

CHAPTER THREE

MENTAL ACTS AND MECHANISTIC PSYCHOLOGY IN DESCARTES'S PASSIONS

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Descartes posited an immaterial mind to account for much of the psychology of human beings. This mind was the sole natural (as opposed to divine) cause of all purely intellectual acts, the sole agent in acts of will, the necessary condition for conscious or phenomenal sensory and imaginal experience, and the seat of the passions proper. Only the first two acts involve the mind alone: sensory experience, acts of phenomenal imagination, and the passions require mind–body interaction (whether interpreted occasionalistically or as true interaction). Indeed, sensory perceptions, whether of external objects, internal bodily states, or of the sort known as “passions of the soul” (which I’ll call “passions proper” or just “passions”) are the passive effect in the mind of bodily activity in the nerves and brain fluids (“animal spirits”). They are acts of mind (mental states) caused by bodily states.

To account for the “mental life” of human beings—consciously available mental activities or states—Descartes’s scheme required an immaterial mind. However, the thesis of this chapter is that Descartes’s theoretical framework yielded a further set of *psychological* processes and states that involve the body alone. Such processes and states, which occur without any mental contribution, are shared by human and nonhuman animals alike. In Descartes’s view, these processes, as produced by brain mechanisms that direct the flow of animal spirits, explain much of the behavior of all animals, humans included.

According to Descartes’s notorious “animal machine” hypothesis, all the behavior of nonhuman animals is accounted for by mechanical processes alone. These processes, as I interpret Descartes, are devoid of intentionality and sentience proper.¹ Yet Descartes intended such [50] processes to account for the animal capacities and behaviors that, in the Aristotelian scheme, were explained by the “sensitive soul,” or the sensitive power of the animal soul. These

capacities included not only sense perception, but also the limited motivational and cognitive functions that Aristotelians attributed to the sensitive appetites and the “estimative power” in animals. The appetites would direct animals toward things they perceive as good for them and away from things they perceive as bad; the estimative power was to account for simple cognitive acts in animals, as when the sheep perceives the wolf to be an enemy (ST I.81.3).² Although the Aristotelians ascribed such powers to the soul of nonhuman animals, Descartes proclaimed that he could explain such capacities in an entirely mechanistic manner—not only in nonhuman animals but for “very many” human behaviors that “do not depend in any way on the mind” (AT 7:229).³

It is legitimate to speak of a *mechanistic psychology* in Descartes by analogy with the psychology of the Aristotelian sensory soul. The Aristotelian partition of vital capacities into vegetative, sensitive, and rational provided a framework not only for distinguishing the rational capacities of human animals from the limited cognitive capacities of nonhuman animals but also for categorizing their shared behavioral capacities. Sensory discrimination, imaginings of objects not present, memory of sensory patterns, guidance of motion in a manner appropriate to external circumstances and the good of the body, and simple cognitive acts belong to the “sensitive soul” or “sensitive power”; they are shared by human and nonhuman animals alike. Descartes sought to provide a mechanistic account of the capacities within this shared domain of psychological phenomena, by contrast with the nonmechanistic hylomorphism of standard Aristotelianism. In mechanizing the functions of the sensitive power, Descartes effectively mechanized much of the psychology that Aristotelians had ascribed to that power. I say “much of” rather than “all,” because Descartes did not mechanize conscious sensory perception and the passions proper; in his scheme, these require a mind that is acted upon by the brain. Nonetheless, Descartes believed that he could account for the sensitive soul’s primary functions: those that guide animals (nonhuman and human) in behaviors appropriate to their nourishment and health. Aristotelians ascribed these functions to the sensitive capacities of the *anima* or *psyche*, thereby including them within what the seventeenth century sometimes termed “psychology.”⁴

We will examine the mechanistic psychology of Descartes in the *Passions*, while also drawing on the *Treatise on Man*. I will develop the idea of a Cartesian “psychology” that relies on purely bodily mechanisms [51] by showing that he explained some behaviorally appropriate responses through bodily mechanisms alone and that he envisioned the tailoring of such responses to environmental circumstances through a purely corporeal⁵ “memory.” An animal’s adjustment of behavior as caused by recurring patterns of sensory

stimulation falls under the notion of “learning,” behavioristically conceived.⁶ Indeed, Descartes's animal-machine hypothesis may well be a distant ancestor to Watsonian behaviorism, via T. H. Huxley (1884). In the final two sections of the chapter, I take stock of what psychological capacities Descartes ascribed to mind, body, or both, and I also consider those capacities that we might now plausibly construe as being explicable by nonmentalistic mechanisms as opposed to those that at present remain unreducedly mentalistic.

The Function or “Use” of the Passions

In the scholastic Aristotelian scheme of Thomas Aquinas and his followers, the “passions” were so called because they were indeed *passions*: the passive response of the sensitive appetite to the situation as presented by sense perception. In nonhuman animals, the estimative power assesses as good or bad the situation as presented by the senses. The sensory appetite then responds to this presentation (ST II-1.22.2), being drawn toward the good and away from the bad, where “good” and “bad” mean good or bad for the health of the body. In a commonly used example, the sheep's estimative power assesses the sensory perception of a wolf as the presence of a dangerous enemy (ST I.81.3). The sensory appetite then responds with the passion of fear (an animal response to a present evil, according to Aquinas), inducing the sheep to flee the wolf. In the human animal, the “cogitative power” of the sensitive part of the soul plays the role of the estimative power in nonhuman animals (ST I.78.4). However, human beings also possess intellectual appetites (such as the love of God), and they undertake voluntary acts, both of which belong to the rational power and hence are distinct from (but may serve to curb or guide) the passions, which belong only to the sensitive power (ST I.81.2–3, I.82.5).

Aquinas's scheme of the passions—eleven in all (ST II-1.23.4), divided into “concupiscible” (merely appetitive) and “irascible” (appetite involving arduousness)—was widely adopted in the seventeenth century (King 2002, Hatfield 2007c). Descartes knowingly departed from it in various ways (AT 11:379, a. 68). For present purposes, his most important deviation concerns his explanation of the powers the Aristotelians assigned to a sensitive soul, that is, perceiving and assessing the situation and inducing an appropriate [52] behavioral response. In nonhuman animals, to which Descartes denied a “sensitive soul” (AT 11:202), he needed to explain these functions through purely mechanistic processes. Descartes envisioned these processes as involving tubes and fibers and the flow of fluids within the brain and to the muscles, as I explain in the next section.

Importantly, Descartes viewed similar bodily processes as causing the human passions. In his definitional scheme, the human passions are indeed

passions: passive responses in the mind to a bodily action (AT 11:328, a. 2). Without this mental response, there is no “passion,” properly speaking (AT 11:347, a. 25). Thus, nonhuman animals do not have passions, although they do possess the same or similar physiological processes as occur in the human. These physiological processes produce true mental passions in the human case alone. However, we need a term for these physiological processes as occurring in nonhuman animals (and in the human body considered by itself); let us term them “corporeal passions,” so as to distinguish them from mental passions proper.⁷

Even more importantly, Descartes held that, in both human and nonhuman animals, brain processes alone direct the body to flee a dangerous situation such as the approach of a dangerous animal. In the human case, this normally happens without any mental intervention. Purely material brain processes not only cause the mental passion of fear but they also directly cause the fleeing (or other appropriate) behavior. This is what happens when the sensory image of an “unusual and very frightful” animal (AT 11:356, a. 36), such as an approaching bear, is formed in the brain and causes the animal spirits to flow:

just as the course that these spirits take toward the nerves of the heart suffices to bestow the movement to the gland by which fear is put in the soul, so too, solely in virtue of the fact that certain spirits proceed at the same time toward the nerves that serve to stir the legs to flee, they cause another movement of the same gland by means of which the soul feels and perceives this flight—which can in this way be excited in the body by the disposition of the organs alone and without the soul contributing to it. (AT 11:358, a. 38)

In the human case, as described here, the flow of spirits caused by the brain image of the frightful animal produces three effects. Some of the spirits flow toward the heart, and this very flowing of spirits causes the *feeling of fear* in the soul. Some of them flow toward the nerves that *set the legs moving* to flee from the animal. This same flowing of spirits causes the soul to *feel that the person is running*, an act of proprioception that arises from the state of the brain that causes the legs to move. [53]

Although Descartes mentioned cases in which the passion-causing spirits are originally set in motion by a judgment of the soul (e.g., AT 11:375, a. 58), the above passage describes the primary case: the body responds first to sensory stimulation, and its response causes both the initial behavioral response and the passion. In the typical “body first” case, the causal chain is material sensory image → brain state → (bodily action of flight & feeling of fear & proprioception of flight). The person may choose to alter or cease the body’s response, by altering the course of flight or by resisting the tendency to flee. Nonetheless, mechanistic processes alone mediate the initial response to the

dangerous situation. This means that brain mechanisms must discriminate causally between an approaching bear and an approaching person (see next section). In Descartes's "body first" theory of the passions, the type of passion that is aroused on a given occasion depends on the type of brain state that current sensory stimulation induces.⁸

If the passion proper—the mental state—does not serve to initiate a response such as fleeing, what is its use or function? What is it good for? Descartes explains its function quite clearly, while also again affirming the role of the brain in initiating a response:

I note that the objects that move the senses do not excite different passions in us because of all the diversities that are in them, but only because of the different ways that they can harm or profit us, or else in general be important to us; and that the use of the passions consists in this alone, that they dispose the soul to will the things nature tells us are useful and to persist in this volition; as also the same agitation that usually causes them disposes the body to the movements that serve for the execution of those things. [AT 11:372, a. 52]

Again, the relations of causal dependence deserve note. The object does not first cause a sensory experience in us, which then causes a feeling of fear, which then induces us to run. Rather, the object stimulates the sense organs and the brain, thereby causing one or another flow of animal spirits. This flow of spirits differs depending on whether the brain responds to the material sensory image as it usually does when the object is good for us, bad for us, or simply "important" (new or different). This motion of the spirits itself directs the body to respond to the good (approaching it), the bad (perhaps fleeing, or fighting), and the important (stopping and focusing the senses on it). The same flow also causes the passion of fear. The material sensory image also causes a mental sense perception of the object, and the feeling of fear attaches to that object. The [54] passion then affects the will, (defeasibly) causing it to want to do the thing that the body has already started to do.

The function of the passion is in effect to bring on board the mind (or the will) as regards the body-mediated response. The body-mediated responses are set up to respond differently to things that are (usually) good for the body, or bad, or novel. Since the initial bodily response is purely mechanical, it does not involve a cognitive classification of the thing as good, bad, or novel. But the bodily mechanism here takes on the office of the estimative power in nonhuman animals and of the cogitative power in human animals that the Aristotelian scheme describes. The bodily mechanism plays the role of these powers through nonmental mechanistic operations. I characterize these operations as Descartes's "mechanistic psychology": the bodily mechanism must respond differentially to

good, bad, or novel situations, and they must do so in the absence of sentience and of mental representations of the good, the bad, and the novel.

Such bodily processes do not stimulate the sensitive appetite of the soul as in the Aristotelian scheme, for Descartes has banished the “sensitive soul” from human and nonhuman animals alike. In nonhuman animals, these bodily operations do not produce a passion proper at all but set in motion a physiological process (corporeal passion) that plays the body-preserving role that the Aristotelians had assigned to the sensitive soul: causing the body to approach the good and flee the bad. In human animals, the bodily processes cause a passion proper in the mind, and this passion engages the will and moves the mind to affirm and continue the body’s response.

This does not mean that, for Descartes, bodily processes alone determine all human responses to a dangerous animal or all human responses aimed at what is good for the body. Descartes held that the will can override the passion-based response (AT 11:363–4, a. 46); for example, one might decide to stand unmoving rather than to run from a dangerous animal. In such a case, the bodily processes would cause a tendency to run and they would also cause the feeling of fear; the will could override the running but one would still feel the fear (AT 11:362–3, a. 45). More generally, through the intellect a human being might perceive a dangerous situation in the absence of the processes that create the passions and, without ever feeling fear, pursue a course of action to alleviate the danger. Or, in another scenario, the intellect might perceive that (bodily-induced) fear was not a reliable response in a given circumstance and would therefore lead the will to ignore comparable responses, or indeed the intellect might even induce the will to retrain such responses. To understand the bodily responses themselves and the [55] possibility of retraining them, we must enter into the details of Descartes’s mechanistic psychology.

Brain Physiology: Innate and Acquired Responses

Descartes ascribed great abilities to the mindless human body (described counterfactually, without an adjoined mind) and to the mindless bodies of nonhuman animals. He surveyed these various capacities in the *Treatise* (written in the early 1630s and first published in the original French in 1664), and he summarized this description in Pt. 5 of the *Discourse on the Method* (AT 6:55–56). The list of functions is impressive: the reception of material sensory images, their imprinting in the corporeal imagination and in corporeal memory, and the functioning of these brain mechanisms to guide the behavior of the animal machine (in the *Treatise* and *Discourse*, a mindless human body). The *Discourse* explains that in the brain corporeal “ideas” (material brain patterns) are received in the corporeal “common sense” and preserved in the corporeal

“memory.” In the “fantasy” or corporeal imagination, these corporeal ideas can be changed and combined to form new brain patterns. The material brain patterns in the corporeal imagination (as in the common sense and memory) also direct the animal spirits into the nerves that lead to the muscles:

by distributing the animal spirits to the muscles, [the corporeal imagination can] make the members of this body move in as many different ways as the members of our bodies can move without being guided by the will, and in a manner that is just as appropriate to the objects that are presented to the body's senses and to the internal passions that are in the body. [6:55]

The “passions” in this sentence are what I term “corporeal passions.”

Here Descartes claims that brain mechanism alone can guide the mindless human body to situationally appropriate behaviors. The *Treatise* makes an even stronger claim, that the corporeal memory, “without there being any soul in this machine, can be disposed naturally to imitate all the movements that real human beings, or even other similar machines, will make when the soul is present” (AT 11:185). That purely corporeal mechanisms, in the absence of a soul or mind, can imitate *all* the movements of normal, ensouled human beings is a bold claim. We presumably should treat it as hyperbole, since in the *Discourse* Descartes proposed that mindless machines would not be capable of general problem solving or of meaningful speech (AT 6:56–57), to which we may add that such machines would not have conscious awareness nor exercise acts of will. Even so, Descartes in fact held that many motions of the human body [56] “do not depend in any way on the mind,” including basic physiological processes such as “heartbeat, digestion, nutrition, respiration when we are asleep,” but also “while awake, walking, singing and the like, when they occur without the mind attending to them” (AT 7:229–30). Further examples of such actions include extending one's hands when one falls (which, in his view, occurs automatically, without mental guidance), or blinking when something approaches the eyes rapidly (AT 11:338–9, a. 13).

Indeed, Descartes held that, beyond explaining such habitual or reflexive responses, purely corporeal brain mechanisms could explain a great deal more of human (and of nonhuman animal) behavior. In the *Treatise* and the *Passions* he in effect described a corporeal psychology that guides much human behavior. The engine of behavior in the Aristotelian psychology of the sensitive soul was constituted by simple cognitive and appetitive responses to things as good or bad, along with associatively formed habits. We have seen Descartes assert that brain mechanisms by themselves can account for responses to things as good or bad, as with the dangerous animal. Further, his discussions of memory in the *Discourse* and *Treatise* effectively assert that brain mechanisms can explain

behavior-altering associative habits (considered apart from purely mental habits). Let us consider more closely how he thought this might work.

Descartes's mindless human bodies are hydraulic mechanisms fueled by a "fire without light" in the heart that causes the blood to grow hot and expand. The force of the expanding blood powers the machine. The subtler and more forceful particles in the blood proceed through the arteries to the brain, where they are distilled out as animal spirits, which flow from the pineal gland toward nerve tubules. The gland is located in a central brain cavity, and the walls of the cavity are formed by the ends of nerve tubules, some of which are connected to the sense organs, and some to muscles. Those connected to sense organs serve as sensory nerves, which open in response to material influences on the sense organs (such as an image on the retina). As they open, these tubules receive spirits that flow along a rectilinear path from the pineal gland. In the case of vision, Descartes maintained that the pattern of the retinal image is reproduced in the pattern of tubule openings and hence is reproduced on the surface of the pineal gland (Hatfield 1992, Beyssade 2003).

Whether the outflowing spirits are directed by sensory impressions or by a material disposition of the pineal gland (or indeed by the mind, in the case of voluntary motions), they also enter nerves leading to the muscles, which function as motor nerves. These spirits serve as a hydraulic fluid [57] that inflates the muscles (which are like impermeable sacks) causing them to contract, and, as the pressure decreases, to deflate as they elongate again.

The projection of the spirits into the motor tubes and the connections of the tubes themselves (their "plumbing") together produce the various movements of the machine. Hence, we must consider the factors that influence both the flow of the spirits and the plumbing of the brain.

Descartes lists four factors that control the distribution of the spirits to the muscles and thereby control the motion of the machine: sensory stimulation; the innate plumbing of the brain; alterations in the plumbing due to previous sequences of stimulation; and the character of the spirits themselves (lively or sluggish) as sent up from the heart (AT 11:166, 192–3). The last factor can itself be influenced by a current physiological state (e.g., the type of food or drink ingested) and by humoral temperament (11:166–8). Sensory stimulation includes both the external senses, as affected by various environmental situations, and the internal senses, as affected by factors such as the amount of food in the stomach.

The remaining two factors are innate and acquired plumbing. Innate plumbing must account for many basic responses. The machine grimaces and withdraws its hand from the fire because of its innate structure. Further, a mindless human body will, by "natural instinct," pursue "desirable" things and avoid "injurious" ones (AT 11:192–3). As the passages from the *Passions*

quoted in Section 1 imply, the brain is set up so that the image of a dangerous animal, in reaching the pineal gland, naturally induces a flow of spirits that causes the animal to run. The behaviors that result from innate instincts include the pursuit of food and drink and the avoidance of many basic dangers.

Nonetheless, instinct alone cannot fully explain either the behavior of nonhuman animals or those human behaviors that occur independently of the mind. Descartes granted corporeal memory a large role in explaining such behavior (AT 11:185). The purely corporeal memory is an engine of association. As the *Treatise* explains, when corporeal sensory patterns have occurred frequently together, then the occurrence of one pattern will cause the other to arise in the brain: the sensory pattern of two eyes and a nose will evoke the image of a forehead and a mouth, so as to complete the image of a face (11:179). Or the corporeal image of fire will result in the corporeal image of heat (where "image" is not restricted to vision, but includes the sensory patterns that regularly arise in other sense organs in response to environmental stimuli).

According to Descartes, such purely corporeal associative mechanisms can explain various behaviors in human and nonhuman animals in the [58] absence of intervening mental activity. He gave an example of mechanistic "learning" in a dog: "if you 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). Although he did not call this change in behavior "learning," we can conveniently use the behavioristic notion of learning to describe the mechanism posited by Descartes. On a strict behavioristic conception, "learning" is a stable change in behavior as a result of previous sensory stimulation. The behavioristic connotation is appropriate here, because Descartes ascribes this mechanism of behavior change to nonhuman animals (to whom he denies mental states) and to mindless human bodies.

Descartes frequently mentions that the brain mechanisms of association offer us the possibility of training or retraining the passions. The passions themselves are produced as bare psychophysiological effects in the mind. As such, they are governed by an "institution of nature" (AT 6:139) and hence by Descartes's rule that "any given movement occurring in the part of the brain that immediately affects the mind produces just one corresponding sensation" (AT 7:87). According to Descartes, there is a one-to-one correspondence between type of brain state and type of sensation. Since passions are a type of body-caused perception (AT 11:345–8, aa. 22–5), this rule applies to them.

Nonetheless, Descartes contends that passions that initially are caused by one sort of object can become associated with other objects. This can happen through early experience. If an infant is badly frightened by a cat, the infant's brain may be so altered that the sensory image of a cat will ever after be associated with the brain state that causes fear (AT 11:429, a. 136). Such brain-

mediated associations might account for a variety of otherwise inexplicable psychological tendencies. Descartes describes his own tendency to be drawn to cross-eyed women as the consequence of having loved a cross-eyed girl during childhood:

the impression made by sight in my brain when I looked at her crossed eyes became so closely joined with the impression that was also made by her for arousing in me the passion of love that for a long time afterwards when I saw anyone with a squint I felt more inclined to love them than to love any others, solely because they had that defect; and nevertheless I did not know that it was because of that. [5:57]

One brain impression (caused by the girl's crossed eyes) became associated with another brain impression (that which causes a feeling of love). Thereafter, a type of object that did not naturally or innately cause a [59] feeling of love (a cross-eyed person) came to arouse that feeling in him, by means of associative connections between brain impressions.

In the *Passions*, Descartes explained how we could, by forming new habits, alter the connection between a given passion and a specific object. This might happen in either of two ways: through brain–brain reassociations, or through idea–idea associations. The first mechanism seeks to replace an association between a given material impression (e.g., of a cat) and a corporeal passion (e.g., that producing fear) with a different association (e.g., connecting cats and love). If one were afraid of cats, Descartes would presumably diagnose a contingent relation between the brain image of a cat and the corporeal state that causes fear. He might advise us to break that material association by replacing it with an incompatible one: between the brain image of a cat and the corporeal passion that causes a feeling of love. Extending his suggestions in article 45 (AT 11:362–3), we might do this by, in the presence of cats, thinking about things that are associated with love but that are unrelated to fear. We might consider that food easily tames cats, that the person we love loves cats, or the like. These thoughts induce brain states that are incompatible with the brain state that causes fear; because we produce these brain states while we also have the brain image of cat, a new association is formed between brain states, yielding a mechanism through which we feel love rather than fear in the presence of cats.

The second mechanism involves establishing a connection between the mental feeling of a passion and a subsequent mental state. In article 211 (AT 11:485–8), Descartes recommends that if we haven't been able to retrain ourselves by reassociating brain states, we should form a mental habit so that the will intervenes whenever we feel a certain passion. In response to the unhappy consequences of our past states of anger, we might deliberately seek to form habits of the will through which, upon feeling the passion of anger, we

check any violent behavior and also direct our thoughts toward the unhappy results arising from previous actions taken in anger. Descartes did not believe we could directly will strong anger away (AT 11:363–4, a. 46), but he did think we could stay our action (despite the “appetitive” affect of the passions). Once the action is checked, we might then will thoughts of things that would lessen the brain-based state of anger—for example, we could think of an object of love (e.g., the cat), or about the still waters of a quiet pond.⁹ [60]

Descartes's Two Psychologies: Problems and Open Questions

In mechanizing the psychology of the Aristotelian sensitive soul, Descartes claimed to describe brain mechanisms capable of producing situationally appropriate behavior in response to things that were good, bad, or novel. He posited innate mechanisms that “naturally” lead an animal to approach good things, avoid bad things, and train the sense organs on novel things. He also posited corporeal mechanisms of association by which the responses to a given thing could be altered, by realigning the connection between types of brain states (image of a cat → brain state yielding fear) and replacing them with new associations (image of cat → brain state yielding love). In sum, his mechanistic psychology purports to explain innate and acquired adaptive (i.e., life promoting) responses to stimulus patterns.¹⁰

Descartes of course did not hold that all human psychology can be explained in this manner: he excluded rational or intellectual acts, conscious awareness, and acts of will. In order to account for such properly “mental” acts, Descartes posited a mental substance, that is, an immaterial mind, as their vehicle and causal agent. He appealed to an immaterial mind in explaining a portion of human psychology: intellectual cognition, mental appetites, phenomenal experience, and language use. He also attributed other psychological processes or capacities to the mind: in addition to brain-based memory, he posited a purely mental memory (e.g., AT 4:114), and he ascribed habits to the mind that do not depend on the brain mechanisms of association (e.g., 7:438).

There are, then, two sorts of human psychological processes, according to Descartes: purely corporeal processes that govern much behavior, and mental processes that account for certain kinds of cognitive and volitional acts. Some psychological functions, such as memory and habit, occur on both sides of the mind–body divide. Descartes allowed that various phenomena in the domain of “memory” were subject to completely different explanations. He posited both a *corporeal* memory, explained by brain patterns (AT 11:360, a. 42), and *purely mental* habit and memory, depending on the immaterial mind alone (AT 3:48, 7:438). In human beings, corporeal memory may lead to conscious recollection,

as in the recall of past images, but it may also guide behavior without conscious upshot (AT 7:229–30).

Why would Descartes double up his psychological predicates, by tacitly or explicitly invoking notions of mental memory and corporeal memory, mental passions and corporeal passions, mental habits and bodily [61] associations? He did so because of the interaction between two factors: the domain of phenomena he wished to explain and the explanatory resources permitted by his metaphysics. The domain of phenomena requiring explanation was the behavior of human and nonhuman animals alike, including adaptive responses to a current situation and stable changes in behavior in response to patterns of sensory stimulation. The permitted explanatory framework required that he account for the nonhuman animal behavior nonmentalistically. The parallel between human and nonhuman physiology, together with his body-first conception of observed phenomena such as instinctual eye-blink and immediate emotional responsiveness, required that he also explain part of human behavior nonmentalistically. His conclusion that consciousness, intellection, and volition entail an immaterial substance required that he posit a mind to explain at least these human capacities. The phenomena required that certain capacities and tendencies, such as memory and habit, had to be acknowledged in both his mechanistic psychology of physiological mechanisms and in his mentalistic psychology.

Certain psychological capacities, such as conscious sense perception and the passions, depend on mind–body interaction. In his discussions of both the passions and the psychology of sense perception, Descartes made original contributions on both sides of the mind–body divide: in envisioning brain mechanisms (such as those I describe in Section 2), and in describing the psychological processes that yield perception of size and distance. In the field of perception, his work, including his theory of “natural geometry,” generated ongoing theoretical discussion for at least a century after his death (Hatfield 1990, chap. 2; 1992; 2000).

We have seen that, leaving interaction aside, Descartes had to allow sensory capacities and basic cognitive capacities on both sides of the divide. In particular, he had to allow that the functions of the sensitive soul could be carried out by material mechanisms in nonhuman animals and mindless human bodies alike. If we hew strictly to the notion of mechanistic psychology as nonmental and nonintentional, we must then charge Descartes to explain the ability of nonhuman animals and mindless human bodies to respond to “harmful” and “desirable” things without invoking mental or intentional notions.¹¹

There are two problems here, one psychological, one metaphysical. The psychological problem concerns the adequacy of purely corporeal mechanisms

for explaining the simple cognitive functions that Descartes acknowledged among the phenomena that had previously been explained by the sensitive soul. He must now account for these phenomena without invoking the sensitive soul's capacity for perception and discrimination. I [62] believe that Descartes invoked pattern-matching brain mechanisms here, explicating them through patterns of tubule openings or of pineal outflow. These mechanisms would be supplemented by further brain structures to account for the "natural instincts" of the animal machine to respond adaptively to the patterns. Descartes theorized that his machines are so constructed that they often or usually avoid what is in fact harmful to them and obtain what is good for them. It is an open question in Cartesian studies whether these innate instincts are owing to God (through special creation) or are due to nature (through a process in which living things arise out of a primal chaos).¹²

The metaphysical problem concerns the status of "good" and "bad" in relation to unensouled animal bodies, human or nonhuman. Descartes raised this question in the Sixth Meditation, in comparing the human body in any unhealthy state (and without considering its relation to the mind) to a poorly functioning clock. The unhealthy state is one that induces the body to drink even when it is ill with dropsy (so that drink is bad for it). He compares this poor functioning (physiological tendency to drink) with a clock that functions poorly by not displaying the proper time. Notoriously, he then suggests that the good and bad functioning of the clock or the human body are merely "extraneous" notions that our thought imposes on those things rather than having reality "in the things themselves." By contrast, he allows that when the body causes the mind to want a drink in these circumstances, this makes for a true error "in the things themselves" (AT 7:84–5).

A natural way to read this passage is to suppose that, among natural (as opposed to divine) beings, only the human mind can sustain genuine notions of good and bad. The human mind discerns good and bad behavior relative to bodily preservation (and relative to moral standards). So interpreted, the passage implies that nothing is good or bad relative to the body by itself; the end of preserving the body and the notions of what is "good" and "bad" for the body depend on the mind's existence. Of course, Descartes might be able to ground the good and the bad for bodies in the extraneous but real intentions of a designer, just as he grounds good and bad functioning of a clock in the extraneous but real intentions of the clockmaker. But, as is well known, he precludes our considering God's final causes in natural philosophy (AT 7:55), and he also precludes such speculation with respect to the apparent design found in plants and animals (AT 7:374–5).

These passages from the *Meditations* do not match Descartes's intellectual practice in other contexts, for he regularly invokes the "uses" or "functions" of

the parts of animals in a way that seems to ascribe [63] biofunctional teleology to their constitution (AT 11:224, 227, 238). Thus, he suggests that a mindless human body with an empty stomach will rove about until it finds food, and that such a body will seek things “desirable” for it (AT 11:193–5). But since it is mindless, it feels no desire, so in what sense is the food desirable? In the sense (which Descartes frequently invokes) that it is beneficial for the body (AT 11:372, a. 52; 11:519).

One might suggest that, in the case of purely corporeal functions, Descartes invoked the notions of benefit and proper functioning as merely extraneous labels that the theoretical practices of the science of physiology (and of mechanistic psychology) suggest to our thought but that have no reality in things. This conception would be consistent with the Sixth Meditation and with the usual implications of a “mechanistic” world view, that it excludes “final causes” from nature (Henry 1997, 57; Shapin 1996, 29–38).

I would like to offer a different interpretation, which relies on the metaphysical notion of “good” in Descartes. In an Augustinian and Platonic mode, Descartes (AT 4:354, 7:55) treats the good as what is perfect (complete); the bad or evil is what deviates from such perfection (completeness). This notion of relative perfection, or completeness, must surely be in play in the Sixth Meditation passage: the error of the mind in wanting to drink concerns what will harm the body when it is edematous, or reduce its perfection. Now, putting aside the theodical question of whether God, as creator, can be blamed for the errant thirst (the question that frames the discussion of the Sixth Meditation), perhaps we can retain the notion of perfection or completeness in human and nonhuman animal bodies in relation to their own growth and survival. By “retain” I mean *retain as real* for the purposes of natural philosophy.

In the *Passions*, Descartes returns to the clock metaphor and uses it to define death. In article 6, he writes:

death never occurs through the fault of the soul, but only because one of the principal parts of the body becomes corrupt; and 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 11:331–2]

He goes on to explain that the “corporeal principle” of movement of the human body derives from the heat of the heart, which causes the blood to expand and exit the heart with great force (AT 11:33, aa. 8–9). But note that in the quoted

passage he also speaks of “everything that is required” [64] for the action of a machine’s corporeal principle, which must include the orderly disposition of its parts. And note further that the soul leaves the body when some bodily part “becomes corrupt,” that is, loses its proper disposition or functioning. Presumably, the soul leaves not because of some merely nominal or extraneously considered state of the body, but because the body really is broken. (Otherwise, *death* becomes a merely extraneous label!)

On this interpretation, the perfection of an organic body consists in its proper organization to carry out the functions of life, which for Descartes included the usual list of nourishment, growth, and sensory and motor functions (AT 11:201–2). Accordingly, Descartes could define the benefit and harm that animals pursue by natural instinct in terms that are relative to the real perfection of the body: whatever promotes growth, nutrition, and proper functioning. Descartes of course cannot rely on the *telos* of an animating psyche to ground this notion of perfection, as might an Aristotelian. The problem of integrating the notion of proper function into his metaphysics remains an open problem of Cartesian metaphysics. But, we must ask, are we any better off today?

Descartes’s Two Psychologies: Current Status

One advance in our knowledge since Descartes’s day is Darwin’s theory of natural selection. By providing a way of understanding how intricate organisms composed of well-ordered parts might arise from the original chaos, natural selection gives new life to the notions of *function* and *adaptation*.

For the past hundred years, the notion of biofunctional organization has served as the background for much of psychology, including both behaviorism and cognitivism. Whether behaviorists emphasized instinct, as did Watson (1914, 1919), or learning, as did the later Watson (1930, 17) and Skinner (1938), they invoked a notion of biological adaptation and function. They saw the organism as adapted and adjusted to its environment (Skinner 1938, 440), even if they were primarily interested in learned adjustments. Even opponents of nativists must allow that initial sensory and motor capacities and the mechanisms of conditioning are part of an organism’s biological equipment. If we regard Descartes’s mechanistic psychology as a form of protobehaviorism, we ought to allow that Darwin’s theory has advanced the state of discussion on the metaphysics of the functions of the animal machine.

Behaviorist theories, however, are notoriously incomplete in relation to the full domain of psychological phenomena, including perception and [65] cognition. Today’s theorists (in psychology, philosophy, and cognitive science) freely invoke mentalistic notions such as conscious experience and representational content. At the same time, most theorists regard the unreduced

mentalism in Descartes, which took the form of mind–body substance dualism, as undesirable. How far have we come in accounting for the mental by purely material processes? If we consider the general state of play in philosophy of psychology today, the answer is at best mixed. As regards consciousness, there is no actual reduction at present, nor is the road toward reduction visible before us. The same might be said for normative aspects of the mental, such as judgment and knowledge (Hatfield 1990, chap. 7).

By contrast, some contemporary theorists see great hope for reduction of the propositional or intentional contents of thought.¹³ This hope is largely inspired by Dretske's informational account of propositional content.¹⁴ In Dretske's account, information exists in the world as a physical entity, independent of minds. This information is conceived propositionally: it is *information that p*.¹⁵ In the terms of one popular example, the (say) thirty rings in the cross-section of a given tree *bear the information that* the tree is thirty years old. They do so independently of whether anyone understands the relation between tree-rings and years.¹⁶

Dretske and his followers use this notion of information, together with the concept of biological function, to develop an account of mental representation. The details need not detain us. The important point here is that the content of such mental representations derives from informational content. The most promising avenue for naturalizing intentionality (by many lights) rests on the notion that informational content is a mind-independent property of matter or a physical relation of some sort.

Have Darwin and Dretske brought us to the point that we now possess acceptable physical accounts of proper functioning and mental content? It seems to me not. When the notion of information is ascribed mind-independent propositional content, that strikes me as a mentalizing of the physical, rather than a reduction of mental content to something mind-independent and physical. While not everyone would agree, we can all agree that the question of our having adequately reduced even propositional content to something physical remains open.

Further, the question of whether the metaphysics of genuinely functional notions, including the normative notions of function and dysfunction, has been secured through Darwinian theory also remains open. Some, following Wright (1973), believe that Darwinian natural selection sustains notions of bioteological function. Others disagree: they render the notion of function as a matter of functional analysis or explanatory schema¹⁷ and make it “interest relative” what functions there [66] are, thereby returning the notion of well functioning to the status of an “extraneous label.” The metaphysics of biofunctional teleology remains unsettled.¹⁸

Descartes's body of work is ancestral to both of the major traditions in recent psychology, behavioristic and mentalistic. He described a mechanistic psychology in remarkable detail, seeking to account for memory, learning, and situationally appropriate behavior through bodily mechanisms alone. As is better known, he contributed to the psychology of perception, including its mentalistic aspects, in his work on vision, and he identified the domain of conscious phenomena as an explanandum. His work also raised questions regarding the metaphysical basis of biological functions that remained open in his time and remain open still. Although he believed he had solved other metaphysical problems concerning the ontological status of mental phenomena, subsequent philosophy has not accepted his solutions. That his work raised questions that remain unresolved and that it gave some answers that did not stand up, testify to both the astuteness and the difficulty of the questions he posed.

¹ Some scholars, including Cottingham (1998), Gaukroger (1995, 278–90), Morris (2000), and Sutton (2000), interpret Descartes as affirming that nonhuman animals don't have immaterial souls and reflective consciousness while nonetheless ascribing properties of sentience or intentionality to their bodily processes. In this paper I interpret Descartes's "animal machine" hypothesis as denying sentience and intentionality to nonhuman animals (on which, see Hatfield 2007a).

²I cite the text and translation of Thomas Aquinas, *Summa theologiae* (1964–81), using the abbreviation "ST" and the divisions of the work (Part, Question, and Article). The *Summa* was published in manuscript form during the latter part of the thirteenth century.

³ I cite Descartes's works using the pagination of the Adam and Tannery edition (Descartes 1974–76), abbreviated as "AT," followed by volume and page numbers. In citing his *Passions of the Soul* I also [67] give the article number. I am responsible for all translations of Descartes's writings herein.

⁴ As is well known, Aristotelian "psychology" was founded upon the *De anima*—the Latin title for Aristotle's Greek work, *Peri psyches*. This Aristotelian work—or the term for its object, the soul or *psyche*—provided the root word for the term "psychology," the first known uses of which in print date from the sixteenth century (Lapointe 1972). This early psychology (usually labeled in Latin simply as the study of the *anima*) formally included study of the vegetative, sensitive, and rational powers of the soul, all three, although textbook accounts devoted most discussion to the sensitive and rational powers and so were in that way similar to the subsequent eighteenth-century use of the term "psychology" to denote the discipline that examines the sensitive, motor, and rational powers of the soul (Hatfield 1995). Indeed, from the seventeenth century and into the eighteenth, subscription to the Aristotelian notion that the soul is responsible for merely vital ("vegetative") functions was in steep decline. This decline is reflected in Christian Wolff's use of the term "psychology" in its narrower sense (sensory, motor, and cognitive) in his textbooks, *Psychologia rationalis* (1740) and *Psychologia empirica* (1738), and in the explicit distinction made by the Wolffian follower Michael Christoph Hanov (1766) between a science of the soul and a science of *biologia* (his term for the

study of living things), making his the first known use in print of a cognate for the term “biology.”

⁵ The implications of a process being purely “corporeal” are different in the Aristotelian and Cartesian frameworks. In the Aristotelian framework, the functions of the vegetative and sensitive soul are “corporeal”: they are functions carried out by bodily organs as hylomorphically “informed” by the *anima* or *psyche* (Ariew and Gabbey 1998, 427; Hatfield 1998, 956). Here, “corporeal” does not imply “mechanistic.” By contrast, for Descartes “corporeal” implies material, which implies a substance possessing only the properties of size, shape, position, and motion (and hence not possessed of any *telos* such as animates all hylomorphically conceived substances). Therefore, in the appropriate seventeenth-century sense of a “mechanical philosophy,” corporeal implies mechanistic. However, equating these two notions is not without philosophical problems, for a “mechanism” may imply an organization to perform a function (on which, see Hatfield [1992] and Section 3, [68] below). Finally, I should note that in this paper I, as do scholars of the seventeenth-century generally, interpret Aristotelian philosophy as it was (variously) presented and understood in Descartes’ day. This *may* differ from our current best understanding of Aristotle’s own works; indeed, there is controversy over how best to interpret Aristotle’s hylomorphism, conception of matter, and version of the mind–body problem (e.g., Burnyeat 1992, Nussbaum and Putnam 1992). In this paper, I cite Aquinas (13th c.) as a generic Aristotelian account of the functions of the *anima* or *psyche* (see Hatfield 1998 on various early seventeenth-century Aristotelian accounts of sensory perception and their metaphysics).

⁶ Here and throughout I use the term “behavior” with the usual behavioristic connotations. So understood, not all bodily motions count as behavior: e.g., downward motion during free fall is not a behavior, nor is the motion of a sleeping child’s body as it is carried in to bed. The behaviorists provided various definitions of behavior, all emphasizing that behavior is an action or a “doing” of the organism as it interacts with its environment (e.g., Hull 1943, 19; Skinner 1938, 6); the term “action” here does not imply any underlying intentionality but it typically does imply that changes in behavior should be adaptive (on the notion “adaptive” as invoked here, see note 10). Behavioristic notions of learning are sometimes couched in terms of alterations of connections between “effectors” and “receptors,” that is, responses and stimuli (e.g., Hull 1943, 69); the more abstract description I give in the text accommodates the wider range of behavioral learning theories (Estes 1959, 396).

⁷ By viewing these physiological processes as “corporeal passions” we can interpret Descartes’s occasional mention of “passions” in nonhuman animals (e.g., AT 4:353–4) and in the mindless human body (AT 6:55, 11:202) and the human body itself considered independently of mental activity (AT 3:373). This interpretation avoids ascribing the incoherence that Marjorie Grene (1985, chap. 2) finds in Descartes’s theory. [69]

⁸ In this regard, Descartes’s theory of the passions is similar to William James’s (1890) later theory of the emotions. However, although both theories are “body first,” they differ fundamentally because Descartes assigns a cognitive or “appraisal” value to the mental passion proper, whereas James does not (Hatfield 2007b).

⁹ Some scholars, including Voss (1989, viii), Rodis-Lewis (1989, xx–xxi), and Shapiro (2003, 42), maintain that Descartes adopted a principle of “habituation,” according to which the immediate relations between brain states and felt passions can be altered and realigned. My interpretation instead sees any such realignments as mediated by brain–brain or idea–idea reassociations (see Hatfield 2007c for a detailed assessment of the textual evidence).

¹⁰ Descartes spoke of the “preservation” (*conservatio*) of the “healthy man” (AT 7:87) and of bodily actions that tend toward the “benefit” (*commodus, profiteri*) or “harm” (*nuire*) of the animal body (AT 11:372, a. 52; 11:519). The idea that animals tend toward their own preservation, and are functionally adapted to do so, is a commonplace of biological thinking from antiquity. The notion of “function” employed here is that of biological function, which since Aristotle had also been discussed under the concept of the “uses” of the parts of an organism or their contribution toward organic ends. The modifier “adaptive” (in text) means “adapted to fit the circumstances,” whether standing circumstances (as in the instinctual eye-blink, AT 11:338–9, a. 13) or contingent circumstances (as when an empty-stomached body roves about prepared to detect and grasp food, AT 11:194–5). On Descartes’ conception of physiology, see Hatfield (1992). On the pre-Darwinian history of notions of function and adaptedness, see Russell (1916, chaps. 1–13) and Rudwick (1985, chap. 3). On the notion of biological function as used by Descartes in his *Passions*, see the excellent paper by Radner (2003), [70] who (in my view, mistakenly) denies that Descartes employed a notion of adaptation or adaptedness (2003, 175).

¹¹ I have described Descartes’s mechanistic psychology without importing notions such as “representation” or “signification” to describe the relation between brain images and external objects. This accords with the language of the *Treatise*, where Descartes speaks of the “correspondence” between brain states and properties of external objects, such as their distance from the observer (AT 11:183). We might elaborate Descartes’ mechanistic psychology in the language of biofunctional behaviorism, excluding mental terms such as “representation.” But in the *Passions*, Descartes speaks of brain images as “representing” external objects (AT 11:356, a. 35). Did Descartes, like the scholastic Aristotelians, believe that there is mind-independent intentionality, or representation? For instance, do brain images (considered as material patterns) naturally represent objects as being a certain way (e.g., representing object’s shapes by resembling them in shape)? Are some events that are causally correlated also natural instances of “reference”? Or shall we understand these representational relations as depending ultimately on the way in which the mind interprets signs and images, so that, for Descartes, the intentionality is derived only from mind? Arguments can be made on both sides, and the issue deserves further study.

¹² Although Descartes often affirms that animal machines (and machines “like” the human body) are created by God (AT 7:384, 11:120), he also suggests on several occasions that the world and all the bodies in it developed out of a primal chaos (AT 8A:100, 11:31–72), simply as a result of impacts among particles. He explained the formation of the planets in this way (AT 8A:195) and of the Earth’s geological features

(AT 8A:203–31), and he even hinted that plants and animals might arise from “seeds” naturally arising out of the chaos (AT 8A:100). On this topic, see Hatfield 2007a.

¹³Rey 1997, 6–10.

¹⁴Dretske 1981, 1988, 1995.

¹⁵Dretske 1981, chap. 3. [71]

¹⁶Dretske 1988, 55; Tye 1995, 100.

¹⁷Cummins 1975.

¹⁸Ariew, Cummins, and Perlman 2002.

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