing intends anything in this process*—but the formation of the brain is necessary for the persistence of the heart and the formation of the heart a necessary precondition for the formation of the brain."<sup>38</sup> In this way, intrinsic function is grounded in interdependence: the heart has a function in embryogenesis and development not because it intends to help produce a foetus or because it has been assigned that function by a designer, but because it depends on other parts of the foetus that also depend on it.

Other scholars have sought to explain the possibility of Descartes's speaking of the health of the living body through a projectionist reading of natural teleology.<sup>39</sup> Human bodies are unique, for Descartes, in that they are united with minds, and since minds are capable of having intrinsic ends, the union can confer teleology upon the human body. On the projectionist reading, when Descartes attributes health and function to animals, and to human bodies considered in isolation from their minds, this is a projection of the human case onto machines similar to that of the human body. In recent papers, Manning has argued that animals and body-machines exist as intermediary substances between ensouled humans and bodies in general.<sup>40</sup> These intermediary substances can be ascribed health by human minds, by comparison with human bodies. In distinction to Shapiro's and Brown's accounts, this does not place health (and function) within the machine itself, but makes it an extrinsic denomination projected from the human case onto the living body. Indeed, on this reading, attempts to objectify health and function invert the situation, by trying to locate human health and function within the machine itself: as Manning puts it, "[t]he health of the machine is parasitic on the health of the human being, not the other way around."<sup>41</sup> In this way, the projectionist reading operates with an anthropology where natural-philosophical explanations are based on the sense that we humans have of our own, living bodies. On this reading, it is the experience of being in a body which is primary for Descartes, and the basis on which he can make physiological arguments about bodies regarded naturalistically or mechanically.

---

<sup>37</sup> Brown restricts her analysis on the account of embryogenesis, but interdependence is also central to the physiology of the developed body. See Hutchins, "Descartes, Corpuscles, and Reductionism."

<sup>38</sup> Brown, "Cartesian Functional Analysis," 86.

<sup>39</sup> See Des Chene, "Life and Health"; Manning, "Descartes' Healthy Machines," "Descartes' Metaphysical Biology"; Hutchins, *Obscurity and Confusion*, Ch. 6.

<sup>40</sup> Manning, "Descartes' Healthy Machines," "Descartes' Metaphysical Biology."

<sup>41</sup> Manning, "Descartes' Healthy Machines," 261.

Despite its anthropocentrism, the projectionist reading still points to a particularity of living bodies: a body-machine lends itself to the projection of health and function, while a stone or a lump of metal does not. What projectionism might appear to risk, however, is antirealism about health and function in non-ensouled bodies. If health and function are nothing but projection from the human situation—if, that is, they are extrinsic to living bodies themselves—they might start to look like anthropocentric fantasies. In other words, if health and function are not to be found in living bodies themselves, it is not at all clear that we are talking about the body itself when we talk of its health; it is not clear that we are talking about the heart itself when we talk about its function. If Shapiro's and Brown's accounts do not hold, and if Descartes has no means of allowing for intrinsic bodily health and function, there appears to be nothing about those bodies themselves that can constitute their health and function; in which case, isn't the ascription of health and function to bodies simply an illusion? Hutchins has recently suggested that teleology in the natural world might constitute an epistemic gap in Descartes's system—that is, there are some phenomena that cannot be accounted for within Descartes's system, but this does not imply that Descartes takes them to be unreal.<sup>42</sup> On this reading, we are capable of recognizing health and function in living bodies even if we cannot identify a particular material structure in which it consists. Consequently, bodily health and function is more than an anthropocentric fantasy: it is something intrinsic to living bodies, albeit something inexplicable.

### 3.2 Memory and reflex

Descartes's neurophysiology of memory and sensation is a key moment in 'revisionist' reconstructions of his thought, not least given that most discussions of the 'embodied mind', in the wake of Varela et al.'s influential 1991 work, reiterate in yet another form the 'whipping boy' role for Descartes.<sup>43</sup> Consider the now-classic presentation of the situation in Canguilhem's 1955 study of the origins and development of reflex action, which is partly a polemic against Descartes and in favour of Thomas Willis, including the latter's account of animal spirits.<sup>44</sup> In contrast, Sutton does not proceed according to the same somewhat 'Manichean' method of opposition, but seeks to inscribe Cartesian neurophysiology into a more fluid, dynamic narrative, notably in his groundbreaking 1998 book *Philosophy and memory traces*, and subsequent papers. In a complementary vein, Kirkebøen in his detailed 2001 paper on "Descartes' Embodied Psychology," which takes Antonio Damasio's *Descartes' Error* as its foil, supplies a detailed account

---

<sup>42</sup> Hutchins, *Obscurity and Confusion*, Ch. 6.

<sup>43</sup> Namely, Varela, Thompson and Rosch, *The Embodied Mind*. This is further discussed in Roux's "L'ennemi cartésien. Cartésianisme et anti-cartésianisme en philosophie de l'esprit et en sciences cognitives."

<sup>44</sup> Canguilhem, *Formation du concept de réflexe*, 30, 33.

of the complexities of a Cartesian mechanistic psychology and indeed its posterity, via William James, Pavlov and (unintentionally), Müller's law of "specific nervous energy" and Fechner's psychophysics.

How much can a machine do? Differently put, how much can a mechanist physiology achieve? Without challenging substance dualism *per se*, the answer is quite a lot: "although there can be no Cartesian science of the self-conscious mind, there can and must be sciences of memory, imagination, dreaming, and so on."<sup>45</sup> Descartes's neurophysiology of spirits, pores and memory traces is not as easily brushed aside as one might think, given that it seems to present a kind of archaic survival of items that have no place in a mechanistic ontology, such as animal spirits. While some more positivist historians of science have found the presence of animal spirits in Descartes's neurophysiology to be something of an embarrassment, or at least an inconsistency, Sutton has consistently maintained that it is on the contrary an indicator of the fertility and plasticity of the Cartesian machine model of life and the nervous system, and in addition, a tenet which is consistent with other core components of what we are terming the 'embodied Descartes' here. *L'Homme*, on this reading, gives a detailed account of "animal spirits roaming through the pores and traces of body and brain, which is entirely consistent with his scattered remarks elsewhere, through to *The Passions of the Soul*, on corporeal memory and the dynamics of embodied cognition."<sup>46</sup>

Indeed, as Sutton has insisted, fluid dynamics forms the explicit basis for Descartes's physiology, and moreover, "the picture of a static, rigid body . . . is entirely foreign to Descartes's physiology."<sup>47</sup> An act of remembering is then more about reconstructing "patterns of motion in the animal spirits" than about disembodied representation, in a context of what Sutton refers to as "causal holism"<sup>48</sup>: "Every trace in a brain region affects any episode of processing, so every memory is composite, just as every sensation dangerously carries the perceptual history of the perceiver. This is how 'chimeras and hypogryphs are formed in the imaginations of those who daydream', who neglect the twin direction offered by external objects and by reason."<sup>49</sup> This is

---

<sup>45</sup> Sutton, "Body and brain," 708; Philosophy and memory traces, 75f.; Sutton, McIlwain et al., "Applying intelligence to the reflexes," 84f. (for the point that the treatment of memory in *L'Homme* directly rebuts the caricature of the deterministic, input-output model of the Cartesian automaton).

<sup>46</sup> Sutton, McIlwain et al., "Applying intelligence to the reflexes," 84.

<sup>47</sup> Sutton, "Body and brain," 716.

<sup>48</sup> Sutton, *Philosophy and memory traces*, 55; cf. 58, 61, 86f.

<sup>49</sup> Sutton, McIlwain et al., "Applying intelligence to the reflexes," 85, citing *L'Homme*, AT XI, 185.

where the importance of Descartes's treatment of memory becomes clearer. It is not just that he had a neurophysiology of memory explained in terms of cerebral folds and animal spirits.<sup>50</sup> Rather, it helps bring out the lack of a kind of crude, Pavlovian (stimulus-response) determinism of the Cartesian automaton. Automatic behaviour is not non-deterministic, but it is not a strict linear determinism, because "the corporeal causes act holistically."<sup>51</sup> Contrasting with the idea that all bodily functions are explainable in terms of reflex arcs, Sutton and others highlight Descartes's concerns with flexible, non-hardwired cerebral mechanisms in *L'Homme* (but also in the *Dioptrics* and the *Passions*).

On the Cartesian view, Sutton writes, "there is no reason to accept that hard-wiring or biology, on the one hand, and current stimuli, on the other, must be the sole determinants of machine behavior."<sup>52</sup> In the case of the memory processes of the automaton,

the effects of experience are transmitted over long temporal gaps, and are causally involved in behaviour mediated by complex internal processes. . . To put it another way, memory shows that an automaton's physiology changes over time. Automata with different histories, different 'experiences' marking their brains and bodies, will . . . respond differently, and one automaton will respond differently to the same stimulus at different times, after new experience has modified the pores and folds of its brain.<sup>53</sup>

For the body and the brain to be treated 'just as machines' turns out to mean: treated in a dynamical and detailed way. Rather than reducing neurophysiology and passions to a "linear biophysics of barren matter," Cartesian mechanism leaves quite a lot in, also as regards what we might expect in terms of reductionism: "mechanism did not require the elimination of puzzling

---

<sup>50</sup> For more on animal spirits, see Sutton, *Philosophy and memory traces*, 102f. For a more developmental perspective, see the chapters on Descartes in Emanuela Scribano, *Macchine con la mente* (Roma: Carocci, 2015). Scribano argues that Descartes modified his theory of knowledge and perception over time, in search of greater 'scientific' coherence, particularly in a neurophysiological vein (an emphasis already present in Sutton's 1998 book), but she has a less naturalistic reading of the union than Sutton does. Thanks to Claudia Matteini for discussion of this text.

<sup>51</sup> Sutton, "Body and brain," 709.

<sup>52</sup> *Ibid.*

<sup>53</sup> Sutton, "Body and brain," 709. Sutton notes that Amélie Rorty still divides "informational and maintenance systems" in her otherwise embodied vision of how intertwined "epistemology and physiological homeostasis are" in Descartes' "thinking with the body" (Sutton, *Philosophy and memory traces*, 92). For Rorty, "The criteria for identifying a medically sound body might sometimes vary, depending on whether the body is considered primarily and solely as a homeostatic machine, or as a homeostatic machine designed to serve an epistemically sound information system" ("Descartes on thinking with the body," 385). Sutton notes that Rorty does not address the way that animal spirits, themselves information-bearing entities, are generated by non-cognitive bodily processes.

and complex natural phenomena. Indeed, Descartes accepts some of the stranger facts of the organicist world: he rejects not the baffling phenomena (the bleeding of wounds on the approach of the murderer, the weapon salve, sympathies, the maternal imagination imprinting on the foetus), but only certain candidate explanations of these phenomena which attribute thought or free will to corpuscles.”<sup>54</sup>

If we take this revised picture of a Cartesian neurophysiology together with Descartes’s focus on the passions, we can imagine with Timothy Reiss that “Descartes’s final achievement would have been to bring back the particular body with its specific passions produced by particular perceptions and controlled by a reason and a will, specific but yet common to all humanity” (“Denying the Body?”, 603). But for that, we need to discuss Cartesian psychosomatics, as we do below in section 4.4. Embodied cognition

In the available text of *L’Homme*, whenever Descartes refers to the relation between the body-machine and the soul, he seems to treat the latter as simply superadded to the former. At one point, after having compared the body to the intricate fountains at Saint-Germain-en-Laye<sup>55</sup>, he writes,

when a rational soul is present in this machine it will have its principal seat in the brain and will reside there like the fountaineer, who must be stationed at the tanks to which the fountain’s pipes return if he wants to initiate, impede, or in some way alter their movements.<sup>56</sup>

As Gaukroger notes, this “comes dangerously close to the idea of the mind as being like a pilot guiding a ship”<sup>57</sup>—that is, from this passage, as well as from the few other references to the soul in *L’Homme* itself, it is easy to get the impression that the Cartesian mind really is divorced from its body. But, it is not incidental that what we have of *L’Homme* is not the whole story: in the summary of the treatise he provides in the *Discourse*, Descartes describes a later (now missing, and possibly never-written) section of the text, in which he

showed how it is not sufficient for [the soul] to be lodged in the human body like a helmsman in his ship, except perhaps to move its limbs, but that it must be more closely joined and united

---

<sup>54</sup> Sutton, McIlwain et al., “Applying intelligence to the reflexes,” 99n; Sutton, “Body and Brain,” 701-702, referring also to *L’Homme* AT XI, 177.

<sup>55</sup> Descartes specifies only “grottoes and fountains in the royal gardens” (AT XI, 130/TM, 107), but the description fits those at Saint-Germain. See Gaukroger, *Descartes*, 63–64. On Descartes’s use of the fountain analogy, see Des Chene, *Spirits & Clocks*, Ch. 6; Sutton, *Philosophy and Memory Traces*, 94f.

<sup>56</sup> AT XI, 131–132/TM 107.

<sup>57</sup> TM 107, n. 19.

with the body in order to have, besides this power of movement, feelings and appetites like ours and so constitute a real man.<sup>58</sup>

Evidently, Descartes had intended to nuance his fountaineer analogy, to show that the fountaineer of our body is not merely stationed at the tanks, but is actually within the pipes and fluids themselves—the true fountaineer is, indeed, not separate from but embodied within the fountain. In order to understand how the body-machine is united with its soul, then, the existing text of *L'Homme* is somewhat lacking; the scholarship has had to look elsewhere—principally, to the *Meditations* and the *Treatise on the Passions of the Soul*—to reconstitute the full story.

In a paper expressly targeted against Damasio's (admittedly rhetorical) use of the 'Descartes as father of the disembodied mind' trope, Kirkeboen gives a broad overview, in which he wants to show that, from the *Rules* to the *Passions*, Descartes consistently adopts an embodied mind position. Descartes's "explanations of psychological phenomena," Kirkeboen argues, "are *all* embodied."<sup>59</sup> Rorty emphasizes a similar point in her 1992 paper, "Thinking with the Body." Addressing the issue of whether it matters for the mind how the body is structured, she argues that the Cartesian body actively and necessarily contributes to thought in general, and to thought pertaining to kinematics, the biological sciences, and morals, especially.<sup>60</sup> It is the influence of the body, and its union with the mind, that drives us to seek those things we take to be good for us (i.e. healthy), and to avoid harmful things—in both our practical activities and cognitive processes.<sup>61</sup>

This underlying concern for the health of the union is a recurring element in the scholarship on Cartesian embodied cognition. In an influential 2001 paper, Simmons shows how the mind's experience of sensation is inextricably tied up with the health of the union:

sensation occurs only in a mind that is united to a body; because it is essential to such a mind that its place of residence be preserved, it needs to be alerted to any damage to the body so that it can initiate body-preserving behavior . . . and thereby aid in the preservation of the body and so of the mind-body union. The biological function of the senses . . . clearly sets the backdrop

---

<sup>58</sup> AT VI, 59/CSM I, 141. Descartes famously repeats the point in the Sixth Meditation (AT VII, 81/CSM I, 56).

<sup>59</sup> Kirkeboen, "Descartes' Embodied Psychology," 174 (our emphasis). Kirkeboen also provides a wealth of details concerning Descartes's influence on experimental psychology, in figures such as Pavlov, Sherrington and McCulloch (179, 188); Hatfield, "Descartes' Machine Psychology," also notes Descartes' influence on William James and Pavlov.

<sup>60</sup> Rorty, "Descartes on thinking with the body," 372.

<sup>61</sup> *Ibid.*



for Descartes' treatment of the production of sensations throughout his career in natural philosophy.<sup>62</sup>

Similarly, drawing partly on the work of Grene, Rorty argues that, for example, the judgement that one piece of matter has moved from the vicinity of one set of bodies to that of another,<sup>63</sup> cannot be established by pure thought alone, but needs sensory observation and experiment to be determined.<sup>64</sup> So, when it comes to general ideas, such as that of extension, they are found through intellectual analysis, but when it comes to particular ideas about things in motion, i.e. the behaviour of natural phenomena, they come from bodily-sourced perceptual ideas<sup>65</sup>, which, if Simmons is correct, all (more or less implicitly) must refer to the mind's union with its body. This means that, in contrast to the picture of Descartes's philosophy in which all knowledge picture of Descartes<sup>66</sup> is due to pure cognition that is fundamentally divorced from the body, it turns out that all our empirical knowledge is bound up with the health of our bodies.

And it is this embodiment at the heart of sensation that prevents our being fountaineers stationed at the water tanks of our own bodies—as Simmons puts it, “[t]hese sensations, [Descartes] insists, cannot be made sense of on the pilot-in-a-ship or, equivalently, the angel-in-a-machine [or fountaineer-in-a-fountain] model. Why not? Because sensations are not purely intellectual thoughts of the sort a pure intellect has.”<sup>67</sup> The non-embodied fountaineer receives explicit information about the status of the fountain, and manipulates its pipes explicitly to produce the intended effects.<sup>68</sup> But that is not how the Cartesian mind interacts with its body: Descartes is well aware that we *feel* thirst and simply lift the water glass to our mouths in response; our minds do not receive explicit information about our bodies' dehydration and then deliberately tug on the correct strings in our brains to make the arm reach out for the glass.

All this is not to deny, however, that Descartes does take the mind and the body to be radically distinct—and to be fully separable, at least in principle. Brown provides a way to make sense of

---

<sup>62</sup> Simmons, “Sensible Ends,” 60. See also “Re-Humanizing Descartes,” 63.

<sup>63</sup> Cf. *Principles*, Part II, 25.

<sup>64</sup> Rorty, “Descartes on thinking with the body,” 376; cf. Grene, *Descartes*.

<sup>65</sup> Rorty, “Descartes on thinking with the body,” 377.

<sup>66</sup> Alston, “Foundationalism,” 384.

<sup>67</sup> Simmons, “Re-Humanizing Descartes,” 57.

<sup>68</sup> Cf. AT VII, 81/CSM II, 56.

the apparent conflict between Descartes's account of an embodied mind and the real distinction between thinking and extended substances that he propounds elsewhere.<sup>69</sup> She argues that Descartes has two, separate ways of identifying the self. On the one hand, I am a “minimal self”—that is, the version of myself that consists in only what indubitably belongs to me. My minimal self is nothing but a thinking thing. But, on the other hand, I am a maximal self: a union of mind and body—an embodied mind.<sup>70</sup> My maximal, embodied self is my natural state, and it takes “an extraordinary and unsustainable effort”<sup>71</sup> to shift to seeing myself as a minimal self.<sup>72</sup>

One significant upshot of this tight integration between the Cartesian mind and the Cartesian body has, perhaps not surprisingly, to do with health: the embodiment of the mind has practical implications for Cartesian medicine. For Des Chene, Descartes addresses health in two ways: biomechanics and psychosomatics.<sup>73</sup> The former treats the mechanism of the body itself; the latter treats the body in union with the mind—Descartes takes it that the mind can intervene in the health of the body through their union, and that somatic and psychological, and even moral, pathologies are interdependent.<sup>74</sup> The reception of Descartes's work has taken biomechanics to be Cartesian medicine per se—this is fully consistent with the long-received picture of the Cartesian body as a set of interchangeable parts that can be worked on as a mechanic works on any other mechanism. But, as Des Chene notes,<sup>75</sup> Descartes himself favoured psychosomatics over biomechanics. He took the greatest medical benefit to be found not in mechanical intervention with the body-machine itself (which, as we have discussed in Section 3, was never “just” a machine anyway), but in the embodied treatment possible only between a mind and a body that are united.

---

<sup>69</sup> See also Simmons, “Re-Humanizing Descartes.”

<sup>70</sup> Brown, “Descartes and the Embodied Self,” 245.

<sup>71</sup> *Ibid.*, 240.

<sup>72</sup> Cf. Hutchins (*Obscurity and Confusion*, Ch. 4), who argues that our natural, embodied state has a certain epistemic priority over our minimal state.

<sup>73</sup> Des Chene, “Life and health in Cartesian natural philosophy,” 723. Note that psychosomatic medicine involves altering bodily memory, on which see section 3.1 here. See also Sutton, “Body and brain,” 715, on Descartes's infamous psychosomatic self-cure for his heterotopia fetish (the example of the little girl with a squint Descartes gives in the letter to Chanut).

<sup>74</sup> On the moral side, see Brown, *Descartes and the Passionate Mind*, Ch. 8.

<sup>75</sup> Des Chene, “Life and health in Cartesian natural philosophy,” 724.

## 5. Conclusion

The recent literature (of which, what we have presented here is only a sampling) builds up a picture of Descartes's philosophy at odds with the traditional, received view in which the mind is at its centre, and in which the body, if it is to be considered at all, is dispensable and alienated. This picture of an embodied Descartes radically re-evaluates the Cartesian body. Human and animal bodies are, ontologically, still fully continuous with any other lump of extended substance—there is no ontological difference between them, of course. But, human and animal bodies are, nevertheless, different. They are, the literature has suggested, “embodied” differently—unlike rocks or bits of metal, human and animal bodies are, in some sense, inhabited.

In the human case, bodies are inhabited by minds with which they are fully combined. As Kirkebøen shows, this means that the cognition of the Cartesian mind is influenced by the passions of the body to which it is united; and, as Rorty and Simmons show, all empirical knowledge available to the mind is fundamentally mixed up with a concern for the health of its union with its body. And even medicine, for Descartes, is, in its most efficacious form, an embodied medicine, as set out in Des Chene's account of psychosomatics.

In the animal case, on the other hand, bodies are inhabited not by minds as such, but by processes that bear more than a passing resemblance to what others take to be psychological. They are inhabited, as we see in Canguilhem's and Sutton's analyses, by their reflexes and memories, and perhaps also, as Brown and Shapiro have argued, by a material interest in their own health. The posterity of *L'Homme*, even if it is overshadowed by biomechanics, has many other nuances, whether it leaves us with absolute consistency or not.<sup>76</sup> The picture of the embodied Descartes that emerges from this literature is, if not quite that of a phenomenologist of the intimacy of the lived body, of its joys and its pains, nevertheless quite far removed from the old caricature of the brute mechanist with his pile of disposable limbs.

---

<sup>76</sup> That is, the scholarship should not just be understood as presenting either an ‘embodied Descartes’ or its contrary. Faced with complexity, some readers could also charge him with inconsistency: how can a mechanist have such an account of health? of the passions? of animal spirits? And so on. We hope to have sketched a different presentation, both of Descartes and of the literature, offering a form of coherence. A further option which goes beyond the boundaries of this chapter is to explore whether Descartes actually “requires us to contract full intimacy with our own body and our own peculiar past,” so that “paradoxically, Descartes himself could hint at the possibilities and the perils of what's become known as ‘post-Cartesian agency’” (Sutton, “Body and brain,” 699, 700).

## References

- Alston, William. "Foundationalism." In Jonathan Dancy, Ernest Sosa, Matthias Steup (eds.), *A Companion to Epistemology*, 382–385. Oxford: Blackwell, 1992.
- Brown, Deborah. *Descartes and the Passionate Mind*. Cambridge: Cambridge University Press, 2006.
- Brown, Deborah. "Cartesian Functional Analysis." *Australasian Journal of Philosophy* 90(1) (2012): 75–92.
- Brown, Deborah. "The Sixth Meditation: Descartes and the Embodied Self." In David Cunning (Ed.), *The Cambridge Companion to Descartes' Meditations*, 240–57. Cambridge: Cambridge University Press, 2014.
- Canguilhem, Georges. *La formation du concept de réflexe aux XVII<sup>e</sup> et XVIII<sup>e</sup> siècles*, 2<sup>nd</sup> revised edition. Paris: Vrin, 1977 (First published 1955).
- Damasio, Antonio. *Descartes' Error. Emotion, Reason, and the Human Brain*. New York: Putnam, 1994.
- Des Chene, Dennis. "Life and health in Cartesian natural philosophy." In Stephen Gaukroger, John Sutton, John Schuster (eds.), *Descartes' Natural Philosophy*, 723–725. London: Routledge, 2000.
- Des Chene, Dennis, *Spirits and Clocks: Machine & Organism in Descartes*. Ithaca, NY and London: Cornell University Press, 2001.
- Descartes, René, *Œuvres*, ed. C. Adam and P. Tannery, new presentation by B. Rochot and P. Costabel. Paris: Vrin-CNRS 1964–1974. (AT)
- Descartes, René. *The World and Other Writings*. Trans. and ed. Stephen Gaukroger. Cambridge: Cambridge University Press, 1998.
- Distelzweig, Peter M. "The Use of *Usus* and the Function of *Functio*: Teleology and Its Limits in Descartes's Physiology." *Journal of the History of Philosophy* 53(3) (2015): 377–399.
- Duchesneau, François. *Les modèles du vivant de Descartes à Leibniz*. Paris: Vrin, 1998.
- Garber, Daniel. *Descartes Embodied. Reading Cartesian Philosophy Through Cartesian Science*. Cambridge: Cambridge University Press, 2001.
- Gaukroger, Stephen. *Descartes: An Intellectual Biography*. Oxford: Oxford University Press, 1995.

Gaukroger, Stephen. "The resources of a mechanist physiology and the problem of goal-directed processes." In Stephen Gaukroger, John Sutton, John Schuster (eds.), *Descartes' Natural Philosophy*, 383-400. London: Routledge, 2000.

Gaukroger, Stephen. *Descartes' System of Natural Philosophy*. Cambridge: Cambridge University Press, 2002.

Gaukroger, Stephen, Schuster, John, and Sutton, John (eds.), *Descartes' Natural Philosophy*. London: Routledge, 2000.

Grene, Marjorie. *Descartes*. Brighton: Harvester Press, 1985.

Grosholz, Emily. *Cartesian Method and the Problem of Reduction*. Oxford: Clarendon Press, 1991.

Hacking, Ian. "The Cartesian Body." *BioSocieties* 1 (2006): 13-15

Hatfield, Gary. "The *Passions of the Soul* and Descartes's Machine Psychology." *Studies in the History and Philosophy of Science* 38 (2007): 1-35

Hutchins, Barnaby R. "Descartes, corpuscles and reductionism: Mechanism and systems in Descartes's physiology." *The Philosophical Quarterly* 65(261) (2015): 669-689

Hutchins, Barnaby R. "Descartes and the Dissolution of Life." *The Southern Journal of Philosophy* 54(2) (2016): 155-173

Hutchins, Barnaby R. *Obscurity And Confusion: Nonreductionism in Descartes's Biology and Philosophy*. PhD dissertation, Department of Philosophy and Moral Sciences, Ghent University, 2016.

James, Susan. *Passion and Action: The Emotions in Seventeenth-Century Philosophy*. Oxford: Clarendon Press, 1997.

Kirkebøen, Geir. "Descartes' Embodied Psychology: Descartes or Damasio's Error?" *Journal of the History of the Neurosciences* 10(2) (2001): 173-191

Manning, Gideon. "Descartes' Healthy Machines and the Human Exception." In Daniel Garber and Sophie Roux (eds.), *The Mechanization of Natural Philosophy*, 237-262. Dordrecht: Springer, 2013.

Manning, Gideon. "Descartes's Metaphysical Biology." *HOPOS: The Journal of the International Society for the History of Philosophy of Science* 5(2) (2015): 209-239.

Merleau-Ponty, Maurice, *Phenomenology of Perception*, trans. C. Smith. London: Routledge Kegan Paul, 1962.

Reiss, Timothy. "Denying the Body? Memory and the Dilemmas of History in Descartes." *Journal of the History of Ideas* 57(4) (1996): 587-607

Rorty, Amélie Oksenberg. "Descartes on thinking with the body." In J. Cottingham (ed.), *The Cambridge Companion to Descartes*, 371-392. Cambridge: Cambridge University Press, 1992.

Rorty, Richard. *Philosophy and the mirror of nature*. Princeton: Princeton University Press, 1979.

Roux, Sandrine. "L'ennemi cartésien. Cartésianisme et anti-cartésianisme en philosophie de l'esprit et en sciences cognitives." *Astériorion* 11 (2013), <http://asterion.revues.org/2419>

Roux, Sandrine (ed.), *Le corps et l'esprit, problèmes cartésiens, problèmes contemporains*. Paris: Editions des archives contemporaines, 2015.

Ryle, Gilbert. *The Concept of Mind*. London: Hutchinson, 1949.

Sawday, Jonathan. *The body emblazoned: dissection and the human body in Renaissance culture*. London: Routledge, 1995.

Scribano, Emanuela. *Macchine con la mente. Fisiologia e metafisica tra Cartesio e Spinoza*. Roma: Carocci, 2015.

Shapin, Steven. "Descartes the Doctor: Rationalism and its Therapies." *British Journal for the History of Science* 33 (2000): 131-154.

Shapiro, Lisa. "The Health of the Body-Machine? Or Seventeenth Century Mechanism and the Concept of Health," *Perspectives on Science* 11(4) (2003): 421-442.

Simmons, Alison. "Sensible Ends: Latent Teleology in Descartes' Account of Sensation." *Journal of the History of Philosophy* 39 (1) (2001): 49-75

Simmons, Alison. "Re-Humanizing Descartes," *Philosophic Exchange* 41(1) Article 2 (2013): 53-71 [http://digitalcommons.brockport.edu/phil\\_ex/vol41/iss1/2](http://digitalcommons.brockport.edu/phil_ex/vol41/iss1/2)

Snider, Alvin. "Cartesian Bodies," *Modern Philology* 98(2) (2000): 299-319.

Sutton, John. *Philosophy and Memory Traces: Descartes to connectionism*. Cambridge: Cambridge University Press, 1998.

Sutton, John. "The Body and the Brain." In Stephen Gaukroger, John Sutton, John Schuster (eds.), *Descartes' Natural Philosophy*, 697-722. London: Routledge, 2000.

Sutton, John, McIlwain, Doris, Christensen, Wayne, & Geeves, Andrew. "Applying intelligence to the reflexes: Embodied skills and habit between Dreyfus and Descartes." *Journal of the British Society for Phenomenology* 42(1) (2011): 78-103.

Varela, Francisco, Thompson, Evan and Rosch, Eleanor, *The Embodied Mind. Cognitive Science and Human Experience*. Cambridge (Mass.): MIT Press, 1991.

Williams, Bernard. *Descartes: The Project of Pure Enquiry*. London: Pelican, 1978.

Wolfe, Charles T., "Le mécanique face au vivant." In Aurélia Gaillard, Bernard Roukhomovsky and Sophie Roux (eds.), *L'automate : modèle, machine, merveille*, 115-138. Bordeaux: Presses Universitaires de Bordeaux, 2012.

Wolfe, Charles T. "Teleomechanism redux? Functional physiology and hybrid models of Life in early modern natural philosophy." *Gesnerus* (special issue: *Teleology and Mechanism in Early Modern Medicine*) 71(2) (2014): 290-307.