MECHANIZING THE SENSITIVE SOUL

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Descartes was a great mechanizer of nature. As a proponent of a “mechanical” natural philosophy, he sought to explain the great majority of natural phenomena—those not wholly dependent on soul or mind—by means of geometrically conceived matter, that is, matter consisting in the properties of extension alone (size, shape, position, and motion). He was, of course, not unique in undertaking such an endeavor, but his efforts are even now impressively thorough in their treatment of a large variety of natural phenomena, terrestrial and celestial, mineralogical, meteorological, optical, and also including living things. His explanations are also impressive for their imaginative fertility: he imagined that particles of water have an eel-shape, which explains why wetted cloth can dry out rather quickly, by comparison with the branchy shape of particles of oil, which stick to the fibers of cloth and remain as an oily stain (AT 1:423); he conceived magnetic fields as patterns of motion of corkscrew shaped particles, and magnets as having threaded grooves that admit the particles (AT 8A:289).1

Granting that Descartes was a mechanizer of natural phenomena, or one who seeks to explain natural phenomena mechanistically,2 we may

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naturally ask where he obtained his conception of the phenomena to be explained. He accepted descriptions of phenomena from the extant literature in natural philosophy (for natural phenomena in general, including living things); from the mixed mathematical sciences (e.g., optics, astronomy, music, mechanics); and from medicine (for the phenomena of living things)—as supplemented in some cases by his own observations and the observations of others as reported to him.

In connection with Descartes’ work on living things, historians of physiology Thomas Steele Hall, Karl Rothschuh, Annie Bitpol-Hespériès, and Vincent Aucante have documented the various ways in which Descartes drew upon the medical and physiological literature. Descartes mentions several medical writers, including Galen, Jean Fernel, Andreas Vesalius, Fabricius of Aquapendente, Caspar Bauhin, Caspar Assellius, Sébastien Basson, and William Harvey; historians believe that he also knew the writings of Caspar Bartholin and his son Thomas, Realdo Columbus, Gabriel Fallopius, Arcangelo Piccolhomini, Jean Riolan the younger, and J.B. van Helmont. The predominant Galenic tradition in medicine included elements of Aristotelian physics, stemming from Galen’s own writings and from subsequent discussions. Conversely, as regards what the Galenic


4 The first group of authors is mentioned by Descartes (index of proper names, AT 5:715–41); see also AT 5:567–72, Hall’s Introduction, pp. xvii–xxii, xxxii, Bitpol-Hespériès, Principe de vie, pp. 31–3, and Aucante, Philosophie médicale, pp. 67–9. Van Helmont was a proponent of chemistry in medicine. Descartes’ writings, including his description of digestion and the “fire without light,” include references to chemical interactions (water and quicklime, aqua fortis and metal) and fermentations: AT 11:121; see also 1:530–1, 6:322. On Descartes’ acquaintance with chemistry, see Aucante, Philosophie médicale, chs. 4–5.

5 In European medical education, Avicenna’s (or Ibn Sina’s) Canon of Medicine (11th c.) played an important role in presenting Galenic doctrines after its translation into Latin in the mid twelfth century. Ever greater attention was given to Galen in the original Greek during the sixteenth century. See Nancy Siraisi, Medieval and Early Renaissance Medicine (Chicago: University of Chicago Press, 1990) and Avicenna in Renaissance Italy: The Canon and Medical Teaching in Italian Universities after 1500 (Princeton: Princeton University Press, 1987), the latter of which details the evolving commentary tradition. On early mod-
physician Fernel called “physiology”—that is, the study of the nature of the healthy human being (including both structure and function)—Aristotelian treatises of natural philosophy covered the normal functioning of the body in considering the operations of the soul, and especially those called “vegetative” and “sensitive.” These discussions often referred to Galen and to Avicenna’s compendium of Galenic medicine (as also to Fernel). In both the medical and the philosophical literatures, the soul was treated as the principle of life. The normal functions of living beings, including growth, nutrition, the operation of the senses, and the behaviors of animals in seeking benefits and avoiding harms, were explained hylomorphically through the faculties and powers of the soul, as ranged under the primary denominations of the “vegetative” and “sensitive” souls (or parts, or powers, or operations of the soul).

Although the noted scholar Etienne Gilson has suggested that Descartes merely drew “facts” from the medical and natural philosophical traditions, Hall’s careful notations to his translation of the *Treatise on Man* show that Descartes accepted many aspects of the functional theories. Thus, he assigned to the liver the function of producing blood (as in Galenic medicine), and he associated life with the heat of the heart (as did
both Aristotle and Galen). He also recognized “animal spirits” as subtle matter that fills the nerves. As Hall suggests, Descartes creatively adapted previous theory to his own mechanistic program. Thus, he treated the blood as mere particulate matter originating in food and he denied the functioning of vital or natural powers in its production; in direct contrast to Aristotle and others, he treated the vital heat of the heart as equivalent to fire as a nonvital phenomenon; and he stripped the animal spirits of their “sentient power,” treating them merely as subtle matter in rapid motion. In connection with his purely corpuscular treatment of the blood, he assigned the spleen a novel function of purging the blood of those particles least suited to feeding the heart’s fire.

In his mechanistic program, Descartes was no less ambitious with respect to living things than he had been with respect to the other phenomena of physics or natural philosophy. (“Physics” is here used in the wide sense, to include all phenomena of nature, including biological and psychological phenomena, a usage that persisted into the nineteenth century.) Leaving aside the phenomena of human mentality, Descartes

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9 Hall, pp. 8–9, 12, 19, nn. 16, 19, 26, 40.
10 Aristotle, *De anima*, trans. D.W. Hamlyn (Oxford: Clarendon Press, 1968), 416a10–18, contends that, although some hold that “the nature of fire” causes nutrition and growth, it isn’t the principal cause, which is the soul (the principle of life). In *De generatione animalium*, in Complete Works of Aristotle, Vol. One, ed. J. Barnes (Princeton: Princeton University Press, 1984), 736b35–737a54, he says that “the vital force . . . is not fire nor any such force,” but that the natural principle found in the “breath” contained in semen is “analogous to the element of the stars.” He continues: “whereas fire generates no animal and we do not find any living thing forming in either solids or liquids under the influence of fire, the heat of the sun and that of animals does generate them.” Also Fernel, *Physiologia*, p. 256, on an innate heat in living things that is not elemental: “Calorem quendam in nobis cunctisque viuentibus inesse, eumque diuinum.”

11 Hall, p. 75, n. 121.
12 In the Aristotelian scheme of disciplines as presented in medieval and late scholastic commentaries and textbooks, “physics” or “natural philosophy” treated of both nonliving and living things, including the ensouled human being and its cognitive operations, both sensitive and intellectual (though there were boundary disputes, with some authors placing part or all of the discussion of the human soul under metaphysics), on which see Katharine Park and Eckhard Kessler, “Concept of Psychology,” in Cambridge History of Renaissance Philosophy, ed. Charles B. Schmitt (Cambridge: Cambridge University Press, 1988), pp. 455–63, and Gary Hatfield, “Remaking the Science of Mind: Psychology as a Natural Science,” in Inventing Human Science, ed. C. Fox, R. Porter, and R. Wokler (Berkeley: University of California Press, 1995), pp. 184–231. Thomas Brown (1788–1820), Professor of Moral Philosophy at Edinburgh, who was no materialist, placed the topic of the “philosophy of the human mind” (including psychological topics, in our sense) within “a system of general physics,” Lectures on the Philosophy of the Human Mind, 3 vols. (Philadelphia: John Grigg, 1824), 1:47; in this context, “physics” must be understood as the “theory of nature in general,” and so includes mental phenomena. Similarly, “physiology” is found into the
boasted that he could explain all the phenomena of living things, including not only digestion, circulation, nourishment, and growth, but also waking and sleeping, the operation of the external senses, imagination, memory, appetites, and the production of animal motion or behavior, purely mechanistically, without invoking a vegetative or sensitive soul. At the end of his Treatise on Man (first composed by 1633), he attributed the functions just listed to the “machines” described therein (human bodies counterfactually supposed to possess no soul, and so to be mere mindless machines), and he compared his explanations of those functions to the kind of explanation one might give of a clock by alluding only to the shapes and motions of its parts:

I desire, I say, that you should consider that these functions follow completely naturally in this machine, solely from the disposition of its organs, no more nor less than do the motions of a clock or other automaton from the disposition of its counterweights and wheels; so that it is not at all necessary, in the case of these functions, to conceive in this machine any other vegetative or sensitive soul, or any other principle of movement and life, than its blood and spirits, which are agitated by the heat of the fire that burns continually in its heart, which has a nature that does not differ from all the fires that are in inanimate bodies. (AT 11:202)

Descartes has clearly set for himself an ambitious program in accounting for the offices of the vegetative and sensitive souls, without invoking souls or the faculties or powers of souls in his explanation. He rejects the notion that the soul is hylomorphically present in the organs of the body so as to carry out vital and sensory functions. Rather, the body’s organs operate in a purely mechanical fashion. That is what is involved in “mechanizing” these phenomena. The role of the soul is restricted to properly mental functions: to the conscious aspects of sensations and other mental

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nineteenth century with both a general meaning (as physics or natural philosophy) and a more particular meaning (as the theory of the functioning of organisms, now often distinguished from anatomy).

Descartes originally intended his Treatise to be the second part of a three-part work titled The World, the first part being the Treatise on Light and the third part on the soul. The first two parts survived in MS at Descartes’ death (he had continued to work on the Treatise, or its topics, throughout his life, AT 2:525, 5:112); they were published separately in 1664, as Le monde ou traité de la lumière (Paris: Legras) and L’Homme (Paris: Angot). Hall gives further bibliographic details. Descartes summarized the contents of these then unpublished works (suppressed upon his hearing of Galileo’s condemnation, AT 1:270–2, 324) in his Discourse on the Method, pt. 5. He published aspects of his physiological program in the Discourse (1637; AT 6), Dioptrics (1637; AT 6), Meditations (1641; AT 7), Principles of Philosophy (1644; AT 8A), and Passions of the Soul (1649; AT 11:301–488), which are (wholly or partially) in his Philosophical Writings, trans. Cottingham et al., vols. 1–2.
operations; to intellectual acts; and to acts of volition (will). In effect, soul becomes mind (AT 7:161, 356).

In order to understand the extent of Descartes’ ambition, I first consider more fully the functions attributed to the soul or to the vital faculties in the Aristotelian and Galenic traditions, and especially the functions of the sensitive soul or power. I draw attention to the cognitive aspects of these functions, beyond the mere operation of the external senses. Then I turn to Descartes’ mechanistic explanations for these cognitive functions. Finally, I situate Descartes’ new mechanistic psychology within the larger context of his novel anthropology, or theory of the human being.

1. The Sensitive Soul in Galenic Medicine and Aristotelian Natural Philosophy

From the standpoint of the first half of the seventeenth century, the corpus of extant writings on the soul and its functions that might be assigned to the Galenic and Aristotelian traditions is vast, and there was a growing body of self-styled “innovative” writings that also addressed these topics. For our purposes, it is not necessary to examine in detail the various traditions and responses to tradition—which is well, as the details can be daunting. Descartes was aware of some of the disagreements within traditions and to traditions, but he rarely responded to them overtly. As regards received positions in Aristotelian natural philosophy on a topic such as the sensitive soul, he saw himself as responding to the common assumptions. He remarked that the “diversity of their opinions” does not make it difficult to refute the scholastic philosophers; one simply focuses on “all the foundations on which they agree among themselves,” and once these have been refuted “their disputes over details will seem foolish” (AT 3:232). With respect to the medical literature, he did not see himself as departing from the established facts—with some notable exceptions, such as his acceptance of the circulation of the blood.14 Indeed, he claimed to accept only agreed upon structures into his anatomy (AT 1:378). As noted above, he frequently but not always picked one or another received position as regards function. His primary innovation was to offer a different kind of explanation, a mechanistic explanation, for the functions that he recognized.

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14 Descartes apparently accepted the circulation of the blood before reading Harvey’s book (AT 1:263, letter to Mersenne in 1632). See Aucante, Philosophie médicale, ch. 5.
The Aristotelian legacy regarding the soul and its faculties was widely reflected in scholastic philosophy and in the medical literature that Descartes knew. A basic point of agreement in these traditions was that the soul is the principle of life: it separates animate (living) from inanimate (nonliving). According to Aristotle, the soul is by definition the actuality of a body capable of having life. Aquinas affirmed that the soul is “the first principle of life in the living things that are alive around us.” Aristotelian commentators known to Descartes echoed this view (in their own ways). Fernel defined the soul as “the origin and cause of the functions of the living body.” As such, the powers and the capacities of the soul are in the service of life. This is evident in the case of the vegetative and sensitive capacities. The vegetative powers include reproduction, growth, and nutrition, which are necessary for living things to come into being and to maintain themselves. The sensitive powers, which are discussed more fully below, are necessary either for the existence of animals (as in the case of touch, which is required to sense food) or for their well-being. These powers include sense, appetite, and motion, which together direct the animal to avoid harms and gain benefits and so to preserve the body. Leaving aside the rational power (which only pertains to human beings), we can say that the sensitive powers are directed toward the good of the body.

15 Aristotle, *De anima*, 412a20–2. Aristotelian commentators discussed this as Aristotle’s first definition.” What they called his second definition is mentioned below, n. 21.

16 Thomas Aquinas, *Treatise on Human Nature: Summa Theologiae 1a 75–89*, trans. R. Pasnau (Indianapolis: Hackett, 2002), question 75, art. 1, main reply. Hereafter, references to this work are abbreviated as “THN,” followed by question number and article number, and specifying article part as needed.


19 For this reason, imperfect animals, having only the senses of touch and taste, must still possess the internal senses, including the “estimative power” (as explained below) in order to be able to perceive what is suitable for preserving their nature, since the external senses do not themselves perceive that something is good for the animal; see Rubio, *De anima*, p. 647; also, Toledo, *De anima*, p. 128v; and p. 126v: as regards the internal powers, “bruta solas habent operations ordinatas ad victum.”
As we move beyond this general framework of the soul as the principle of life, there is some complexity involved in setting out the commonly held aspects of the Aristotelian and Galenic traditions. The first complexity concerns the number of souls there are and the relations between souls and their faculties or powers. Aristotle listed five primary capacities of the soul: vegetative, sensitive, appetitive, locomotive, and intellective or rational. These were grouped together to form three kinds of souls: vegetative (or natural), sensitive, and rational. Plants have vegetative souls, nonhuman animals have sensitive souls, and humans have rational souls. Further, the five capacities were grouped to mark off four levels of living thing: plants, having only the vegetative capacities; animals that don’t move about (plant-like animals, such as sponges), but which are sensitive and have appetite; animals that also move, or are capable of locomotion; and the human being, possessing all five capacities, and so, including reason or intellection. There are only four types of living things on the assumption that what has sense also has appetite, so that these two capacities always co-occur.

The majority of nonhuman animals possess all the sensitive powers (sentience, appetite, locomotion), and all animals possess vegetative powers. This led to a question of whether animals have two souls, one vegetative and one sensitive, or only one, and of whether human beings have

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20 Aristotelian and Galenic traditions as found in the seventeenth century do not necessarily reflect our best reading of the doctrines of Aristotle and Galen themselves. In seeking common elements in these traditions to which Descartes responded, and in allowing Fernel to stand for the Galenic tradition, I do not deny that the actual currents of Aristotelianism and Galenism were intellectually complex or that they continued to develop during the seventeenth century. On the fortunes of Galenism in seventeenth-century France, see Brockliss and Jones, Medical World, ch. 2; on the Galenic orthodoxy in relation to its enemies in chemical medicine, see Allen G. Debus, The French Paracelsians: The Chemical Challenge to Medical and Scientific Tradition in Early Modern France (Cambridge: Cambridge University Press, 1991), and Walter Pagel, Joan Baptista Van Helmont: Reformer of Science and Medicine (Cambridge: Cambridge University Press, 1982).

21 Aristotle, De anima, 414a31–2. The “second definition” discussed by commentators defined the human soul as possessing these five capacities.

22 Discussion of the five capacities, three souls, and four types of animals may be found in Aquinas, THN 78.4; Fernel, Physiologia, bk. 5, ch. 2; Toledo, De anima, pp. 59–60; Coimbra, De anima, pp. 133–6; Suárez, De anima, pp. 506–10; Rubio, De anima, pp. 124–6; Eustace, “Physica,” pp. 181–2, 190; Dupleix, Physique, bk. 8, ch. 4. Suárez neatly summarized the relations among the three types of soul, by dividing living things into vegetative and cognitive, and cognitive living things into sensitive and rational: “Vivens autem sic sumptum immediate divide poterit in vivens vegetativum et cognoscitivum: et rursus vivens cognoscitivum, in sensitivum et rationale” (De anima, p. 516). The cognition of nonhuman animals is to be distinguished from the rational knowledge or science (scientia) that human beings possess.
three souls (two plus the rational soul). The standard position was that nonhuman animals possess only one soul, the sensitive, and that humans possess only one soul, the rational, and that the sensitive soul of nonhuman animals also possesses the vegetative powers, while the human rational soul also has both vegetative and sensitive powers. Metaphysically, further questions arose as to how the powers of the lower souls are contained in the higher soul: as parts, or as faculties, or as eminent powers of operation. These are the sorts of questions that Descartes ignored, responding only to the general conception that there are three types of souls with five main powers, and that most nonhuman animals possess four of the powers while human beings possess all five: vegetative, sensitive, appetitive, locomotive, and intellective. Descartes’ claim was to be able, in nonhuman animals, to mechanize the functions of the first four powers. Leaving aside the vegetative powers, in order to understand his task we need to consider more closely the operations of the three main powers of the sensitive soul and the further division of the specifically sensory or cognitive powers.

The sensitive soul possesses the powers of sense, appetite, and motion. The senses provide knowledge or cognition (cognitio, connaissance); appetite responds to things which are represented as good or bad for the animal, as beneficial or harmful; such appetitive responses spur the animal to motion, toward or away from the thing presented by the senses as beneficial or harmful. The sensitive appetite is to be distinguished from the intellectual appetites of human beings, which are associated with will, freedom of will, and moral responsibility. Humans and nonhuman animals share sensitive appetites, which generate passions such as anger, fear, and joy. The sensory powers, appetite, and the ability for motion jointly explain the ability of animals to respond appropriately to local circumstances, seeking food and avoiding harmful enemies. They also

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23 Discussion of the parts, powers, or faculties of the soul may be found in Aquinas, THN 78.1; Fernel, Physiologia, bk. 5, ch. 2; Toledo, De anima, pp. 61–3; Coimbra, De anima, p. 133; Suárez, De anima, pp. 492–505; Rubio, De anima, pp. 130–3; Eustace, “Physica,” pp. 182–7; Dupleix, Physique, bk. 8, ch. 5. A further metaphysical question concerned whether the informing soul subsumes all other forms within it, or whether there are a plurality of forms in the living body.

24 In taking Descartes at his word (quoted above) that he could safely ignore the diversity of scholastic opinions in refuting their commonly agreed doctrines (extended now to include some Galenic doctrines), I do not assume that Descartes was unaware of this diversity (to which he refers). The Aristotelian and Galenic works that he mentioned himself (cited above) included disagreements and controversies. My point is to contrast Descartes’ doctrines with some widely held theses that he rejected.
explain animals’ abilities to provide for the future, as when birds gather straw in order to build a nest.25

In accounting for the cognitive powers of the Aristotelian sensitive soul, Arabic and medieval Latin commentators drew on a variety of theoretical entities and powers, including “sensible species,” conceived as representing sensory qualities in bodies; additional contents called “intentions”; and powers for discerning, manipulating, and storing these species and intentions.

There was widespread agreement that the five external senses, sight, touch, hearing, smell, and taste, receive the sensory qualities of things via sensible species.26 These include the proper sensibles, such as light and color for vision, as well as the common sensibles, such as spatial properties, size, shape, and motion, for touch and vision.27 These sensible qualities are “accidents” that reveal the qualities of sensible things but do not reveal the essence of those things or even their general beneficial or harmful aspects. Differences in color at a location allow us to tell one thing from another, but the sensory apprehension of color and shape do not by themselves tell us whether that thing is good, bad, or a matter of indifference to us. A light can be so bright that it is painful, and so we close our eyes, but that sort of pleasure and pain from a sensible thing does not reveal the further benefits and harms that objects afford. Apples are red, round, and good to eat. The external senses of themselves only comprehend the red and round qualities; they do not comprehend that apples are good to eat. That falls to an internal sense, which recognizes the apple

25 Discussion of sense (or cognition), appetite, and motion as the three powers of the sensitive soul may be found in Aquinas, THN, 78.1, 80; Fernel, Physiologia, bk. 5, chs. 2, 8, 9; Toledo, De anima, pp. 59v, 60v; Coimbra College, De anima, pp. 135–6, 475; Suárez, De anima, p. 508; Rubio, De anima, pp. 126–7; Eustace, “Physica,” pp. 182, 228; Dupleix, Physique, bk. 8, ch. 10.


27 The common sensibles are those “commonly sensed” by two or more external senses; they are not the specific objects of the faculty called the “common sense,” which compares the objects of the senses and recognizes that seeing, hearing, etc., is occurring; see, e.g., Toledo, De anima, p. 73v, and Rubio, De anima, p. 257. See also Robert Pasnau, Thomas Aquinas on Human Nature: A Philosophical Study of Summa theologiae 1a, 75–89 (Cambridge: Cambridge University Press, 2002), pp. 181–4, 191.
as food from its shape and color. The wolf appears grey and specifically shaped to the sheep; but the shape and color do not in themselves convey the meaning that the wolf is an enemy of the sheep. An internal sense must cognize that aspect of the wolf, from the shape and color.

The difference between the qualities sensed by the external senses and the special objects, often called “intentions,” that go beyond those objects, is explained by Thomas Aquinas. He casts his explanation in terms of pleasures and pains specific to the senses, as opposed to other qualities:

One must further recognize that if an animal were moved only by what is pleasant and painful to the senses, it would be necessary to posit in an animal only the apprehension of forms perceived by the senses, in which it would take pleasure or fright. But it is necessary for an animal to seek or flee from things not only because they are or are not agreeable to the senses, but also for the sake of some further benefits and uses, or harms. Thus the sheep flees from the wolf because the wolf is harmful to the sheep’s nature. Likewise, a bird collects straw, not because that pleases its senses, but because it is useful for nest building. Therefore it is necessary for an animal to perceive intentions of this sort, which the external senses do not perceive.28

The “intention” in question is not the essence of the wolf (a human intellect or better is required to perceive that), but the fact of the wolf’s enmity to the sheep. This intention is, presumably, perceived in virtue of the other qualities perceived, such as the shape and color of the wolf,29 but its apprehension is not reducible to the apprehension of those sensible qualities (which are called “forms” in the quotation).

Aquinas goes on to list the various internal senses, some of which are responsible for receiving sensible forms, and some for apprehending intentions that go beyond sensible forms or qualities:

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28 Aquinas, THN, 78.4, main reply.
29 Rubio, De anima, p. 629: “Nostra igitur sententia asserit species insensate produci ab eadem aestemativa mediis sensatis, quas recipit a sensu communi, vel phantasia”; in this context, “sensed” and “unsensed” mean sensed or not sensed by the external senses, in turn implying discerned and cognized, or not, by the external senses. Also, Toledo, De anima, p. 126r. Coimbra, De anima, pp. 353, 356, simply spoke of sensed and unsensed “species” (not using the term “intention” to mark the difference as did Toledo and Rubio); Coimbra also held that lower animals don’t elicit unsensed species from sensed qualities (and so don’t cognize them by the estimative power), but instead respond directly to the sensed qualities “from instinct.” Suárez, De anima, p. 708, rejected the distinction between sensed and unsensed species, and held that the internal sense must perceive the enmity of the wolf via sensed species.
So the *proper senses* and the *common sense* are directed at receiving sensible forms. . . . *Phantasia* or *imagination* (the two are the same) is directed at the retention or preservation of these forms. For phantasia (or imagination) serves as a kind of treasury for forms grasped through the [external] senses. The *estimative power* is directed at apprehending intentions that are not grasped through the [external] senses. And the power for *memory*, which is a kind of treasury for intentions of this kind, is directed at their preservation.30

In this scheme, the common sense and imagination receive and retain the forms from the external senses. The common sense perceives that vision, hearing, etc., have perceived, and in addition it perceives that the white thing is also sweet (comparing vision and taste). The imagination retains the sensory qualities after the sensory image has faded; it also can unite qualities not actually perceived together, as when we imagine a golden mountain. The estimative power goes beyond the qualities of the external senses, as a later scholastic noted, “to recognize a thing under the aspect of friend or enemy, useful or not useful, known or unknown, pleasing or annoying, consanguineous or alien.”31 The memory retains and stores these perceptions of intentions. The power of memory allows animals to respond to what is absent, and to move toward or away from it. A bird may remember where it has obtained straw before, and go there again. The sheep may remember where it has eaten grass before, and return.

According to Aquinas, Avicenna32 listed five internal senses, distinguishing phantasia from imagination; Aquinas reduces the list to four. The number and specific functions of the internal senses was a matter of controversy into the seventeenth century. While many authors cited Aquinas’ position as a received opinion, by the turn of the seventeenth century it

30 Aquinas, THN, 78.4, main reply. The bracketed words are the translator’s.
31 Eustace, “Physica,” p. 274. See also Toledo, De anima, p. 126; Rubio, De anima, pp. 581–90, 623–32.
32 Avicenna, Canon of Medicine, in O. Cameron Gruner, Treatise on the Canon of Medicine of Avicenna, Incorporating a Translation of the First Book (London: Luzac, 1930), pp. 135–9. In fact, several schemes of the internal senses can be drawn from Avicenna’s writings, and such variety is found in discussions into the seventeenth century. For an overview, see Harry Austryn Wolfson, The Internal Senses in Latin, Arabic, and Hebrew Philosophical Texts (Cambridge: Harvard University Press, 1935); on Avicenna, pp. 95–100. As a further example of this complexity, Rubio, De anima, pp. 581–2, outlines seven types of internal sensations, including two specific to humans. The five in animals are: common sense, phantasia, compositive imagination, estimative power, and memory; the two specific to humans are the cogitative power and memory as voluntary reminiscence. Rubio presents the seven as phenomena and then reduces them, in animals, to one internal sense that carries out five offices or functions (pp. 585–90).
was honored more in the breach. Some authors posited a single internal sense and regarded Aquinas’ four functions as powers of this one internal sense. Others recognized only three internal senses: common sense, imagination (or else the estimative power, or phantasia), and memory. Still others granted only two: common sense and phantasia; or else imagination and memory. These disagreements are again of the sort that Descartes would have ignored. What was important for him in this scheme was the presence of core functional differences, including those among common sense, imagination, and memory. The division between “reception” and “retention” (or “storage”) was also important for him.

Other topics of interest to Descartes concerned the cognitive capacities of animals, whether animals possess reason, and the roles of instinct and learning in animal behavior. In the Aristotelian and Galenic traditions, it was widely accepted that animals possess cognitive capacities. They apprehend sensory qualities as well as pleasure and pain. These apprehended qualities are brought together in the common sense, retained in the imagination, and stored in memory. As we have seen in the quotation from Aquinas, animals also apprehend other intentions, such as when a bird perceives the suitability of straw for building a nest, or a sheep perceives the enmity of the wolf.

A controversy arose concerning the basis for these cognitive feats and others, such as the geometrical structure of the spider’s web, or the bees’ hive with its hexagonal cells. A traditional view held that such acts arise in the estimative power, through instinct, not reasoning. Aquinas attributed to instinct alone the response of the sheep to the wolf, and so the sheep’s perception of the enmity of the wolf: animals “perceive these intentions through a kind of natural instinct [instinctu].” A human being, by contrast, “also makes a kind of comparison.” In order to distinguish the higher cognitive capacity of the human soul, Aquinas called the third internal

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33 Suárez, *De anima*, p. 709 (one “internal sense,” which Aristotle called the “primary sense”); Eustace, “Physica,” pp. 265–6 (the one internal sense is “phantasia”). As mentioned, Rubio, *De anima*, pp. 585–90, attributes to nonhuman animals one internal sense, the common sense, with four additional offices, making five offices in all (as in Aquinas’ Avicenna).
34 Fernel, *Physiologia*, bk. 5, ch. 2; Toledo, *De anima*, p. 126 (estimative power); Dupleix, *Physique*, bk. 8, ch. 21 (phantasia).
37 Aquinas, THN, 78.4, main reply.
sense the “estimative power” in animals and the “cogitative power” (or also “particular reason”) in human beings.

The important point for our purposes concerns the implications of relegating the animal response to instinct. Aquinas is effectively saying that the sheep comes predisposed to react to the wolf in an appropriate way. This reaction, including the response of the appetite to the wolf’s enmity and the subsequent engagement of the motive power to cause the sheep to flee, is built in. Human beings, by contrast, through the act of comparison, can discover through experience such things as the danger of the wolf, and they can then recognize a subsequent instance of the danger. This human capacity, according to Aquinas, is aided by the rational soul and so is not possible for nonhuman animals, which lack rational capacity.

Other writers disagreed that the ability of animals to transcend the mere perception of sensory qualities is always a matter of instinct. During the latter half of the sixteenth century and first half of the seventeenth century, some authors ascribed reason to animals. They did so in various degrees. Some, such as Montaigne and Charron, virtually equated animal reason with human reason. Montaigne spoke on behalf of animals:

> there is no apparent reason to judge that the beasts do by natural and obligatory instinct the same things that we do by our choice and cleverness. We must infer from like results like faculties, and consequently confess that this same reason, this same method that we have for working, is also that of the animals.38

He recited a bouquet of examples, which became common, including a story from Chrysippus of a dog who was seeking his master and, coming to the three-way fork in the road, sniffed two forks and chose the third without sniffing; or the story of another dog, seeking oil from low in a pitcher, who fetched stones to displace the oil and raise its level; or elephants that draw spears and arrows from other elephants and from their masters. Charron adopted a similar position, using some of the same examples, and he also opposed an explanation through instinct.39

Most others who ascribed reason to animals were more circumspect, denying to animals any ability to form universals while granting to them something like what Aquinas called “particular reason,” which

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39 Pierre Charron, De la sagesse, 2nd edn. (Paris: David Douceur, 1604), bk. 1, ch. 34.
they ascribed to the faculty of imagination. Accordingly, these authors ascribed to animals the ability to compose images, in that way associating visual sensory qualities of a thing with the experience of good eating. Some authors compared such connections to the formation of particular syllogisms, whereas others refused to compare animal cognition to judgment and reasoning.

The traditional instinct view had its defenders. In general, such authors ascribed to animals an ability to cognize enmity by instinct, sometimes calling this ability a “judgment,” and sometimes not. Moreover, even the instinct view granted a form of learning to animals, as when, through memory, they recall where an instinctually cognized harm or benefit is located. During the 1640s, Pierre Chanet, a defender of the instinct view, allowed that by their natural faculties alone animals can perceive some benefits and harms and are capable of memory and learning (discipline). Thus, a dog seeks food naturally; it can recognize those who have given it food. Dogs also can be trained to point at pheasants and to hold their position, and they can be trained to lead the blind. These are not instincts but effects of sense, imagination, memory, and the motive faculty. Chanet

40 La Chambre, Connaissance des animaux, p. 16, and pts. 2–3. Adrien Baillet, Vie de monsieur Des-Cartes (Paris: Daniel Horthemels, 1691), 2:393, reports that Descartes had befriended La Chambre in 1644 and had a copy of his Passions sent to him in 1649; it also appears that Descartes received La Chambre’s earlier Les caractères des passions (Paris: P. Rocolet and P. Blaise, 1640) in January, 1641 (AT 3:296, 299 n.). In 1645, La Chambre re-issued that work with a second volume containing an appendix, “De la connaissance des animaux” (Paris: Rocolet, 1645), in which he responded to Pierre Chanet’s Considerations sur la Sagesse de Charron (Paris: Le Groult, 1643) regarding instinct in animals; La Chambre’s Connaissance des animaux in 1647 responded to Chanet’s 1646 (see n. 43) response to La Chambre’s 1645 appendix. In any event, Descartes most likely knew of La Chambre’s writings about animal cognition (and, at least indirectly, Chanet’s) prior to composing his Passions.

41 Fernel, Physiologia, bk. 6, ch. 11.

42 Toledo, De anima, pp. 127v–128r (animals operate by instinct and memory; the estimative power “as it were” judges); Coimbra, De anima, pp. 358–9 (animals do judge, in the sense of apprehending benefits and harms); Rubio, De anima, pp. 606–11, 623–7 (animals don’t judge, but do apprehend and compose in imagination); Eustace, “Physica,” pp. 267 (“species non sensatas sint omnibus animantibus naturaliter ingenitas”), 274 (the estimative power has this office: “de rebus, sive per species sensatas, sive per non sensatas perceptis ferre judicium, & de ipsis etiam suo modo discurre”)”); Dupleix, Physique, bk. 8, ch. 24, pp. 642–3 (God gave animals natural instinct and knowledge [cognition] as necessary for conserving their life and that of their offspring); 645 (sense and appetite explain the dog at the crossroads and with the oil); 646 (animals do judge, not discursively, but in the sense that the special senses recognize sensory qualities and discriminate among them, and the common sense discriminates among the special senses).

43 Pierre Chanet, De l’instinct et de la connaissance des animaux (La Rochelle: Tous-saints de Govy, 1646), p. 4; see also ch. 7.
held that instincts should be assigned to animals only for acts that they perform which would require reason. He regarded instincts as created by God above the natural order of the faculties of the sensitive soul, and he attributed such instincts to humans and animals alike. Thus, when a human infant first suckles, it is drawn to the breast by instinct. Similarly for a newborn lamb. Birds build their nests by instinct, without knowing (sçavoir) that they will protect the eggs.44

In one respect, Descartes was on the conservative side of this debate concerning animal reasoning. He denied that animals have general problem solving or reasoning abilities (AT 6:56–7). Indeed, he went further and denied them any soul at all, thereby excluding sensory cognition of any kind, and any power of representation.45 He invoked animal instincts, in the form of innate mechanisms, and he attributed to animals mechanical counterparts of the sensory, appetitive, and motive powers. In addition to invoking instinct, he also allowed some learning in animals, via memory. In this he may have been following the description of the functions of animal memory of his Aristotelian predecessors, while also adding some recent observations in support of attributing learning to animals. But he adopted a position that was in one respect more radical than other accounts of animal learning in his time, for he contended that these learning processes could be explained mechanistically, independent of a sensitive soul or other hylomorphically conceived power.

44 Ibid., pp. 56, 66, 86.
45 Descartes implies that animals have no souls at AT 6:58–9. Some recent commentators, including John Cottingham, “Descartes’ Treatment of Animals,” in Descartes, ed. J. Cottingham (Oxford: Oxford University Press, 1998), pp. 225–33, and Stephen Gaukroger, Descartes’ System of Natural Philosophy (Cambridge: Cambridge University Press, 2002), ch. 7, have questioned whether Descartes actually denied sentience and/or intentionally conceived cognitive operations to nonhuman animals. I defend the interpretation that Descartes held animals to be mere machines lacking intentional states in Hatfield, “Animals,” in Companion to Descartes, ed. J. Carriero and J. Broughton (Oxford: Blackwell, 2007), pp. 404–25. A challenge for my interpretation arises from a terminological difference between the Treatise and the Passions. In the Treatise, Descartes speaks of the “correspondence” between brain states and properties of external objects, such as their distance from the observer (AT 11:383); this relation might explain situationally appropriate behavior without invoking the concept of representation. In some passages in the Passions, Descartes says that the impression in the brain (not a mental state) “represents” an object as, e.g., rare (AT 11:386). I interpret this usage in much the way I do Descartes’ use of the term “idea” in the Treatise: the brain state is a representation only in the sense that it will produce a representation in the mind (see n. 56). The notion that, in Descartes’ view, bodily states might be representations independent of their effects on minds is made even less plausible if, as I contend, Descartes made representation, and not consciousness, the defining feature of mind: Hatfield, Descartes and the Meditations, pp. 258–60, 325–6.
2. Descartes’ Mindless Machines and the Sensitive Powers

The contrast between Descartes’ substance dualism as regards the mind and body, and the standard Aristotelian position, has been much discussed. In the standard Aristotelian scheme, the soul serves as the form of the human body. Its sensitive powers are bound to organs for their operation, and its intellectual powers (in the standard scheme) require a phantasm or image in the faculty of imagination (phantasia) for their operation. By contrast, Descartes described the soul as able to operate on its own, independent of the body. It can have intellectual thoughts, even concerning extension (the object of geometry), independent of the body or corporeal imagination. The senses and imagination depend on the body for their operation; although conscious sensation arises only in a mind, that mental state requires a bodily cause (or occasion).46

As radical as his substance dualism may have been in its context, Descartes’ view of matter as having the sole essence of extension, and therefore as not requiring a form to render it a substantial being, was perhaps a greater departure from the standard Aristotelian scheme. In that scheme, there is no matter without form.47 Each type of mineral, plant, and animal has its characteristic substantial form, which is responsible for the thing being what it is, and which brings about its characteristic activities, including the growth and development of living things. In positing a world of matter having as its sole essence extension, Descartes abandoned the hylomorphic form–matter explanation of all bodies, including living bodies.48 He thus gladly took on the task not only of explaining the

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46 Tad M. Schmaltz, Descartes on Causation (Oxford: Oxford University Press, 2008), discusses occasionalist and non-occasionalist positions on body–mind and other relations in Descartes and his followers.

47 Some medieval and early modern Aristotelians, including Scotus, Ockham, Dupleix (Physique, bk. 2, chs. 4–5), and Eustace (“Physica,” p. 17), held that God could create prime matter without any form. Since these authors accepted that all things in nature have both matter and form, this is the type of disagreement that Descartes ignored. For a brief summary of disagreements over prime matter, see R. Ariew and A. Gabbey, “Scholastic Background,” in Cambridge History of Seventeenth-Century Philosophy, ed. M. Ayers and D. Garber (Cambridge: Cambridge University Press, 1998), pp. 425–53, on pp. 430–2.

48 Some scholars argue that Descartes held there to be only one material substance, comprising the entire extended stuff of the universe; for a discussion, see Matthew Stuart, “Descartes’ Extended Substances,” in New Essays on the Rationalists, ed. Rocco J. Gennaro and Charles Huemer (New York: Oxford University Press, 1999), pp. 82–104. This view raises the question of how Descartes can individuate ordinary objects, including animal bodies. If animals are not themselves individual substances, what characterizes them as individuals? In “Animals” (pp. 415–17), I suggest that Descartes introduced a principle of
characteristics of nonliving things in a mechanical manner, but also that of explaining the phenomena of living things.

The first challenge that Descartes faced was to distinguish living from nonliving. Because he denied souls to animals, he could no longer make the soul the principle of life. In the Fifth Reply in the Meditations, he compares the view that the soul gives life to the beliefs of “the earliest human beings,” and makes clear that he restricts the concept of soul to mind and so excludes the operations that humans share with brutes:

because the earliest human beings perchance did not distinguish in us that principle by which we are nourished, grow, and accomplish without any thought everything else that we have in common with the brutes, from the principle through which we think, and designated both by the single term soul, on noticing that thought is distinct from nutrition, they called that which thinks mind and believed it to be the principal part of the soul. I, however, observing that the principle by which we are nourished is wholly distinct in kind from that through which we think, have said that the term soul, when it is used for both of these principles, is ambiguous. And in particular, taking soul specifically for the first actuality or the principal form of the human being, it is understood only to be the principle through which we think, and this I have designated with the term mind for the most part, in order to avoid ambiguity; for I consider mind not as a part of the soul, but as the whole of that soul which thinks. (AT 7:356)

individuation that may be less than substantial but adequate for his physics: the “nature” of a thing is its characteristic pattern of motion. For animals, this “nature” would include the structure of the body and its micro-mechanical motions as well as observable motions. If, in opposition to the “one substance” view, one holds that animal bodies are substances, then this “nature” would serve to individuate them as substances (and would be distinct from a determinate collection or quantity of matter, AT 4:166). I mention opposing views to this account of animal individuation below. More generally, as even subsequent Cartesians allowed (noted below), one might speak of the structure of an animal body and the pattern of internal motions as a “form,” in which case Descartes’ position does not seem so radically different from Aristotelianism. But it is. Descartes denied Aristotelian forms as active principles that direct growth and other vital functions (e.g., AT 11:202) and by extension he also denied Galenic active physiological principles (faculties and powers). His matter possesses motion, which he did not attribute to an indwelling force but to God’s power (AT 8A:61–6); see Hatfield, “Force (God) in Descartes’ Physics,” Studies in History and Philosophy of Science 10 (1979), pp. 113–40. One might nonetheless observe that extension, the principal attribute of matter, as that through which the other properties (or “modes”) of matter are understood, is in this way (weakly) analogous to an Aristotelian substantial form; Hatfield, “First Philosophy and Natural Philosophy in Descartes,” in Philosophy, Its History and Historiography, ed. A.J. Holland (Dordrecht: Reidel, 1985), pp. 149–64, on p. 151.
Having rejected hylomorphism, the soul cannot be the principle of life; it is now equated with mind and denied to animals. At the same time, Descartes recognized that we share life with the brutes. Hence he needed a new principle of life that could apply to both brutes and humans and would not involve the soul.

For human and nonhuman animals, Descartes met this challenge by pronouncing the heat of the heart to be the principle of life (AT 11:202, 407). By contrast with Aristotle and Galen, he insisted that the heat of the heart, or the “fire without light,” is the same in living things as in apparently nonvital processes (such as the heat generated in hay stacks). His vital heat was thus truly “distinct in kind” from the vital heat of his predecessors.

Beyond the vital heat, in his Passions of the Soul Descartes described another feature of living things, by implication from his account of death. He describes the error of believing that the soul is the source of the heat of the body, and that the body loses its heat because the soul leaves. Rather, it is the other way around. Death comes about, and the soul leaves, “because this heat ceases and the organs that serve to move the body become corrupt” (AT 11:330). Death occurs, in essence, because the body becomes broken:

49 The heat of the heart cannot be the principle of life in plants, but heat might still serve that purpose. In some remarks on plants in his Exerpta anatomica (from the 1630s; first published in 1660, see AT 11:545–8) and Generatio animalium (1648; first published in Latin in 1701, see AT 11:503), Descartes attributes the formation and growth of plants to a “power of heat” (AT 11:534, 629). The Cartesian philosopher Antoine Le Grand (1629–99), Institutio philosophiae secundum principia de Renati Descartes, new ed. (London, 1678); trans. Richard Blome, An Entire Body of Philosophy, According to the Principles of the Famous Renate Des Cartes, 2 vols. (London: Samuel Roycroft, 1694; reprint, Bristol: Thoemmes, 2003), observes that “the life of Vegetables consists in perpetual motion” (2:156) and later that “the life of Plants consists in heat and moisture” (2:169), the former being the “Agent.” The two formulations are compatible, since, on the Cartesian view, heat is a kind of motion: “Heat therefore is a Quality arising from a greater and unequal Motion of the Terrestial Particles” (1:223). On Le Grand’s general definition of life, invoking heat, see n. 53, below. Le Grand, born and educated in Douai (then part of the Spanish Netherlands), entered an order of English Franciscans and was assigned to England from 1656, where he propagated Cartesian philosophy.

50 Or, many of his predecessors. Toledo, De anima, p. 71v, held “against the others” that the heat of life (“natural heat”) is of the same kind as elemental heat (“calor naturali est eiusdem speciei cum calore elementi”), and that it derives from the sun. Fernel, Physiologia, bk. 4, chs. 1–2, distinguished vital heat from elemental fire (one of the four elements) and compared it to an ethereal spirit, which mediates between soul and body; he reviewed favorably a characterization of this spirit as “starlike” or, with Aristotle, as analogous to “the element of the stars.”
let us judge that the body of a living man differs from that of a dead man as much as does a watch or other automaton (that is, other self-moving machine), when it is wound and contains within it the corporeal principle of the movements for which it is constructed together with everything that is required for the action of that principle, and the same watch or other machine when it is broken and the principle of its movement ceases to act. (AT 11:330–1)

Being dead is being broken. Which suggests that a living thing is like a machine in the sense of being an integrated whole whose parts cooperate in making possible its proper functioning. The notion that the soul leaves when the body stops functioning suggests that the body has its own integrated unity, independent of its being united with a soul. The proper

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51 The Synopsis to the Meditations suggests more cryptically that a human body can perish simply if “the shape of some of its parts be changed” (AT 11:14).

52 Geneviève Rodis-Lewis, “Limitations of the Mechanical Model in the Cartesian Conception of the Organism,” in Descartes: Critical and Interpretive Essays, ed. Michael Hooker (Baltimore: Johns Hopkins University Press, 1978), pp. 152–70, examines the question of whether the unity of this integrated whole depends on mind–body union or can be defined independent of it. If I understand her position correctly, she has Descartes deny that animal and human bodies have any intrinsic finitude and functionality; their motion is either “regular” or not, so that brokenness comes down to moving erratically. Hence, animal bodies have no intrinsic unity and the human body has such unity only through its union with the soul. She relies in part on Descartes’ letter to Mesland (9 Feb. 1645), in which he appeals to the soul as a principle of individuating human bodies (a passage which arises in connection with a discussion of the metaphysics of the Eucharist, and so must in any case be taken with a grain of salt). The Mesland passage, while indicating that “when we speak of the body of a man,… we mean only all of the matter which is, as a whole, united with the soul of that man,” also says that “we believe that this body is whole and entire, as long as it has in it all of the dispositions required for preserving that union” (a “substantial union”) with the soul (AT 4:166). This last qualification suggests that the body has its own integrity; and so even the Mesland letter is consistent with passage above, from the Passions, which indicates that the unity of the body is independent of its union with the soul, because it is brokenness on the part of the body that causes the soul to leave, not the departure of the soul that destroys the functional integrity of the body. Rodis-Lewis, “Le domaine propre de l’homme chez les cartésiens,” in her Anthropologie cartésienne (Paris: Presses Universitaires de France, 1990), pp. 39–83, on p. 45, cites Passions, art. 30, in support of her view that the body’s unity stems from its union with the soul. But the cited passage again supports the unity of the body independent of the soul; it says that the soul is united to the whole body “because the body is one, and in a way indivisible, on account of the disposition of its organs, which are so related to one another that when one of them is removed this renders the whole body defective” (AT 11:351); the point is not that the body is one because it is united to the soul, but rather that the soul is united to the whole body because the body is one on account of its organization. Manning, “Descartes’ Healthy Machines,” argues that human bodies are individuated in relation to God’s designing intentions (his paper includes a careful analysis of the Sixth Meditation passage on “extrinsic denomination”). His argument explains the language of healthy or well-functioning bodily systems in relation to God’s designs, but it depends on taking the creation story literally, which Descartes gives us reason to doubt in favor of the view that the world
functions of the human body presumably are just those that we share with nonhuman animals. In this concept of living things as integrated machines, Descartes comprises the concept of body-preserving operations that was part of the Aristotelian and Galenic conception of the operations of the vegetative and sensitive powers.  

Because Descartes denied soul and mind to nonhuman animals, he needed to explain how the offices of the vegetative and sensitive souls could be performed in mindless animals. And since he believed that the human body can carry out many of the same sensory and appetitive functions independently of the mind (AT 7:229–30), he also needed to explain those human capacities in a purely mechanistic manner.

To illustrate his explanations, in the Treatise he adopted the conceit of a human body operating without a soul, which could also stand in for the animal body. With respect to this human body, he needed to

and animals arise out of a chaotic soup without divine providence (e.g., AT 8A:99–100). Manning’s arguments appeal to his belief that “Descartes is conceptually confused where he insists mechanical principles can be used to explain the creation of a machine and not just its operations; mechanical principles can do the latter, but not the former” (he shares this belief with Rodis-Lewis, Anthropologie cartésienne, pp. 149–67, and others). For more on my alternative account of the integrity of bodies and their internal finality, including a discussion of how Descartes could have thought that mechanical principles might explain the creation of a machine (as suggested at AT 2:525), see Hatfield, “Mental Acts and Mechanistic Psychology in Descartes’ Passions,” in Descartes and the Modern, ed. N. Robertson, G. McOuat, and T. Vinci (Newcastle upon Tyne: Cambridge Scholars Publishing, 2008), pp. 49–71, on pp. 61–4, and “Animals,” pp. 411–17, 422.

The conception of animal bodies as functionally integrated wholes could also apply to plants. Descartes acknowledged that plants are functionally organized as are animals (AT 7:374). Le Grand, Body of Philosophy, offered a general definition of life in which he referred both to the “organization” of living things and to a (non-shining) fire as the “soul” of plants and animals: “We call those Living Bodies, that have received from the Author of Nature such a Disposition of an Organical Body, as that by numerable passages and conveyances it hath, the Alimentary juice, being by motion thrust into them, is by the Soul every way dispersed and distributed, for their Nourishment, Growth and Conservation. They are called Living Bodies from the Life they Possess, and Animate Bodies from their Soul.” This soul “chiefly consists in the Innate or Inborn heat, which is a Heating, but not Shining Fire” (1:229). By invoking God as the creator of organized bodies, Le Grand followed the letter but not the spirit of Descartes’ philosophy, which tended toward the view that living things first arose by natural processes (Hatfield, "Animals," pp. 408–11).

In the Discourse, when summarizing the Treatise Descartes observed that the functions he had described in that work “are the very ones in which animals without reason may be said to resemble us” (AT 6:46). Writing to Mersenne (20 Feb. 1639) about the World (including the Treatise), he acknowledged that at present he claimed to know only “the animal in general, which is not subject to fever, and not yet man in particular, who is subject to fever” (AT 2:526). In a letter to Mersenne (23 Nov. 1646), he spoke of his earlier work describing “all the functions of the human body, or of the animal” (AT 4:566); also, to Elizabeth (Mar. 1647; AT 4:626).
explain how it could (without a soul) respond, when food-deprived, by grasping and eating an apple (AT 11:195); by pulling its hand from the fire (AT 11:192–3); or by fighting or fleeing, depending on circumstances (AT 11:194; also 11:356–9)—things that he believed the human body might do by itself even when ensouled. This amounted to a “machine psychology”\(^{55}\) for both human and nonhuman animals. Among the works published in his lifetime, aspects of this machine psychology are presented in the *Dioptrics*, described in the *Discourse on Method*, and developed in some detail in the *Passions*.

As I mentioned above, Descartes listed the functions of the sensitive soul at the end of his *Treatise*. Here is the list in his words:

> the reception of light, sounds, odors, tastes, heat, and other qualities by the external sense organs; the impression of the ideas of them in the organ of common sense and the imagination, the retention or imprint of these ideas in the memory; the internal movements of the appetites and passions; and finally the external movements of all the bodily parts that so aptly follow both the actions of objects presented to the senses and the passions and impressions that are encountered in the memory that they imitate as perfectly as is possible the movements of real men. (AT 11:202)\(^{56}\)

The quotation follows in a general way the schema of powers of the sensitive soul found in Aristotelian natural philosophy and Galenic medicine. It lists the five external senses; the common sense, imagination, and memory; appetites and passions; and external motions.

Considered more closely, the scheme of the *Treatise* differs in some ways from Aristotelian and Galenic accounts. As had Fernel and some

\(^{55}\) For more on mechanistic psychology in Descartes, see Hatfield, "Mental Acts and Mechanistic Psychology."

\(^{56}\) Descartes’ use of the term “idea” in this passage might suggest that he has in fact mentalized this machine; however, in the 1630s he utilized the notion of a *corporeal idea*, a bodily state that served to control movement (in a sensorimotor feedback loop) and which, if the body were ensouled, might cause a properly mental idea (AT 11:176–7; also *Discourse*, AT 6:55); in the Second Reply in the *Meditations* (AT 7:160–1), he explicitly restricted this sense of the term “idea” to instances in which the mind is actually affected by the brain state, refusing to term the brain pattern by itself an “idea” (as he had in the *Treatise* and *Discourse*). And yet in the *Passions* he again uses the term “idea” for brain states that have only physiological effects and that, at the least, are not currently causing a mental state (11:429; see Voss’s n. 36 at AT 11:497, in his translation of the *Passions*). This passage can be rendered consistent with the Second Reply by assuming that a brain pattern can be called an “idea” if it could cause a corresponding mental state, even if it isn’t doing so at a given time (see *Treatise*, AT 11:76–7). On corporeal ideas in the seventeenth century, see E. Michaels and F.S. Michaels, "Corporeal Ideas in Seventeenth-Century Psychology," *Journal of the History of Ideas* 50 (1989), pp. 31–48.
Aristotelians, Descartes reduced the internal senses to three: common sense, imagination, and memory. Somewhat more noteworthy is the fact that, in the Treatise, he did not use the term “internal senses” for these functions. He did not use that term at all. He used a similar sounding phrase to describe the appetites and passions, which he called “internal sensations” (AT 11:163, “sentimens interieurs”), a term also found in the Principles (AT 8A:316, “sensus internos”). But again this fact of terminology is not of great moment.

If he is to mechanize the functions of the sensitive soul, Descartes must explain the cognitive functions listed in the quotation without invoking concepts of representation, intention, content, or an appetitive power that responds to such content (and also of course without consciousness). Forsaking such resources, he must explain how human and nonhuman nervous systems can produce responses that serve the good of the body and avoid harms.

Descartes provided the fullest accounts of his mechanistic theory of behavior in the Treatise and the Passions. He conceived the animal body (including the human body) as powered by the heat of the heart, which agitates the blood, sending it to the brain where subtle matter called “animal spirits” are filtered out at the base of the pineal gland. The gland distributes these spirits to the array of open tubes that line the interior cavity of the brain. These tubes may be opened by motions received through the senses, which cause filaments inside the tubes to be pulled so as to open the tubes; or the spirits themselves may force open the tubes. It can also

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57 On Fernel and others, see n. 34. In the Passions Descartes distinguished different kinds of imagination, including the ability to form images at will (AT 11:344), which most of the Aristotelians canvassed above considered a specifically human ability.

58 Bitpol-Hespériès and Verdet, L’Homme, p. 192, n. 129, have Descartes “deliberately departing” from the standard distinction between external and internal senses, in “announcing” his internal sensations (hunger, thirst, passions). It is more a case of Descartes not using the terminology at all, and using another term, “internal sensations,” to describe internal feelings. As these authors note, in the Treatise and Principles, Descartes grouped the internal sensations together with appetites and passions. In doing so, he agreed with the Aristotelian conception that the passions are responses of the sensitive appetite. In the Passions, Descartes distinguished appetite from passion, redefining the passions as perceptions that engage the appetite, thereby adopting a cognitive theory of the passions as representations of what is good, bad, or novel; see Hatfield, “The Passions of the Soul and Descartes’s Machine Psychology,” Studies in History and Philosophy of Science 38 (2007), pp. 1–35. In the Principles (AT 8A:316) and Passions (AT 11:346), he treats hunger and thirst as appetites; in the Meditations (AT 7:76) he distinguishes between sensations coming from the stomach and the appetitive response that we should eat or drink (see also AT 4:312, 603).
happen that the tube-openings are yoked together so that when one set of tubes open, another is caused to open. Some of the tubes lead to muscles, and when the spirits flow down those tubes they cause the muscles to inflate and to contract, moving the body.

In this scheme, the external senses consist of the material sense organs as connected by sensory nerve fibers to the brain. The seat of the common sense is the pineal gland. Sensory activity causes spirits to flow out from the pineal gland to the newly opened tubules. In this way, in the case of vision, the pattern of light in the retinal image causes a corresponding pattern of tube openings in the brain, and a point-for-point copy of the retinal image is produced on the surface of the pineal gland by the outflowing spirits (AT 11:175–6). The pineal gland in its interaction with the tube openings constitutes the imagination. Tubes previously opened by sensory stimulation are more easily reopened, allowing the brain to cause an image to form on the pineal gland in the absence of sensory stimulation. The tendency of previously opened patterns of tubules to reopen together is also the basis of memory. Appetite consists in the plumbing of the tubes being so arranged that the tugging of the nerves from the stomach when it is dry causes the body to move about and drink liquid if some is present, or, if the stomach is empty, to move about and eat food (AT 11:194–5). In nonhuman animals, in the mindless human body, or in the human body operating without any mental contribution, appetite cannot involve any feeling. The motive power consists in the plumbing of the tubes in relation to the limbs and muscles, so that if spirits flow down some tubes a bodily limb moves in one direction, if they flow down another tube the limb moves a different direction, and so on. The source of such spirits is the pineal outflow, as illustrated in Figure 1, which shows the change in pineal flow necessary to cause the arm to move so as to be pointing at one region of an object rather than another.

Descartes lists four factors that determine the response of the machine to a given set of circumstances: (1) current sensory stimulation; (2) innate plumbing of the brain; (3) alterations to the plumbing due to previous stimulation; and (4) the character of the spirits arriving from the heart, as influenced by recent ingestions of food or drink and by bodily temperament.

59 In the Treatise, Descartes does not explicitly extend the example from food to drink, although he does mention the bodily and neural conditions of thirst (AT 11:164); a passage in the Passions (AT 11:338) countenances this extension.
Figure 1. Brain processes in a mindless machine, shaped like a human. The machine shifts the fixation point of its eyes from C to B, causing its arm to move from alignment with C to alignment with B. The change is mediated by brain events involving optic nerves 3–4, pineal gland H, pineal pores b and c, and opening 8 of a nerve tubule leading to the musculature of the arm. From L'homme de René Descartes, 2nd edn. (Paris: Girard, 1677), p. 74. Private collection.
Let us consider only the first three, focusing for now on (1) and (2).

Current sensory stimulation affects the flow of spirits from the pineal gland as described. Innate plumbing accounts for what Descartes calls “natural instincts” (AT 11:192). Natural instincts can cause human animals to act without intervention from the mind (nonhuman animals always act without such intervention). As illustrated in Figure 2, innate plumbing causes the mindless machine to withdraw the hand, turn the head and eyes toward the fire, wrinkle the forehead, produce tears, and cry out (AT 11:192–3). Such instincts are body-preserving. The bodily machine is built to engage in situationally appropriate (sense-guided) adaptive behavior.

In a letter from 1639, Descartes describes two sorts of instinct. The first is “in us as human beings, and is purely intellectual”; it is the natural light of the intellect, which compels the will to assent to what it reveals. That sort of instinct is irrelevant in the present context. The second “is in us as animals, and is a certain impulse of nature toward the preservation of our body, toward the enjoyment of bodily pleasures, and so on” (AT 2:599). Although Descartes writes that this second sort of instinct “should not always be followed,” in the Meditations (AT 7:80–1) and Passions (AT 11:372) he makes clear that it must often be followed and that it is generally reliable in helping us to avoid bodily harm and to gain bodily benefits. Again, the specifically mental appetites that he calls the “teachings of nature” (AT 7:80) are not relevant to machine psychology, except inasmuch as they are produced by the machine psychology of the brain. (Nerves must be so arranged that, when the skin is damaged, nervous activity is conveyed to the brain, where, by the mind–body institution, it causes pain.) In order to understand Descartes’ machine psychology, we must find mechanistic analogues for appetite that are sufficient to produce appropriate behavior in relation to things that can benefit or harm the body.

In the Treatise, Descartes elaborates on the natural instincts that arise from the innate plumbing of the brain. These instincts cause the machine to engage in “external movements that serve for pursuing desirable things or avoiding harmful ones” (AT 11:193). The notions of “desirable” and “harmful” can have no reference to the mind or mental perception. They are defined in relation to the good of the body as an organized, functionally integrated thing.60 Brain mechanisms alone, unassisted by the mind, must

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60 As noted above, on some interpretations, the notion of the “good of the body” is defined in relation to the mind–body complex or to the designing intentions of the deity.
Figure 2. Brain processes in a mindless machine with its hand in a fire. The action of the fire, which burns the hand, affects sensory nerve fibrils (not shown) that cause nerve tubule 7 to open wide, allowing abundant spirits to flow into it from the pineal gland. These spirits push past N to passage R and on to various muscles that cause the arm to withdraw, the body to pull back, and the eyes to turn toward the fire. Another portion of these spirits pushes past N to passage S, causing corporeal passions suitable to a painful situation along with external signs on the face, such as grimacing and tears. From *L’homme* (1677), p. 87.
be adequate in both human and nonhuman animals to differentially react to things that are “good” and “bad” for the body, as when the machine moves about and imbibes liquid when the stomach is dry, or ingests food when the stomach is empty. If the machine is to perform these actions, the sensory processes of the brain must be such as to respond selectively to potable liquid and to food. In the Passions, Descartes expands the list of things that the machine must be able to detect mechanistically, so as to include “novel” things in the environment, which invoke a brain response prior to eliciting the feeling of wonder in the soul (AT 11:380–3).

Descartes does not offer much detail on how these brain mechanisms operate, but we can imagine that, in the first instance, it is a matter of pre-plumbed pattern matching in the common sense and imagination (see AT 11:391). That is, the machine must come primed to “recognize” food and drink, in the sense of responding appropriately when food and drink are present (and its stomach is empty or dry). Some such responses occur very quickly and automatically, as when a human being blinks at a hand thrust at the eyes (without mental intervention), or puts hands out when falling (again, without mental intervention). In other cases, such as the detection of novelty, it is more difficult to imagine how the mechanism might work, but presumably the spirits proceeding from the pineal gland have a different character when flowing toward a novel pattern.

The machine must also be such as to learn, that is, to change its behavior depending on past patterns of sensory stimulation. Descartes addresses this function under the heading of memory. He attributes learning and memory to nonhuman animals and human animals alike. His examples involve (in effect) establishing associative connections. He appreciated this sort of “learning” in dogs early on, and returned to it late in his career. In a letter to Mersenne of 18 March 1630, he wrote that “if you thoroughly whipped a dog five or six times to the sound of a violin, it would begin to cry and run away as soon as it heard that music again” (AT 1:134). This is

I prefer an account in which the good of the body is defined in terms of its perfection as an organized thing, and the finality involved in its well-functioning is internal finality. See my “Mental Acts and Mechanistic Psychology,” pp. 61–4, and “Animals,” pp. 411–17, 422. (See also n. 52, above.)

61 Blink: AT 11:338–9; hands out: AT 7:230. Scholars have debated whether, through such examples, Descartes invoked the notion of reflex action; for further discussion see Aucante, Philosophie médicale, pp. 291–2, and Hatfield, “Passions of the Soul,” p. 5.

62 Juan Luis Vives, De anima et vita (Basil: Brugis, 1538; reprint, Torino: Bottega d’Erasmo, 1959), pp. 59–60, offered a similar example, saying that if we have heard a sound when we were happy, we will be happy on hearing just the sound again; or if when sad, then we will
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(again, in effect) a description of classical (or Pavlovian) conditioning. In the Passions, Descartes noted that the plumbing of a hunting dog’s brain can be altered through training so as to change its responses to objects:

when a dog sees a partridge, it is naturally disposed to run toward it; and when it hears a gun fired, this noise naturally incites it to flee; but nevertheless, setters are commonly trained so that the sight of a partridge makes them stop, and the noise they hear afterward, when someone fires at the bird, makes them run toward it. (AT 11:370)

Descartes made great claims for the power of memory in mindless machines. He claimed that the functioning of memory would allow his mindless machine, “without there being any soul present” in it, to imitate “all the movements of real men” who are ensouled. This statement is, presumably, hyperbole, as Descartes in the Discourse denied general intelligence and meaningful speech to his machines. But it expresses his belief that a wide range of behavior can be explained by corporeal memory alone.

In the Treatise, Descartes offered an analogy to show how this associative memory might work. He observed that if one uses needles to make a pattern of holes in a linen cloth, then if some of these holes are later forced open, the other holes will be disposed to open at the same time, “especially if they had all been opened together several times and had not usually been opened separately” (see Fig. 3). This mechanism then explains associative connections:

This shows how the recollection of one thing can be excited by that of another which had previously been imprinted in the memory at the same time. For example, if I see two eyes and a nose, I immediately imagine a forehead and a mouth, and all the other parts of a face, because I am not accustomed to seeing the former without the latter; and seeing fire, I am reminded of its heat, because I have sensed this in the past when seeing fire. (AT 11:179)

be sad; and similarly a nonhuman animal, depending on whether a sound was used to call it to dinner or was paired with a beating. Descartes knew the work (AT 11:422).

63 Unlike Chrysippus’ dog at a crossroads, this example is relatively new, as hunting with dogs and shooting at birds on the wing is a practice that arose only ca. 1590, when the hunting gun (the arquebus) became sufficiently accurate: William Arkwright, The Pointer and His Predecessors: An Illustrated History of the Pointing Dog from the Earliest Times, 2nd edn. (London: Arthur L. Humphreys, 1904), pp. 59–61. Chanet, De l’instinct, p. 4, mentions dogs pointing at pheasants as an example of animal learning.

64 French “sentir.” Hall (p. 90) and Gaukroger (World and Other Writings, p. 152) translate this word as “felt,” implying a mental sensation. However, French sentir, like Latin sentire, can mean simply to receive an impression via one of the senses (Petit Larousse,
Because he is speaking here of a mindless machine, the “sensing” in question is restricted to the flow of spirits, leaving aside the sensations that an ensouled human being would feel under such circumstances. Rather, the associative connections of memory, which explain the training of dogs and a portion of human behavior, occur through mechanisms that rely on the simultaneous reopening of pores in the brain.

Paris: Larousse, 1963, p. 961), and the question of conscious feeling then hinges on the meaning of “impression.” Similarly, French sens and Latin sensus can mean the faculty of sense (e.g., the sense organs), or they can mean to perceive and to feel. For this reason, I do not find that Descartes’ letter to More (AT 5:278), granting sensus to animals, decisively attributes feeling to them.
We have reviewed Descartes' mechanistic counterparts, invoking no mental operations, for sense, appetite, and motion. These mechanisms conspire to yield the type of behavior that the sensitive powers produced in the Aristotelian and Galenic schemes: behavior through which animals gain bodily benefits and avoid bodily harms. In mechanizing the functions of the sensitive soul, including cognitive operations underlying instinct and memory, now reconceived to occur without mental trappings, Descartes effectively created a machine psychology. His "clockwork" or "horological" or "automatic" account of the functioning of animals and of the human body was immediately taken up by medical writers and natural philosophers in the Netherlands, Germany, England, and France—and was subsequently revived and discussed on various occasions.65

65 Henry Regius (1598–1679), professor of theoretical medicine and botany at Utrecht, was the first to publicly discuss Descartes' notion of mechanized vegetative and sensory souls (adumbrated in the Discourse, and available in the Treatise, which Regius later saw ca. 1645 [AT 4:567]) in disputations from 1641, on which, see Theo Verbeek, Descartes and the Dutch: Early Reactions to Cartesian Philosophy, 1637–1650 (Carbondale: Southern Illinois University Press, 1992), pp. 13–15. He subsequently published Fundamenta physices (Amsterdam: Elsevier, 1646), which adopts Descartes' mechanistic account of the sensory soul. Descartes later expressed dismay that Regius derived his physics from Descartes in part by obtaining MSS he had withheld from him, and without properly understanding his metaphysics (AT 4:625–7; also, Verbeek, Descartes and the Dutch, pp. 52–4). Moreover, although Regius' commitment to the basic ideas of Descartes' machine psychology is clear, the extent to which his mechanistic foundations actually influenced his medical thought may be questioned, on which, see Gideon Manning, "Naturalism and Un-Naturalism Among the Cartesian Physicians," Inquiry 51 (2008), pp. 441–63. Descartes (AT 4:627) was favorable toward the work of Cornelius van Hogelande (1590–1651), a physician in Leiden who dedicated to Descartes his Cognitiones, quibus Dei existentia: item animae spiritualitas, et possibilis cum corpore unio, demonstrantur: nec non, brevis historia oeconomiae corporis animalis, proponitur, atque mechanice explicator (Amsterdam: Elzevier, 1646), in which he endorsed the view of the animal soul as constituted by subtle, particulate matter in motion (pp. 43–4). Adriaan Heereboord (1614–61), professor of logic at Leiden, introduced Cartesianism to that university (Verbeek, Descartes and the Dutch, ch. 3). He discussed Descartes' mechanization of the vegetative and sensitive souls (together with ideas from other authors) in his Philosophia naturalis (Leiden: Cornelius Drieuhsyen, 1663), in describing standard Aristotelian ideas and alternative opinions; the work displayed an Aristotelian organization, into which Cartesian ideas were fitted: e.g., matter has only the properties of motion, size, shape, position, distance, number, and the like, and "form" becomes the arrangement of particles (p. 31). Despite Descartes' repudiation of Regius, medical authors grouped their positions together, e.g., anonymous Nouveau cours de médecine (Paris: François Clouzier, & Pierre Aubouyn, 1669): on the nature of matter (pp. 14–15); automatic motions (180); no perception in beasts (186); and heart-beat through rarefication of blood (p. 197). On Descartes' physician acquaintances in the Netherlands, see G.A. Lindeboom, Descartes and Medicine (Amsterdam: Rodopi, 1979), ch. 2. On the reception of Descartes' natural philosophy and medical thought in Duisburg, F. Trevisani, Descartes in Germania: la ricezione del cartesianesimo nella Facoltà filosofica e medica di Duisburg (1652–1703), Milan: F. Angeli, 1992. On the spread of Descartes' machine psychology among his followers in England and France and beyond, Hatfield, ‘Descartes’ Naturalism
Descartes’ Anthropology in Light of His Machine Psychology

By the latter part of the sixteenth century, some physics books included a subject called “anthropology,” or the theory of human nature, in two parts, one on anatomy, the other on the functions of the soul. This title and division continued into the seventeenth century and beyond. The rationale for the division was to consider the structure of the body, including the brain and sense organs, in the part sometimes called “somatotomia” or “somatologia,” and to treat the functions of the soul, including the vegetative, sensitive, and rational powers, in the part sometimes called “psychologia” or sometimes “de anima.” The works often included discussion of the nature of the human soul and its relation to the body. Generally, the soul was treated as the form of the human body, although other positions were put forward for debate, including that the soul is simply a part of the human being, together with the body.66

By analogy with these discussions, scholars have discussed Descartes’ anthropology, and especially how his mind–body dualism demanded a new anthropology and whether in fact he ultimately was left with no anthropology, that is, with no coherent theory of the mind–body composite as a single entity or being.

As regards Descartes’ “new anthropology,” Bitpol-Hespériès observes that he reconceived the relations among mind, soul, life, and body.67 In the Aristotelian and Galenic schemes, the body only becomes a human body by being ensouled. As the principle of life, the soul operates throughout the body. It is the same life-giving form that manifests the nutritive, sensitive, and rational powers. In distinguishing the principle of life from soul or mind, Descartes ruptured this connection.68 In Descartes’ anthropo-

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68 As noted above, some scholars hold that, in Descartes’ scheme, the relation to the soul is needed to individuate the body and to support attributions of health and proper functioning to its operations. As previously explained, I interpret Descartes as holding that the body has its own integrity as a natural, functionally characterized entity (whether a substance or simply a thing with a “nature”).
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Let us suppose that a Cartesian anthropology were to be published having, as did the earlier anthropologies, one part on the body and the other on the soul. How would the topics divide? The principle of life, including reproduction, nutrition, and growth, would now go on the body side, while intellectual operations would stay on the soul side. This means that some functions previously treated under “soul” are now put together with anatomy under “body.” However, the simple division between life and mind leaves unclear where the sensory capacities fall. The sensory capacities depend on organs and they support life, which puts them on the body side. But the conscious manifestations of sense perception in human beings require a mind.

In the Aristotelian anthropologies, the anatomy of the senses had regularly been treated on the body side, while the functioning of the external and internal senses, appetite, and motion fell under soul. If we now ask how to make this division in a Cartesian anthropology, we get different answers for animals and humans. In Descartes’ zoology, or theory of animals, the answer is clear: these functions must go on the body side, for animals have no souls. But in his new anthropology, the answer is mixed. Sensory functions cannot fall exclusively to the soul, for sense perception, bodily appetites, and motion all involve complex bodily mechanisms, and they may also involve mind–body union and interaction. Moreover, some sensory functions and some motions belong to the body alone, as in the eye-blink and falling examples and other cases of the body acting without any mental contribution. The mixed nature of these functions becomes especially evident in Descartes’ theory of the passions, in which bodily mechanisms initiate situationally appropriate behavioral responses in human beings prior to any effect on the mind (AT 11:358, 372).

It seems that a Cartesian anthropology should be divided into four parts, not two. The first part would contain anatomy, as in the traditional anthropologies. The second would contain physiology, including the vital functions of growth, nutrition, and reproduction. The third would contain psychology, divided into two subparts. The first division would discuss those bodily mechanisms that do or can operate without any mind–body interaction, yielding a variety of human behaviors. The second division would cover the mental response to brain states, as in felt sensations, perceptions, passions, and acts of memory, and would also include felt appetites and felt bodily motions. Finally, the fourth part would pertain to the mind alone, including intellectual acts and pure acts of volition that have no bodily counterpart.
This anthropology is not defined simply by its dualism and its separation of the principle of life from the soul, which puts physiology on the body side. It contains three additional novel elements: first, a machine psychology of sensitive functions that do or can occur without the mind; second, a psychology of perception and the passions that depends on mind–body union and interaction; and third, a theory that some intellectual operations are body-independent.

Descartes’ dualism and his need for mind–body interaction has led to a second response to his anthropology, which holds that by the end of his career he should not have had one, because he no longer believed that human beings exist (as genuine entities). Stephen Voss has argued that the latent Platonism of Descartes’ earlier years became a radical Platonism in his later years, according to which the body is not essential to the human being.69 The human being is the mind, which is, for a time, intimately connected with a body, but which does not, together with the body, constitute a proper thing.

Descartes would of course resist this characterization of his tendencies (early and late). Indeed, he inserted a stock anti-Platonist phrase into the Sixth Meditation. Platonists were commonly accused by Aristotelian commentators of holding that the soul is not truly united to the body (as it is in the Aristotelian relation of “informing” the body), but rather is simply associated with the body and uses it for a time, as a sailor is lodged in a ship.70 Descartes signaled that, in his conception, the soul or mind is not in the body “as a sailor is present in a ship,” but that the mind is “closely joined” and “as it were comingled” with the body, “so that I compose one thing with it” (AT 7:81). Despite these protestations, in the Fourth Objections Arnauld remarked that the argument for mind–body distinctness in the Sixth Meditation appears “to prove too much” (AT 7:203), saddling Descartes with the view that the body is merely the soul’s “vehicle.” In reply, Descartes stuck to his guns, insisting that, beyond mind-body distinctness, he had also proved that “the mind is substantially united to the body” (AT 7:228). In a letter to Henricus Regius (31 Jan. 1642), he indicates that a whole human being is essentially composed of mind and body: “the union by which the human body and soul are conjoined to each other is

70 The phrase “sailor in a ship” is used to characterize views in which the soul merely uses the body: Toledo, De anima, p. 417; Coimbra, De anima, p. 97; Rubio, De anima, pp. 83, 87. See also Pasnau, Aquinas on Human Nature, p. 94.
not accidental to the human being, but essential, since a human being without it is not a human being” (AT 3:508). He subsequently affirmed that a human being is a “composite being... consisting of a soul and a body” (AT 8B:351). All the same, even Descartes' friends were puzzled over how to understand mind–body union and interaction (e.g., Elizabeth to Descartes, AT 3:661, 684), and in response he effectively said that the case may well be hopeless (AT 3:693).

Fortunately, the problem of how mind and body should be understood as the essential components of a unified human being is beyond the scope of this chapter. But the need for such a theory can reinforce the novelty of Descartes' anthropology. Having made mind and body independent substances, each capable of existing on its own, he cannot rely on the old metaphysics of the soul as the form of the body to explain how they constitute one thing. He needs a new metaphysics. In fact, a similar problem arises on the body side. Having rejected forms as unifying principles for natural bodies and their parts, including the organs found in human and animal bodies, Descartes faced the problem of explaining the unity of natural bodies and animal organs. His solution in that case may have been to appeal to the unified patterns of motion that natural bodies and bodily organs display. In the case of the mind–body composite, a corresponding position would invoke the laws of mind–body interaction as constituting the unity of the human being.

Whether a satisfactory resolution of Descartes' problems on this front is forthcoming or not, I hope to have made clear that he introduced a novel element into the history of thought about animal behavior: the notion of

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71 In this letter, Descartes was counseling Regius on how to defend himself from attack by Gisbert Voët, professor of theology at Utrecht. His advice concerns how Regius should word his responses in order not to be affirming that a human being in itself is an “ens per accidens,” as opposed to an “ens per se” (even if, when body and soul are considered individually as substances, it is “accidental” to each to be conjoined to the other). Despite the subtleties, there is nothing that need be seen as a violation of Descartes' own metaphysical principles. More generally, the letter is an example of how Descartes generally avoided going deeply into scholastic terminology in expressing his position, except when pressed, as also in the Fourth Reply and Comments on a Certain Broadsheet (1648; AT 8A:341–69).


73 Le Grande, Body of Philosophy, 1:325, held that “The Union of Soul and Body consists in an Actual dependency of all the Cogitations of the Soul, upon certain motions of the Body; and of some certain motions of the Body, upon some Cogitations of the Soul” (1:325); the Cartesian philosopher Pierre Sylvain Regis (1632–1707), Système de philosophie: contenant la logique, metaphysique, physique & morale, 7 vols. (Lyon: Anisson, Posuel & Rigaud, 1691), defined the mind–body union as a "physical union" of reciprocal dependence (1:234–5), sustained by God’s occasionalistic laws of mind–body interaction (5:347–8).
a machine psychology of the functions of the sensitive soul. This machine psychology had the effect of dividing not only the principle of life from the soul, but also the principles of animal and (some) human psychology from the mind. He created a “psychology without a soul” well in advance of the nineteenth-century calls for one.\textsuperscript{74}

It is not surprising that in the neighborhood of this novel enterprise there should lurk unresolved metaphysical problems about the mind–body composite. Descartes no doubt felt them keenly. At the same time, his extant writings reveal little concern to solve the problems. Descartes’ greater efforts went into his new physics, physiology, and psychology. Indeed, for Descartes to have worked out a detailed position on mind–body unity in response to metaphysical questions about a “genuine” and “substantial” entity would have been for him to remain in the grip of the old metaphysics, in which the substantial form makes a thing be what it is as a genuine entity. Perhaps rather than dwelling on these topics,\textsuperscript{75} Descartes chose instead to spend his time advancing his new conceptions of life and the mechanisms of behavior.\textsuperscript{76}


\textsuperscript{75} Descartes wrote to Elizabeth (28 Jun. 1643) that, although “it is very necessary, once in one’s life, to have properly understood the principles of metaphysics,” nonetheless “it would be very harmful to occupy one’s understanding frequently in meditating on them, because that would not allow the understanding to concern itself as fully with the functions of the imagination and the senses” (AT 3:695); indeed, Descartes had just informed the Princess that in his studies, he was resolved to spend only a “few hours per year” on thoughts that occupy the understanding alone (as would metaphysics). This advice suggests that, having had the needed metaphysical insights, one should move on from metaphysics to other topics.

\textsuperscript{76} Versions of this chapter have been given at the Mellon conference from which this volume arose; the European Science Foundation Summer School on “The Soul: From the Aristotelian scientia de anima to Early Modern Psychology,” organized through Roudboud University, Netherlands; the Max Planck Institute for the History of Science in Berlin; the philosophy colloquium at the University of Virginia; and the philosophy colloquium at the University of Massachusetts, Boston. I am indebted to these audiences for challenging and helpful comments and discussion, and to Gideon Manning for comments on the penultimate version.