

## Cartesian critters can't remember

Devin Sanchez Curry

University of Pennsylvania, Department of Philosophy, 433 Cohen Hall, 249 South 36th Street, Philadelphia, PA 19104-6304, USA



### ARTICLE INFO

#### Article history:

Received 7 October 2017

Received in revised form

12 February 2018

Available online 22 March 2018

#### Keywords:

Descartes

Sensory memory

Animal spirits

Machine psychology

Mind-body union

### ABSTRACT

Descartes held the following view of declarative memory: to remember is to reconstruct an idea that you intellectually recognize as a reconstruction. Descartes countenanced two overarching varieties of declarative memory. To have an intellectual memory is to intellectually reconstruct a universal idea that you recognize as a reconstruction, and to have a sensory memory is to neurophysiologically reconstruct a particular idea that you recognize as a reconstruction. Sensory remembering is thus a capacity of neither ghosts nor machines, but only of human beings qua mind-body unions. This interpretation unifies Descartes's various remarks (and conspicuous silences) about remembering, from the 1628 *Rules for the Direction of the Mind* through the suppressed-in-1633 *Treatise of Man* to the 1649 *Passions of the Soul*. It also rebuts a prevailing thesis in the current secondary literature—that Cartesian critters can remember—while incorporating the textual evidence for that thesis—Descartes's detailed descriptions of the corporeal mechanisms that construct sensory memories.

© 2018 Elsevier Ltd. All rights reserved.

### 1. Memories and mere imaginings

You've lost your keys again. Consider two psychological acts you could perform in order to find them. You could remember where you left them. Or, if your memory fails, you could imagine where you might have left them. In either case, you would bring an idea to bear, such as an idea of keys resting in your coat pocket. In either case, your ability to bring this idea to bear would rely on traces left in your brain by previous sense experiences. Indeed, the distinct acts of memory and imagination might produce apparently identical ideas of keys stowed in coat pockets.

René Descartes famously argued that, while you happen to be a union of body and soul, your “essence consists solely in the fact”

that you are a soul: “a thinking thing” (CSM 2:54; AT 7:78).<sup>1</sup> Nevertheless, Descartes did not believe the psychological acts just described to be purely intellectual functions of your immaterial soul. Instead, he held that remembering (or imagining) where you have (or might have) left your keys is mainly to be chalked up to the operation of physiological mechanisms in your brain. He dissected the heads of various animals in order to unearth these mechanisms.

Despite the success of these dissections, there remains an interpretive puzzle about whether or not Cartesian critters can remember. Although Descartes frequently and enthusiastically attributed the faculty of imagination to nonhuman animals, he conspicuously shied away from unequivocal attributions of sensory

E-mail address: [dcurr@sas.upenn.edu](mailto:dcurr@sas.upenn.edu).

<sup>1</sup> Descartes's writings are cited by the following standard abbreviations.

AT = Charles Adam and Paul Tannery (Eds.) (1964–76). *Oeuvres de Descartes* (Vols. 1–11). CNRS/J. Vrin. Cited by volume and page number.

CSM = John Cottingham, Robert Stoothoff, and Dugald Murdoch (Eds. and Trans.) (1984–85). *The Philosophical Writings of Descartes* (Vols. 1–2). Cambridge University Press. Cited by volume and page number.

CSMK = John Cottingham, Robert Stoothoff, Dugald Murdoch, and Anthony Kenny (Eds. and Trans.) (1991). *The Philosophical Writings of Descartes* (Vol. 3): The Correspondence. Cambridge University Press. Cited by page number.

TM = Thomas Steele Hall (Ed. and Trans.) (1996). *Treatise of Man*. Prometheus Books (Great Minds Series). Cited by page number.

memories—such as your memory of keys resting in your coat pocket—to creatures without souls. As Dennis Sepper writes, “the fact is that Descartes wrote very little about memory, and that little is more enigmatic than clarifying” (1998, p. 295). The enigmatic and sparse state of the textual evidence has given rise to two competing strands of interpretation in the scholarly literature.

According to ‘corporealists’ scholars, Descartes mechanized all of the central functions of the sensitive soul, and thereby explained how soulless animals remember (Clarke, 2003; Gaukroger, 2000, 2002; Hatfield, 2000, 2007, 2008, 2012, 2016; Joyce, 1997; Landormy, 1902; Ott, 2017; Sutton, 1998, 2016).<sup>2</sup> Thus, John Sutton writes that “Descartes is consistent in attributing memory to animals” (2016, p. 490) and that “only intellectual memory is unique to humans: the celebrated beast-machine doctrine does not deny corporeal memory to animals” (1998, p. 74). And Richard Joyce (1997, p. 380) argues that Descartes claimed “that a system with no phenomenological mental states has the ability to remember ... (A plausible view, though not Descartes’s, is that remembering necessarily involves the conscious.)” Corporealists hold that Cartesian sensory remembering is the purview of the body, consisting solely in physiological processes.

‘Incorporealists’ scholars agree that Descartes attributed memories to nonhuman animals in the 1630s, but argue that Descartes later renounced his youthful view and conflated sensory memory with intellectual memory (Des Chene, 2001; Fóti, 2000; Morris, 1969; Scribano, 2016). Emanuela Scribano argues that “the outcome of Descartes’ mature reflections on memory is that brain traces, which he searched for by dissecting animal heads, deserve only metaphorically to be called memory” (2016, p. 146). Animal brains lack a mechanism to render these metaphorical ‘memories’ genuinely past-oriented. Thus, Véronique Fóti writes that in the 1640s Descartes “could no longer recognize a strictly bodily memory that humans would share with animals.” Instead, he came to believe “that animals do not possess genuine memory, but that their behavior attests only to the conditioning of their bodily mechanisms” (2000, p. 598). Incorporealists hold that all genuine Cartesian remembering is the purview of the soul, consisting in acts of the intellect.

I have an intermediate interpretation to offer, according to which Cartesian sensory remembering is the purview of the mind-body union. Corporealists are right that Descartes mechanized the (unconscious) functions of the sensitive soul, including the physiological process of constructing sensory memories. But incorporealists are right that Descartes provided no mechanical means of distinguishing memory from mere imagination. If my arguments are good, both corporealism and incorporealism are false. Descartes held both that remembering necessarily involves the conscious<sup>3</sup> and that sensory memories consist in physiological processes (as opposed to conscious products of intellectual acts)—albeit physiological processes that directly engender conscious feelings and bear the right relationship to conscious acts of reflection. Descartes’s understanding of memory was thus such that he could coherently dissect the heads of animals in order to explain what sensory memories are, while simultaneously denying animals the ability to remember. Humans, as mind-body unions, remember sensory ideas when our souls reflectively recognize that our bodies are reconstructing ideas (rather than merely fantasizing). Insofar as

they lack the intellectual capacity for reflection, Cartesian critters possess the requisite neurophysiological machinery for memory yet cannot remember.<sup>4</sup>

## 2. Memory as reconstruction recognized as such

Both remembering and imagining a past sensation produce a particular idea, such as the idea of keys resting in your coat pocket. Neither of these acts produce the relevant idea out of thin air. They recruit traces that past events have left in your brain, in order to construct an apt image for the situation at hand. The most obvious difference is that imagination sometimes cobbles together fresh images, whereas memory reconstructs previously sensed images. (I will call the latter phenomenon ‘reconstruction.’)

Many renaissance scholastics held reconstruction to be sufficient for remembering (Des Chene, 2000; Edwards, 2013), as did some seventeenth-century philosophers who shared Descartes’s project of mechanizing the sensitive soul, including Pierre Gassendi (1649a, 1649b)<sup>5</sup> and Nicolas Malebranche (1674–1675).<sup>6</sup> However, most early modern European philosophers stressed that remembering necessarily involves an additional element: the reflective awareness that the newly constructed idea closely resembles a previously experienced idea. (I will call this phenomenon—the reflective awareness of a reconstruction as a reconstruction—‘recognition.’) Following Aristotle, Rudolph Goclenius (1613) countenanced recognition as a necessary element of remembering.<sup>7</sup> So did prominent philosophers writing soon after Descartes, including Henry More (1659),<sup>8</sup> Louis de La Forge (1666),<sup>9</sup>

<sup>4</sup> I presume that Cartesian critters lack rational souls. Descartes admitted that it cannot be proved that animals lack souls, “since the human mind does not reach into their hearts” (CSMK 365; AT 5:276–277). Nevertheless, he argued severally that we have (inconclusive) reason to doubt that nonlinguistic animals have souls, since we need not posit souls in order to account for their behavior (CSM 1:139–141; AT 6:55–59; CSMK 302; AT 4:573–576; CSMK 365–366; AT 5:277–279; CSMK 374; AT 5:344–345). Descartes presumed “the fact that animals lack a mind” (CSMK 181; AT 3:370) elsewhere as well (CSMK 148; AT 3:85).

<sup>5</sup> Gassendi (1649a, p. 60): “Nothing [corporeal] acts on itself ... This is the reason that sight cannot see itself or know its vision or apprehend that it sees; nor can any other faculty, which is corporeal, do the like; and moreover, neither can phantasy, which is corporeal, perceive its own imagining or apprehend that it imagines.” Gassendi took memory to be the unreflective corporeal reproduction of ideas (Michael & Michael, 1988; see also note 13 below).

<sup>6</sup> Malebranche (1674–1675/1997, p. 106): “our brain fibers, having once received certain impressions through the flow of the animal spirits and by the action of objects, retain some facility for receiving these same dispositions for some time. Now, memory consists only in this facility, since one thinks of the same things when the brain receives the same impressions.” See Sutton (1998, Appendix 2) for commentary.

<sup>7</sup> Goclenius (1613, pp. 680–681): “Memory is of those things which we have previously known, and notice that we have known, the marks of which are evident, and which without delay arouse our power of remembering. In other words, [in memory] there is a recognition of the thing previously known, as it was known.” (Thanks to Nabeel Hamid for advice on this translation.)

<sup>8</sup> More (1659, §10): “For there is necessarily comprehended in Memory a Sense or Perception that we have had a Perception or Sense afore of the thing which we conceive ourselves to remember.”

<sup>9</sup> La Forge (1666/1997, p. 182): “When some species re-appears on the gland it is always an effect of memory, unless the re-appearance depends completely on the object. But it is not always an effect of remembering. For in order to remember it is not enough simply to perceive a species which comes back again, if one does not also know that this is a re-appearance and that it is not the first time one has had this thought. Thus remembering or the power we have of recalling something consists in our faculty of recalling the original species on the gland and being aware that this is not the first occasion on which it gave us the thought which is present to the mind at the time.”

<sup>2</sup> Corporealists disagree amongst themselves about just how richly sensitive Cartesian automata might be. For example, Sutton (1998) and Gaukroger (2000) interpret Descartes as countenancing purely mechanistic varieties of sentience and intentionality. Hatfield (2008) does not.

<sup>3</sup> Per Joyce, this view is plausible; pace Joyce, it is also Descartes’s.

John Locke (1690/1975),<sup>10</sup> Gottfried Leibniz (1714),<sup>11</sup> and perhaps Thomas Hobbes (1651).<sup>12</sup> According to these philosophers, memories are ideas that you recognize as reconstructions—*aha! I felt my keys in my coat pocket earlier!* Ideas that you do not recognize as reconstructions—*could my keys be in my coat pocket?*—do not count as memories, even when they happen to reconstruct earlier sense experiences.

In this respect, Descartes's understanding of memory was typical of his milieu. Late in life, Descartes provided a five-part analysis of memory. He wrote to Arnauld in 1648 that

If we are to remember (recordemur) something, it is not sufficient that the thing should previously have been before our mind and have left some traces in the brain which give occasion for it to occur in our thought again; it is necessary in addition that we should recognize (agnoscamus), when it occurs the second time, that this is happening because it has already been perceived by us earlier. Thus verses often occur to poets which they do not remember ever having read in other authors, but which would not have occurred to them unless they had read them elsewhere.

From this it is clear that it is not sufficient for memory (memoriam) that there should be traces left in the brain by preceding thoughts. The traces have to be of such a kind that the mind recognizes (agnoscat) that they have not always been present to us, but were at some time newly impressed. Now for the mind to recognize this, I think that when these traces were first made it must have made use of pure intellect to notice that the thing which was then presented to it was new and had not been presented before; for there cannot be any corporeal trace of this novelty. (CSMK 356; AT 5:220)

For Descartes, you remember something if and only if (1) the thing was previously presented to you (2) as a novel idea, (3) that idea made traces in your brain, (4) the traces in your brain led to the thing being presented to you again, and (5) you recognize that the thing was previously presented to you as a novel idea. On the reading I will advance, Descartes held soulless animals incapable of fulfilling conditions (2) and (5), since mechanical brains are equipped to keep track of neither novelty nor familiarity as such.

On Gassendi and Malebranche's broadly Cartesian views, conditions (1), (3), and (4) are jointly sufficient for memory, and poets who accidentally plagiarize do remember the verses they write, even though they fail to recognize themselves as reconstructing old ideas rather than innovating. If Descartes had adopted this simple analysis of memory, then he would have allowed that cats and dogs can remember, even though they cannot recognize their memories (or imaginings) as such.<sup>13</sup> Descartes attributed a variety of sophisticated psychological capacities to the brains of animals, including

the capacity to exploit traces of past experiences to reconstruct corporeal ideas and initiate action routines.<sup>14</sup> Cats physiologically reconstruct ideas of the mice of their past, and “if you whipped a dog five or six times to the sound of a violin, it would begin to howl or run away as soon as heard that music again” (CSMK 20; AT 1:134), reconstructing corporeal associations with (the unconscious aspects of) pain. Descartes thus easily could have attributed memories to Cartesian critters, simply by defining memory as reconstruction.

However, Descartes had substantive reason to eschew this simple analysis. Sensory memory and imagination are different faculties that play different functional roles in human cognition (CSM 2:40; AT 7:57; CSM 1:216; AT 8A:32). Somebody who remembers where they left their keys will confidently retrieve them, or reassure their partner that the keys are safely stowed away. Somebody who merely imagines where they might have left their keys is more likely to waver, even when their fancy has faithfully reconstructed a past sensation. Descartes defined memory as reconstruction plus recognition because he saw no other principled way to distinguish true memories from mere imaginings. Only the reflective capacity of the human soul does the trick. Cartesian critters fail to recognize their occurrent reconstructions as reconstructions, and thus fail to transform them into memories.<sup>15</sup>

In what follows, I square this interpretation with Descartes's sundry claims about remembering, from the *Rules for the Direction of the Mind* (1628) through the *Passions of the Soul* (1649). §3 provides a crash course in Descartes's “machine psychology” (Hatfield, 2007), with an emphasis on the neurophysiology of sensory memory. §4 contrasts three competing interpretations: corporealism, incorporealism, and my intermediate interpretation. §5 concludes.

### 3. Mechanizing the sensitive soul

Nowadays, philosophers and scientists use the term ‘memory’ variously to invoke declarative memory (including episodic memory and semantic memory), nondeclarative memory (including procedural memory), and memory traces, among other mental and neural phenomena (Squire, 2009). On my reading, Descartes taxonomized these cognitive functions in roughly the same way, and denied only declarative memory—the recognized reconstruction of

<sup>10</sup> Locke (1690/1975, p. 150): to remember is “to revive Perceptions, which it has once had, with this additional perception annexed to them, that it has had them before.”

<sup>11</sup> Leibniz (1714/1996, p. 161): “I shall say then that it is sensation when one is aware of an outer object, and that recollection is the recurrence of it without the return of the object; but when one knows that one has had it before, this is memory.” See Jorgensen (2011) for an interpretation that fits this quotation with Leibniz's various other remarks about memory.

<sup>12</sup> Hobbes (1651, p. 5): “This Decaying Sense, when wee would express the thing it self, (I mean Fancy it selfe) wee call Imagination, as I said before; But when we would express the Decay, and signifie that the Sense is fading, old, and past, it is called Memory. So that Imagination and Memory, are but one thing, which for divers considerations hath divers names.”

<sup>13</sup> Gassendi (1649b, p. 441): “Certainly nothing can be more absurd than to think that a dog, for example, says to himself, I imagine that I imagine or something else of this sort.”

<sup>14</sup> Michael and Michael (1989) provide a seminal discussion of the use of the term ‘idea’ in the seventeenth century, with foci on Descartes's early use of ‘idea’ to refer exclusively to corporeal ideas—purely physiological configurations of brain matter—as well as his shift to using the term to refer to any image that appears before the mind. My gloss of Cartesian corporeal ideas can be found in §3, below.

<sup>15</sup> Similar debates about the nature of memory still occupy philosophers in the twentieth and twenty-first centuries. Intellectual heirs of Gassendi and Malebranche support the causal theory that you remember insofar as you reconstruct an idea and the reconstructed idea was causally operative in the reconstruction (Bernecker, 2010; Martin & Deutscher, 1966). Intellectual heirs of Descartes and company support the sense-of-pastness theory that you remember insofar as you reconstruct an idea “and take the relevant experience into account when judging about the past” (Debus, 2010, p. 25; Fernández, 2008). A third theory rejects the presupposition—made by both causal theorists and their opponents—that remembering must be distinguished from mere imagining, and posits that remembering just is imagining the past (Michaelian, 2016). After all, cognitive neuroscience has revealed that Descartes was right that the same brain regions are implicated in memory and imagination, though recent work has suggested that different patterns of activity in the hippocampus underlie the two processes (Addis, Wong, & Schacter, 2007; Kirwan, Brock, Stefania, & Nash, 2014; Schacter et al., 2012).

particular ideas—to animals.<sup>16</sup> Descartes used the term ‘habit’ instead of ‘memory’ to describe procedural memory—acquired skill in motor function, stimulus-response association, pattern detection, and so on—except when the relevant procedure features a declarative memory.<sup>17</sup> Descartes did frequently use ‘memory’ to refer to memory traces—metaphorical stores of ideas in the brain. He also wrote of “the retention or imprint of ideas in the Memory (*la Memoire*)” (TM 113; AT 11:202), using ‘the Memory’ (usually capitalized) to refer to the brain region featuring memory traces. This much is undisputed: according to the machine psychology Descartes developed in the *Treatise of Man* (~1633), *Dioptrics* (1637), and *Passions of the Soul* (1649), soulless creatures exploit traces in the Memory to learn procedures and make sensory ideas available for physiological processing. The principal interpretive question that divides corporealists and incorporealists is whether Descartes identified any of these sensory ideas in animals’ brains with declarative memories.

In 1632, Descartes wrote to Mersenne that “my discussion of man in *The World* [including the *Treatise*] will be a little fuller than I had intended, for I have undertaken to explain all the main functions in man.” Having finished writing about digestion, circulation, and sensation, Descartes had turned to “dissecting the heads of different animals, so that I can explain what memory, imagination, etc. consist in” (CSMK 40; AT 1:263). In the *Treatise*, Descartes presented his neurophysiology as a study of the (apparently) psychological capacities of human bodies, considered without reference to rational souls. He urged that, even without recourse to the rational faculties of understanding and will, the fabulous humanoid automata described in the *Treatise* would be capable of perfectly “imitat[ing] all the movements that real men will make when the soul is present” (TM 96; AT 11:185).<sup>18</sup> In so doing, Descartes rejected the scholastic notion of a sensitive soul, and located the abilities to sense, imagine, and remember squarely in brain matter.<sup>19</sup>

Descartes’s machine psychology was inspired by hydraulic machines found “in the grottoes and fountains in the gardens of our

kings” in seventeenth-century Europe (TM 21; AT 11:130). However, Descartes envisioned animal (including human) bodies to be powered by the rapid flow of fluids finer than water. Following the Galenic tradition, Descartes held “animal spirits” to be produced by siphoning off “the liveliest, strongest, and subtlest parts of ... blood” (TM 17; AT 11:128).<sup>20</sup> Descartes’s metaphors for animal spirits—“a certain very subtle wind, or rather a very lively or very pure flame” (TM 19; AT 11:128)—emphasize the delicacy, speed, and volatility with which they course through nervous systems. Blood and water are too sluggish to be the means by which brains communicate nearly instantaneously with peripheral nerves.

Animal spirits flow downhill from a single source: the pineal gland (where, not coincidentally, Descartes located the mind-body connection). The pineal gland, “situated near the middle of the brain’s substance just at the entrance to its cavities,” receives only the subtlest parts of the blood—animal spirits—from the arteries, coarse parts having been soaked up to “nourish [the brain’s] substance” (TM 19–20; AT 11:128). When arteries pump blood into the brain, they cause the pores surrounding the pineal gland to dilate, and thereby become receptive to the backflow of animal spirits. Upon reaching the highest peak of the pineal gland, refined animal spirits perform an about-face and flow back through “the fibrous mesh of the brain substance,” “whence they spill out into all the nerves.” The constant flow of animal spirits from the pineal gland to the nerve endings at the tips of fingers and toes serves to “keep all the filaments that compose the nerves and the brain so tense that even those actions that have barely force enough to move them are easily communicated from one of their extremities to the other” (TM 84; AT 11:174). A pinprick to an animal’s toe causes nerves, taut with animal spirits, to yank open the relevant pores in the brain, calling the pineal gland to attention.

### 3.1. Sensation

The most developed part of Descartes’s hydraulic neurophysiology is his theory of sensation, and specifically his optics.<sup>21</sup> Descartes famously denied the Aristotelian assumption that sensations must directly resemble their objects. He proposed that the task of the philosopher of perception “is to know simply how [the images formed in our brain] can enable the soul to have sensory perceptions of all the various qualities of the objects to which they correspond—not to know how they can resemble these objects” (CSM 1:166; AT 6:113–114). How can corporeal ideas represent their particular objects without (necessarily) physically resembling them?<sup>22</sup> For starters, the physiology of sensory representation approximates the physiology of pain responses. Corporeal representation involves the pineal gland—yanked to attention by the object of sensation—appropriately adjusting the volume and velocity of animal spirits coursing from its surface. Consider Diagram 50 from the *Treatise*.

<sup>16</sup> On this usage, declarative memory includes episodic memory—the recollection of episodes or states of affairs—and semantic memory—the recollection of facts, concepts, or meanings. For Descartes, on my reading, each of these kinds of recollection consists in the reconstruction of ideas (of previously cognized episodes, states of affairs, facts, concepts, or meanings), and counts as memory only insofar as it is recognized as a reconstruction. Episodic memory is the purview of mind-body unions, whereas semantic memory is the purview of pure intellects.

<sup>17</sup> For example, the lute player’s memory of passages (CSMK 146; AT 3:48) might be considered an instance of procedural memory, but Descartes only calls it ‘memory’ because it crucially involves the recognized reconstruction of particular ideas. When discussing instances of procedural memory that do not involve clear-cut declarative memories, such as the dog running from the violin (CSMK 20; AT 1:134) or the human controlling her passions (CSM 1:348; AT 11: 368–370), Descartes sometimes invokes ‘the Memory,’ but never explicitly calls procedural memories ‘memories.’ Instead, he speaks of ‘habits’ (CSM 1:344; AT 11: 361–362).

<sup>18</sup> Drieux (2016) provides a close reading which highlights the ambiguity of this passage.

<sup>19</sup> Descartes announced that *The World*, like other texts discussing his machine psychology, should be read as a fable: a model presenting how the material world could be, rather than an assertive description of actuality. There is reason to believe that this disclaimer was a facetious smoke screen, since Descartes told Mersenne in 1633 that he suppressed publication of *The World*—in which he “decided to explain all the phenomena of nature, that is to say, the whole of physics” (CSMK 7; AT 1:70)—after the church censured Galileo’s *Dialogue Concerning the Two Chief World Systems*, since “for all the world I did not want to publish a discourse in which a single word could be found that the Church would have disapproved of” (CSMK 41; AT 1:271). Even if Descartes sincerely meant the mechanistic details presented in the *Treatise* to be taken only as a model, his overarching metaphysical system ensures that the construction of sensations, imaginings, and memories must be mechanized somehow or other. After all, soulless animals in the real world have sensory ideas.

<sup>20</sup> Despite their name, animal spirits are modes of material—not mental—substance.

<sup>21</sup> Descartes distinguished three grades of sensation (CSM 2:294–296; AT 7:437–439). The physical sensations I discuss in this section are of the first grade. Second grade sensations are the qualitative experiences that arise directly from physical sensations (in mind-body unions). Third grade sensations are intellectual judgments based on first/second grade sensations, such as the reflective recognition that an idea is a reconstruction. Useful discussions include Garber (1993), Simmons (1999, 2017), Chignell (2009), and Koivunniemi and Curley (2015).

<sup>22</sup> Descartes countenanced both particular ideas (generated by the brain) and universal ideas (in the mind). Neither kind of idea is guaranteed to resemble its object.

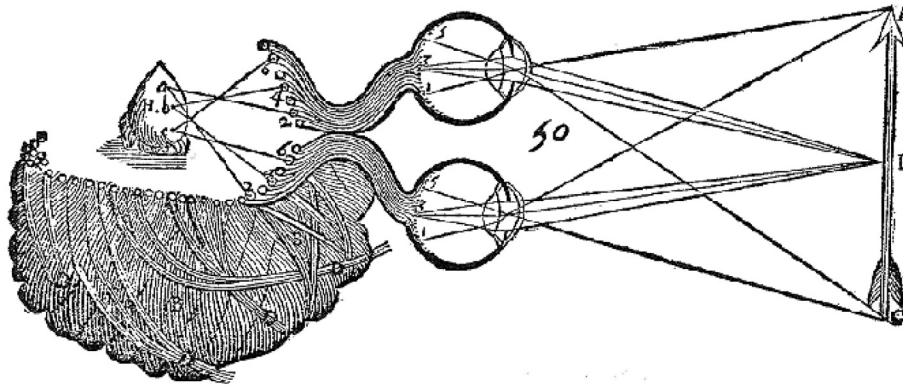


Diagram 50.

Light rays bounce off points A, B, and C on the arrow and “exert pressure on the back of the eye.” The optic nerves which connect the eyes to the pineal gland (H) comprise many filaments, including those labeled 1–2, 3–4, and 5–6. Because these filaments are taut with animal spirits, the slightest pressures “pull the whole of thread 1–2 [& 3–4 & 5–6] and enlarge the opening of the tubule marked 2 [& 4 & 6] (TM 84; AT 11:175),” allowing the filaments to receive animal spirits from the pineal gland “more freely and rapidly,” per lines a–2, b–4, and c–6. Finally, “the spirits ... draw the gland after themselves a little, and cause it to lean if it is not otherwise prevented from so doing; so that, changing the position of its pores, it begins to conduct a much greater quantity of spirits through a, b, and c to 2, 4, and 6 than it did before” (TM 97; AT 11:185). Thus, rather than transmitting an intact image, the light from the arrow sets off a chain reaction culminating in a specific pattern in the pineal gland’s distribution of animal spirits, which mirrors the retinal pattern in its two-dimensional order. This patterned flow of animal spirits is the brain’s corporeal sensation of the arrow.

Corporeal sensations that physically represent—and enable souls to intellectually represent—material objects are four steps removed from, and should not be assumed to resemble, the visual properties of their objects. The visual properties of the arrow (A, B, and C) are physically represented at one remove by retinal images (1, 3, and 5), at two removes by enlarged openings of tubules (2, 4, and 6), at three removes by the lean of the pineal gland, and at four removes by the faster and freer pattern of flow from points on the pineal gland (a, b, and c). Descartes wrote that “among these figures, it is not those imprinted on the organs of external sense [the retinal images], or on the internal surfaces of the brain [the opening of the tubules], but only those traced in spirits on the surface of gland H, where the seat of imagination and common sense is, that should be taken to be ideas, that is to say, to be the forms or images that the rational soul will consider directly when, being united to this machine, it will imagine or will sense any object” (TM 86; AT 11:176). Descartes did not consider retinal images or enlarged tubules—intermediaries between external world and pineal gland—to be sensations. Patterns in the flow of animal spirits from the leaning pineal gland are the only sensations that allow souls to represent material objects. While patterns of flow correlate with the shape, “movement, size, distance, colors, sounds, odors, and other such qualities” of objects (TM 85; AT 11:176), they need not resemble these qualities. Animal spirits do not flow redly, loudly, or stinkily, but from different points, with varying gradients of subtlety and agitation of matter, in lesser or

greater quantities with lesser or greater intensities. Ideas representing different objects vary solely in accordance with these four variables: release point, subtlety gradient, volume, and velocity (TM 75; AT 11:169).

### 3.2. Imagination

Physical sensations are one kind of corporeal idea: animal spirit surges generated in response to light impinging on the eyes, ears, nose, tongue, or skin. But animal spirits sometimes flow in the absence of outside forces. As Descartes remarked, corporeal ideas “are all to be attributed to the common sense when they depend on the presence of objects, but ... can also proceed from several other causes ... and should then be attributed to imagination” (TM 87; AT 11:176). Descartes’s term ‘imagination’ encompasses all sensory ideas that are not caused by physically present external objects. Some imaginings are amalgams of previous ideas, and do not represent any previously sensed object. Others are more or less faithful reconstructions of previous patterns of flow of animal spirits.<sup>23</sup>

Humans can will themselves to conjure up new ideas or recall old ones. When you concentrate on finding your keys, your willful soul compels your pineal gland to lean appropriately, releasing the patterned flow of animal spirits that constitutes your imagined or remembered idea. Animals, alongside the humanoid automata of the *Treatise*, lack souls and therefore lack willpower. But soulless machines do not lack the faculty of imagination; they too form ideas in the absence of objects. Daydreaming is a variety of unwilling imagination; even automata sometimes “let their fancy wander listlessly here and there without external objects diverting it and without the fancy’s being directed by reason.” When daydreaming, the pineal gland releases novel patterns of animal spirits: unprecedented combinations of velocity, volume, subtlety gradient, and release points. Often, these new combinations are amalgams of old combinations—ideas of lions, snakes, goats, horses, and eagles—and thereby represent imaginary monsters such as “chimeras and hypogryphs” (TM 96; AT 11:184). Daydreamers are capable of drawing on previous sensory ideas to dream up these imaginary creatures because old ideas are traced in their Memory folds.

<sup>23</sup> Sepper (1998) provides an in-depth treatment of Descartes on imagination.

### 3.3. Memory

Descartes described “the internal part of the brain” (labeled ‘B’ in Diagram 50) as “the seat of the *Memory*” (TM 88; AT 11:178).<sup>24</sup> Descartes doubted that the pineal gland could construct abominations like chimeras and hypogryphs on its own. He wrote to Mersenne in 1640 that imaginative humans “would not have the great facility which they have in imagining an infinity of things which they have never seen, if their souls were not joined to some part of the brain that was very well equipped to receive all kinds of new impressions, and consequently very ill equipped to preserve them” (CSMK 145; AT 3:47–48). The pineal gland sacrifices the ability to retain ideas for greater flexibility in creating ideas. The Memory is the storage space required to supply the pineal gland with subject matter beyond immediate sense impressions.

As with idea creation, the mechanisms of idea retention and reconstruction revolve around differential flows of animal spirits. The pineal gland pumps animal spirits, not only through tubules connected to sense organs, but also “into the pores or intervals that occur between the filaments composing part B of the brain” (TM 87–88; AT 11:177). Ideas send different volumes of animal spirits at different velocities into different pores in the Memory. While physically resistant to new ideas, the Memory slowly but surely becomes receptive to oft-repeated ideas. If a faint new idea is formed on the pineal gland, its flow of animal spirits leaves the Memory more or less as it was, because the pores associated with that idea remain narrow and rigid. Spirits bore their way into the Memory folds “increasingly effectively in the measure that their action is stronger, or lasts longer, or is more often repeated.” When an idea has released a strong flow of spirits on many occasions, the traces left in the Memory “are no longer so easily erased, but are retained there in such a way that by means of them the ideas that existed previously on this gland can be formed again long afterward, without requiring the presence of the objects to which they correspond” (TM 88; AT 11:178). Persistently recurring ideas rearrange the filaments in the Memory, forcing the relevant pores to become wider and looser.

Descartes concluded this discussion by claiming that “it is in this that the *Memory* consists” (TM 88; AT 11:178). He thereby identified the state of the Memory being amenable to receiving certain ideas—patterned flows of animal spirits—with the retention of those ideas. To make sense of this identification, Descartes invoked a few analogies. He noted (with regard to the following image reproduced from the *Treatise*) that “if one were to pass several needles or engravers’ points through a linen cloth as you see in the cloth marked A, the little holes that one would make would stay open as at *a* and at *b* after the needles had been withdrawn; or if they closed again, they would leave traces in this cloth, as at *c* and at *d*, which would enable them to open quite easily again” (TM 89; AT 11:178–179).

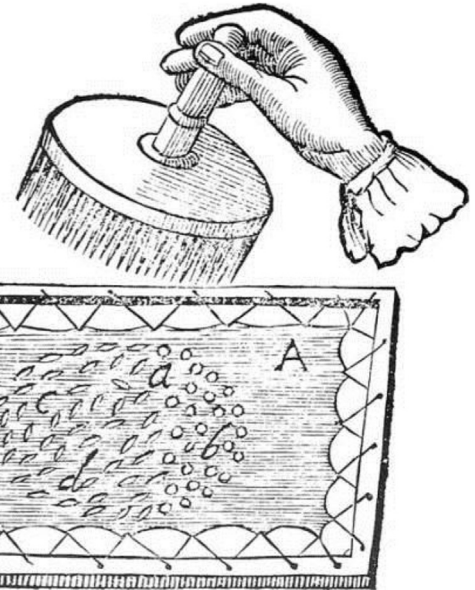


Image of Linen Cloth with Traces.

In a letter to Meyssonier in 1640, meanwhile, he wrote that “the impressions that are preserved in the Memory ... are simply like the folds that remain in this paper once it has been folded” (CSMK 143; AT 3:20; cf. CSMK 233; AT 4:114). Finally, Descartes wrote to Arnauld in 1648 that “we say that there are no human tracks in the sand if we cannot find any impressions shaped like a human foot, though perhaps there may be many unevennesses made by human feet, which can therefore in another sense be called human tracks” (CSMK 356–357; AT 5:220). The cloth does not permanently store the holes, nor the paper the fold, nor the sand the tracks. Nevertheless, the cloth carries the disposition to reopen old holes, the paper carries the disposition to refold along original fault lines, and the sand carries the disposition to receive familiar feet. By analogy, Descartes denied that the Memory stores memories, in the sense of retaining discrete figures in its folds. Instead, the Memory dispositionally preserves memories, in the same sense that the cloth and paper and sand dispositionally preserve their holes and folds and tracks. The brain reconstructs ideas in virtue of being disposed to receive well-worn ideas more readily than it receives novel ones.<sup>25</sup>

The pores of part B of the brain are no different than the other bodily pores through which animal spirits travel. Indeed, in 1640 Descartes wrote to Mersenne that “all the nerves and muscles can also be so utilized” to retain corporeal ideas; “a lute player, for instance, has a part of his memory in his hands: for the ease of bending and positioning his fingers in various ways, which he has acquired by practice, helps him to remember the passages which need these positions when they are played” (CSMK 146; AT 3:48; cf.

<sup>24</sup> In the *Treatise*, Descartes consistently used the capitalized (and sometimes italicized) term ‘la *Memoria*’ to refer to the part of the brain responsible for the storage of memory traces. Elsewhere, he used the lowercase term ‘*memoria*’ to refer to declarative memories—reconstructed corporeal ideas that, like all corporeal ideas, are patterns in the flow of animal spirits from the surface of the pineal gland—and used the term ‘*plis de mémoire*’ to refer to memory traces. However, Descartes used the lowercase ‘*memoria*’ only twice in the *Treatise*. The first instance refers to memory traces (TM 83; AT 174). The second instance may refer to declarative memory, but does not ascribe *memoria* to the automata under discussion (TM 107; AT 195).

<sup>25</sup> Descartes’s treatment of corporeal memories parallels his treatment of innate ideas. In the *Comments on a Certain Broadsheet*, Descartes wrote that innate ideas should not be thought of as immortally stored in the mind, but rather as innate in “the same sense as that in which we say that generosity is ‘innate’ in certain families, or that certain diseases such as gout or stones are innate in others: it is not so much that the babies of such families suffer from these diseases in their mother’s womb, but simply that they are born with a certain ‘faculty’ or tendency to contract them” (CSM 1:303–304; AT 8B:358). In short, to have innate ideas is to be innately disposed to have those ideas, just as to store memories is to become disposed to reconstruct ideas. As I suggest in §§4.2–4.3, Descartes likely understood the intellectual capacity to recognize ideas as reconstructions to be analogously dispositional.

CSMK 143–144; AT 3:20). Lute players' fingers are more receptive to animal spirits than undexterous people's fingers, leading lute players' pineal glands to be more likely to release spirits in patterns that constitute ideas of musical refrains for their fingers to pluck. Descartes even extended the ability to preserve ideas beyond the body. He declared that "when we have read a book, not all the impressions which can remind us of its contents are in our brain. Many of them are on the paper of the copy which we have read" (CSMK 146; AT 3:48). Rereading a book gives rise to the same sensations entertained on the first read. Just as the connection between the pineal gland and the neurological Memory facilitates repetition, access to the written word disposes us to reconstruct certain ideas again and again.

There is an apparent tension between Descartes's endorsement of the embodied and extended Memory and his later analysis of memory. Conditions (3)—that the original idea leave traces in one's brain—and (4)—that the traces in one's brain lead to the recurrence of the idea—of his analysis seem to require that memory traces be situated in brains. Either Descartes rescinded belief in the embodied and extended Memory by 1648, or he intended to require only that the original idea leave traces somewhere suitably accessible to the rememberer.

There are a couple of reasons to prefer the latter interpretation. First, Descartes countenanced intellectual memories which leave incorporeal traces in souls (CSMK 148; AT 3:84–85; CSMK 233; AT 4: 114), so he was generally open to the possibility of non-neural memory traces. More pertinently, Descartes was committed to the view that "nature always acts by the simplest and easiest means" (TM 113; AT 11:201). The aim of his neurophysiology was to demonstrate that "it is not necessary to conceive of any vegetative or sensitive soul or any other principle of movement and life than [the animal machine's] blood and its spirits, agitated by the heat of the fire which burns continually in its heart and which is of no other nature than all those fires that occur in inanimate bodies" (TM 113; AT 11:202). Descartes set out to prove that nutritive and sensitive functions—including sensory memory—could be carried out by the same deterministic motions that characterize whirlpools and the flight of arrows and other phenomena of the material world. Given this project, Descartes was right to deny that only gray matter can retain traces of corporeal ideas. Descartes expected most memory traces to be located in part B of the brain, but his mature neurophysiology also allowed neural machines to be hooked up to (mechanistic) limbs and environments such that peripheral nerves and written notes could retain memories as ably, if not as immediately, as the brain's Memory. Indeed, Descartes may have counted fingers, books, and even other organisms as literal extensions of the Memory itself, insofar as they feature memory traces.

Regardless, Descartes's paradigm case of remembering involves the willful exploitation of traces in the folds of the brain's Memory. Descartes described this process at some length in the *Passions*:

when the soul wants to remember something, this volition makes the [pineal] gland lean first to one side and then to another, thus driving the spirits towards different regions of the brain until they come upon the one containing traces left by the object we want to remember. These traces consist simply in the fact that the pores of the brain through which the spirits previously made their way owing to the presence of this object have thereby become more apt than the others to be opened in the same way when the spirits again flow towards them. And so the spirits enter into these pores more easily when they come upon them, thereby producing in the gland that special movement which represents the same object to the soul, and makes it recognize the object as the one it wanted to remember. (CSMK 1:343–344; AT 11:360)

Willful remembering involves trial and error. When humans ransack their brains for a memory, their pineal glands lean this way and that, releasing animal spirits willy-nilly until they stumble upon the correct pattern of release points, subtlety gradients, volumes, and velocities. Better remembered ideas are easier to stumble upon, since the Memory is more receptive to their unique flow.

Humans also remember idly. A reconstructed image of your keys resting in your coat pocket may pop into your head at any moment, unbidden. Descartes held that in such cases the pineal gland "is inclined in one direction by the force of the spirits alone, without the aid of the rational soul or of the external senses." If, "at the region of the brain toward which the gland is inclined, the shape of one particular object is imprinted more distinctly than any other, the spirits tending to that region cannot fail to receive an impression thereof. And it is thus that past things sometimes return to thought as if by chance and without the Memory of them being excited by [either] any object impinging on the senses" or any act of the will. Our pineal glands sometimes happen to reconstruct ideas irrespective of whether we want to remember. More frequently, though, when humans let their minds wander "several different figures are traced in this same region of the brain almost equally perfectly" (TM 96; AT 11:184), producing imaginary mishmashes like chimeras and hypogryphs.

#### 4. Three interpretations of Descartes on sensory memory

Cartesian cats and dogs lack the ability to will themselves to remember, but their fancies do wander. Although the pineal gland swaying of its own accord usually results in the creation of obviously imaginary ideas, it sometimes results in true memories, even in the brains of soulless animals. Or so goes the corporeal interpretation of Descartes's theory of sensory memory.

##### 4.1. Corporealism

Corporealists emphasize Descartes's descriptions of the neurophysiological processes that suffice for the reconstruction of ideas. For example, he wrote (well into the 1640s) of "the corporeal memory, whose impressions can be explained by these folds in the brain" (CSMK 151; AT 3:143), and that "the motion of these brain particles leaves behind the traces on which memory depends" (CSMK 190; AT 3:425). Indeed, Descartes boasted that "the effect of the Memory that seems to me to be most worthy of consideration here consists in [the fact] that without there being any soul in this machine it can be naturally disposed to imitate all the movements that real men (or many other, similar machines) will make when the soul is present" (TM 96; AT 11:185). He concluded the *Treatise* by asking his readers to consider that functions such as "the retention or imprint of [sensory] ideas in the Memory ... imitate those of a real man as perfectly as possible and that they follow naturally in this machine entirely from the disposition of the organs—no more nor less than do the movements of a clock or other automaton, from the arrangement of its counterweights and wheels" (TM 113; AT 11:202). The Cartesian brain is equipped to retain memory traces and reconstruct memories like fabulous hydraulic clockwork, interventions by the rational soul notwithstanding. Corporealists, citing Descartes's passionate testaments to the sensitivity, flexibility, and creativity of soulless automata, argue that "this is not 'memory' in any derivative sense: this just is (corporeal) memory" (Sutton, 1998, p. 74).

Much of the textual evidence does favor the corporeal view that Descartes attributed sensory memories to animals, but for a couple of snags. Here is the first snag: Descartes never unequivocally claimed that critters can remember. As illustrated in §3, he

maintained that memories *consist in* patterns in the flow of animal spirits from the surface of the pineal gland which, facilitated by traces in the folds of the Memory, reconstruct sensory ideas. But he conspicuously avoided explicitly identifying reconstructed ideas, in either animal or humanoid automata brains, as memories.

The second snag is that no mechanism supported by Descartes's physics could distinguish true memories from mere imaginings.<sup>26</sup> Corporealists err in inferring attribution of memory from attribution of reconstruction. Mere imaginings can consist in the same patterns of animal spirits—the exact same images—as memories, and are facilitated by the same traces in the folds of the Memory. Crucially, imaginings are sometimes reruns too. The question of whether your idea of keys in your coat pocket is a memory or mere imagining is not settled by the fact that a physically identical sensory idea previously left traces in your Memory. Instead, as discussed in §2, Descartes argued that remembering necessarily involves the reflective recognition that a reconstruction is a reconstruction.

An ecumenical corporealist might allow that Descartes was concerned to distinguish reflective remembering from mere reconstruction, but insist that Cartesian critters nevertheless remember insofar as they reconstruct ideas.<sup>27</sup> To see the crux of this reply, consider three idealized psychological events: (a) utterly novel imagination, (b) reconstruction without recognition, and (c) reconstruction with recognition. For example, a poet could (a) devise brand new verses, (b) deliver somebody else's verses without realizing they are plagiarizing, or (c) recite verses and recognize having previously heard those verses. The ecumenical corporealist and I agree that (a) is a case of mere imagining, and (c) is a case of distinctly human remembering. The contentious issue is how to categorize cases like (b). Does reconstruction suffice for memory, or is something more needed?

Ecumenical corporealism is worthy of serious consideration; perhaps Descartes wanted to distinguish reflective remembering—a variety of sensory remembering only found in humans—from unreflective remembering—which is found in other animals too.<sup>28</sup> Descartes's goal in the *Treatise* was to demonstrate that un-ensouled human bodies can perform an impressive range of apparently intelligent activities. Many apparently intelligent activities are enabled by animal spirits boring traces into the Memory and subsequently exploiting those traces in order to reconstruct ideas. Still, the two snags provide evidence that Descartes did not classify cases like (b) as memories. Even in his neurophysiological works, Descartes never explicitly called cases like (b) 'memories'; on the contrary, he explicitly insisted that "verses often [re]occur to poets which they do not remember" (CSMK 356; AT 5:220). On my reading, Descartes refrained from calling mere reconstructions 'memories' because he understood sensory memory and imagination to be functionally differentiated.

<sup>26</sup> Twentieth and twenty-first century philosophers who define memory as reconstruction tend to rely on the causal history of a reconstruction to mark it as a memory rather than mere imagining. It is unclear how causal histories could play this kind of metaphysically individuating role in the context of Descartes's austere corpuscularian physics, though an anonymous reviewer has intriguingly suggested that Descartes could be seen as anticipating embodied and extended versions of the causal theory of memory (as proposed by Sutton & Windhorst, 2009).

<sup>27</sup> Thanks to an anonymous reviewer for suggesting this middle way between strong corporealism and my intermediate interpretation.

<sup>28</sup> Stephen Gaukroger pursues just such an ecumenical corporealism. Gaukroger steadfastly supports the claim that Cartesian critters remember (2012, pp. 204–206, 217), but also allows that humans remember differently, writing that the key difference "seems to lie in the ability of human beings to stand back from, make judgements about, and ultimately control their cognitive and affective states" (p. 214).

Whereas imagination serves to (re)construct ideas for physiological (and, in mind-body unions, conscious) processing, memory serves to reconstruct ideas for processing *as recognized reconstructions*. In other words, memories function as objects of reminiscence; mere imaginings—even when they are reconstructions—do not. I will say more about this functional difference in §4.3. In the meantime, the key point is that this functional conception of sensitive capacities draws the line dividing imagination from memory between cases (b) and (c), rather than between cases (a) and (b). Sensation and imagination are the only functional capacities required to power the mechanized sensitive souls that make Cartesian critters tick.

Descartes never attributed the ability to recognize ideas as reconstructions to creatures without rational souls.<sup>29</sup> Indeed, in the 1648 letters to Arnauld, Descartes denied soulless machines both the ability to recognize reconstructions as reconstructions (condition 5) and the prerequisite ability to mark memory traces as novel (condition 2). If these letters stand as the definitive statement of Descartes's theory of memory, then the corporealist view that Descartes attributed memories to animals is false. Realizing this predicament, the corporealists John Sutton (1998) and Desmond Clarke (2003) have independently argued that the 1648 letters are not definitive, on the grounds that Descartes later countenanced the corporeal recognition of corporeal traces of novelty. Sutton writes that the "claim that there can be no corporeal trace of this novelty is contradicted by Descartes's own later discussion of wonder" (1998, p. 71). This later discussion occurs in §§70–75 of Part Two of Descartes's last published work: the *Passions of the Soul*. Clarke offers an opined summary:

The definition of wonder that is offered in the *Passions* and its explanation in terms of characteristic flows of animal spirits presuppose the capacity of a subject to recognize the novelty of, for example, a perceptual experience because it causes the spirits to flow in unusual ways. Presumably, familiar experiences are associated with flows of spirits in patterns that are already well established and benefit from the inertial dispositions mentioned above, whereas a novel experience will direct the spirits in ways that encounter more resistance. This suggests, in a very schematic form, a physical basis for recognizing novelty or its absence. (Clarke, 2003, pp. 104–105)

When a sense impression fills an animal with wonder (as novel sense impressions are wont to do), it prompts the pineal gland to send animal spirits into previously unexplored pores in the Memory. On Sutton and Clarke's reading, this flow of spirits yields a corporeal trace of novelty by "conspir[ing] to isolate a memory trace and render[ing] it, temporarily, independent of others" (Sutton, 1998, p. 71). Finally, soulless animal brains recognize that memories are reconstructions insofar as the repetition of previously wondrous ideas sends animal spirits into isolated and relatively unexplored memory traces.

Sutton and Clarke's interpretation of Descartes's discussion of wonder contradicts Descartes's claim that there can be no corporeal trace of novelty. It also contradicts another important aspect of Descartes's neurophysiology of memory. Descartes asserted (in the

<sup>29</sup> One possible exception is in Rule 12, where Descartes equated imagination with "the Memory which is corporeal and similar to the one which animals possess" (CSM 1:43; AT 10:416). But given how Descartes used the terms 'imagination' and 'memory' in the context of the *Rules*, it is probable that Descartes referred not to memories (qua ideas) but to the Memory here. Throughout Rule 12, Descartes used 'the common sense' to designate the place in the brain (which he would only later identify with the pineal gland) where ideas are formed, and mainly used 'the imagination' to designate the place in the brain which he would later refer to mainly as 'the Memory' (see CSM 1:41–43; AT 10:414–417).



*Passions* and elsewhere) that when it comes to remembering, practice makes perfect. Though we do not remember much from our childhood, “those [things] we do remember are remembered not only because of the impressions we received when we were young, but mainly because we have done the same things again and renewed the impressions by remembering the events over again from time to time” (CSMK 151; AT 3:143–144). Sutton and Clarke’s interpretation requires Descartes to renounce this view, and hold that we recognize traces of novelty—and thus remember—only when the relevant folds of the Memory are relatively uncharted terrain. As we remember events over and over again, corporeal traces of novelty must fade. On the corporealist interpretation, it therefore must become progressively harder for soulless animals to recognize well-worn memories as memories.

Descartes’s text does not commit him to this implausible consequence, because it does not commit him to the corporealist interpretation of his views. The *Passions* states that wonder “has two causes: first, an impression in the brain, which represents the object as something unusual and consequently worthy of special consideration; and secondly, a movement of the spirits, which the impression disposes ... to flow with great force to the place in the brain where it is located so as to strengthen and preserve it there” (CSM 1:353; AT 11:380–381). Contra Sutton and Clarke, this passage does not imply lasting corporeal traces of novelty, suitable for the recognition of a reconstruction as a reconstruction. Instead, it implies that wondrous impressions lead objects to be represented as novel to the soul, and that wondrous impressions bore unusually strong memory traces into new areas of the Memory (without leaving corporeal traces of novelty).<sup>30</sup> These implications are consistent with Descartes’s letters to Arnauld. The passion of wonder, and associated surge of animal spirits into uncharted Memory folds, spurs the soul to reflect on the novelty of a sensory idea.<sup>31</sup> Upon reconstructing the wondrous idea, the intellect is thereby equipped to reflect on the fact that the corporeal idea is a reconstruction (rather than a fantasy).

Incorporealists, capitalizing on the lack of corporeal traces of novelty, argue that the mature Descartes identified this intellectual act of reflection with remembering, and memories with the purely conscious products thereof.

#### 4.2. Incorporealism

The most radical incorporealist, John Morris (1969), has argued that the neurophysiology of the *Treatise* is untenable, and that Descartes came to realize its flaws in the 1640s. In particular, Morris claims that “there is really no effective mechanical way to search for and retrieve a particular memory pattern from among those stored in the brain. The process of shuffling through millions of individual images in order to locate a particular image simply cannot be accomplished in the brief time that real human beings take” (1969, p. 460). Morris’s charge is a version of the frame problem which challenges any mechanistic theory of memory (Dennett, 1978, p.

125). However, we have no reason to believe the frame problem occurred to Descartes, much less that Descartes abandoned his neurophysiology of memory on its basis.<sup>32</sup>

Morris also claims that “if sensory patterns are represented by folds in the cortex, there simply is not enough room in the brain to hold all the information that obviously must be stored there” (1969, p. 460). Unlike the frame problem, we do have evidence that Descartes considered this problem of raw storage space. Descartes’s contemporary critics beat Morris to the criticism (MacIntosh, 1983), and Descartes wrote to Mersenne in June 1640 that “there is no doubt that the folds of the Memory get in each other’s way, and that there cannot be an infinite number of such folds in the brain; but there are still quite a number of them there” (CSMK 148; AT 3:84).<sup>33</sup> However, the storage space problem did not faze Descartes. Two months later, Descartes told Mersenne that “I do not think that there has to be a very large number of these folds to supply all the things we remember, because a single fold will do for all the things which resemble each other” (CSMK 151; AT 3:143). This response is strengthened by Descartes’s position that ideas are neither literally nor individually stored in the folds of the Memory; instead, the Memory is receptive to whole classes of ideas, disposing the pineal gland to recreate any and all patterns of flow towards memory traces.

Descartes also introduced intellectual memory partly to address the problem of storage space, writing that “in addition to the corporeal Memory, whose impressions can be explained by these folds in the brain, I believe that there is also in our intellect another sort of memory, which is altogether spiritual, and is not found in animals,” and that “it is this [intellectual memory] that we mainly use” (CSMK 151; AT 3:143). In addition to superpositional physical traces in the Memory folds, “the intellectual memory has its own separate impressions, which do not depend in any way on these folds. So I do not believe that the number of folds is necessarily very large” (CSMK 148; AT 3:84–85). Whereas corporealists invoke these passages to argue that Descartes attributed corporeal memories to animals, Morris invokes them to argue that Descartes’s mature view was that “pattern recognition is an intellectual operation” (1969, p. 452). According to Morris, Cartesian brain architecture cannot support declarative memories, so Descartes renounced the corporeal reconstruction of sensory ideas.

Véronique Fóti (2000) and Emanuela Scribano (2016), who endorse otherwise milder incorporealisms, join Morris in conflating intellectual memory with the intellectual recognition of ideas as reconstructions. However, Descartes did not take corporeal memory and intellectual memory to provide different routes to the reconstruction of the same ideas. Instead, he maintained that intellectual memory is “of a wholly different kind from [memory of material things].” In particular, we use intellectual memory to remember “intellectual things” (CSMK 233; AT 4:114)—universal— including innate ideas (CSM 2:48; AT 7:70; CSMK 228; AT 3:695)

<sup>30</sup> Descartes also asserted that “it is also certain that objects of the senses that are novel affect the brain in certain parts where it is not normally affected; and that since these parts are more tender or less firm than those hardened through frequent agitation, the effects of the movements produced in them are thereby increased” (CSM 1:354; AT 11:382). Again, this implies only that wondrous impressions lead to unusually strong memory traces in new areas of the Memory (but not traces of novelty).

<sup>31</sup> The passion of wonder may be said to involve an ephemeral corporeal mark of novelty (on the basis of which the soul reflectively constructs an incorporeal mark of novelty), but not anything like a corporeal trace of novelty, since Descartes used the term ‘trace’ to mean a reasonably long-lasting mark.

<sup>32</sup> Sutton (1998) provides an intriguing defense of Descartes, against the frame problem, by arguing that Descartes had a proto-connectionist theory of memory. Sutton acknowledges that this proto-connectionist theory is more inspired by than representative of Descartes’s actual thinking, but still musters strong textual support for the thesis that Descartes’s machine psychology was equipped to operate a proto-connectionist system of superpositional idea retention and retrieval.

<sup>33</sup> Colin Chamberlain (personal communication) has plausibly remarked that Descartes should allow for the possibility of an infinite number of folds in the brain, given the infinite divisibility of Cartesian matter. Nevertheless, Descartes’s 1640 letters to Mersenne clearly imply that he held the brain to (dispositionally) retain a finite number of memories (as a contingent, empirically discernible fact, rather than an a priori rule of physics).

and the meanings of words (CSMK 336–337; AT 5:150).<sup>34</sup> Descartes's appreciation of intellectual memory entails his denial that mechanized sensitive souls are capable of yielding *all* the memories that ensouled humans enjoy. But intellectual memory could not serve to replace corporeal memory. Descartes held that “intellectual memory has universals rather than particulars as its objects, and so it cannot enable us to recall every single thing we have done” (CSMK 337; AT 5:150). We cannot use intellectual memory to reconstruct particular sensory ideas retained in our Memory as a result of past experiences. Only corporeal memory functions to recall sensory particulars. Cartesian pattern recall is not an intellectual operation; pattern recall is a bodily procedure involving the mechanical reconstruction of patterns of animal spirits.

Incorporealists' references to the increased role that Descartes granted intellectual memory in the 1640s are red herrings in the debate about sensory remembering. Descartes did become more willing to countenance intellectual memory, but never at the expense of corporeal memory. The intellectual recognition of reconstruction could not be reserved solely for intellectual memory, since it often takes particular sensory ideas—such as verses that occur to poets—rather than universals as its object. Nor did Descartes dispense with the need for purely intellectual memory by countenancing an intellectual component of sensory remembering. Intellectual memory enables souls to reconstruct universal ideas.<sup>35</sup> Rather than being equivalent to intellectual memory, the intellectual recognition of reconstruction is a necessary component of each of the distinct faculties of intellectual memory and sensory memory.<sup>36</sup>

At the beginning of his metaphysical career, Descartes suggested that the reflective power of the intellect plays a key role in the construction of corporeal memories. In the twelfth of his 1628 *Rules*, Descartes asserted that corporeal “memory is no different from imagination” (CSM 1:43; AT 10:416). The intellect, he wrote, “is one single power ... when applying itself along with imagination to the ‘common’ sense, it is said to see, touch etc.; when addressing itself to the imagination alone, in so far as the latter is invested with various figures, it is said to remember; when

applying itself to the imagination in order to form new figures, it is said to imagine or conceive; and lastly, when it acts on its own, it is said to understand” (CSM 1:42; AT 10:415–416). Left to its own devices, the soul possesses only willpower and understanding. Brain physiology provides patterns of animal spirits as conduits through which the soul transforms the monolithic power of understanding into the diverse powers to sense, imagine and remember. The young Descartes concluded that “according to its different functions, then, the same power is called either pure intellect, or imagination, or memory, or sense-perception” (CSM 1:42; AT 10:415). On the incorporealist reading of this passage, it is the soul that senses, imagines, and remembers, even though it makes use of corporeal ideas to do so.

In the two 1648 letters to Arnauld, Descartes reaffirmed the essentials of his stance from twenty years prior. You remember an idea if and only if (1) the thing was previously presented to you (2) as a novel idea, (3) that idea made traces in your brain, (4) the traces in your brain led to the thing being presented to you again, and (5) you recognize that the thing was previously presented to you as a novel idea. The soul alone fulfills conditions (2) and (5). Again, Descartes wrote that “for the mind to recognize [novelty], I think that when these traces were first made it must have made use of pure intellect to notice that the thing which was then presented to it was new and had not been presented before; for there cannot be any corporeal trace of this novelty” (CSMK 356; AT 5:220). Physical changes to the Memory render a host of ideas more likely to recur, but cannot indicate that any particular idea has already been constructed on the pineal gland. Later, the reflective power of the soul understands certain corporeal images to be reconstructions of previously novel ideas.

Sutton and Clarke's reading of Descartes's treatment of wonder notwithstanding, Descartes was consistently clear that the ability to recognize novelty (and the lack thereof) belongs to the intellect alone. In the *Conversations with Burman*, Descartes suggested that “we have no memory of the thoughts we had in infancy ... because no traces of these thoughts have been imprinted on the brain” (CSMK 336; AT 5:150; cf. CSM 2:246–247; AT 7:356–357). But two months later, in the first letter to Arnauld, Descartes took this suggestion back, writing that while the “confused sensations [of infancy] leave some traces in the brain, which remain there for life, that does not suffice to enable us to remember them” (CSMK 354; AT 5:192). Descartes did not mean that ideas from our infancy could not recur. He meant that such recurrences would not qualify as memories. For ideas formed during (or before) infancy to qualify as memories, “we would have to observe that the sensations which come to us as adults are like those which we had in our mother's womb; and that in turn would require a certain reflective act of the intellect, or intellectual memory, which was not in use in the womb” (CSMK 354–355; AT 5:192–193).

Fóti and Scribano consider the *Rules* and letters to Arnauld to support a mild form of incorporealism, according to which the metaphysically (rather than physiologically) minded Descartes identified remembering with intellectual acts that interpret corporeal reconstructions. Scribano writes that “when a mind is connected with the machine, it will not *record* brain traces as conscious recollections, but will *interpret* the traces ... thereby transform[ing] them into conscious recollections” (2016, p. 146). On Scribano's reading, sensory memories are the conscious outputs of these intellectual interpretations of corporeal ideas, as opposed to corporeal ideas themselves. Fóti likewise concludes that Descartes's mature verdict was that there is no such thing as corporeal memory, although the intellectual memory of sensory particulars has “a corporeal basis” (2000, p. 591).

Putting aside the erroneous conflation of intellectual memory and reflective recognition, these incorporealist conclusions are on

<sup>34</sup> Descartes also told Huygens that, qua immortal souls, we can use intellectual memory to remember the past after we have died (CSMK 216; AT 3:598). Many scholars plausibly discredit this passage in light of Descartes's transparent desire to console his grieving friend, who had recently lost a brother. However, there is a straightforward way of making this claim consistent with Descartes's other remarks about memory; he might have meant that disembodied souls can remember universal ideas acquired and/or reflected upon during their lives. If anybody in the history of thought were to consider the immortal ability to recall the experience of having clearly and distinctly perceived universal truths genuinely consoling, it would be Descartes.

<sup>35</sup> Scribano is wrong to imply that “Descartes only once speaks of the intellectual memory of past experience working ... without applying the mind to brain traces” (2016, p. 146). Descartes plainly invoked memories of innate ideas in the *Meditations* (CSM 2:48; AT 7:70) and 1643 correspondence with Elisabeth (CSMK 228; AT 3:695).

<sup>36</sup> Descartes once insinuated that the intellectual memory—being equivalent to the innate disposition to have intellectual ideas—is not really memory, writing in a letter to Hyperaspistes that “where purely intellectual things are concerned, memory in the strict sense is not involved; they are thought of just as readily irrespective of whether it is the first or second time that they come to mind—unless, as often happens, they are associated with certain names, in which case, since the latter are corporeal, we do indeed remember them” (CSMK 190; AT 425). Some commentators accordingly identify intellectual memories with innate ideas (Gaukroger, 2002, pp. 221–222; Simmons, 2012, fn. 43). However, as Lisa Shapiro (2015) has argued, considering the role of memory in the *Meditations* provides good reason to differentiate intellectual memories—qua universal ideas that the thinker intellectually recognizes as having actually previously entertained—from mere innate ideas—qua universal ideas that (for all the thinker knows) previously existed only potentially and are perceived for the first time. I discuss my Shapiro-esque take on intellectual memory more in §4.3.

the right track. Nevertheless, they are too quick to identify Cartesian remembering with a pure act of the intellect, and Cartesian sensory memories with the purely conscious products of that act. Descartes reaffirmed the machine psychology of the *Treatise* in the 1649 *Passions*—where he also reaffirmed that remembering involves reconstruction plus recognition (CSMK 343–344; AT 11:360). The central doctrine of all of his neurophysiological writings is that all sensory ideas—sensations, imaginings, and episodic memories—are corporeal patterns of animal spirits located in brain matter. Descartes consistently claimed that he had successfully mechanized these core states of the sensitive soul, and explained in detail how sensory ideas—including memories—represent (without resembling) external objects. Corporealists are right to insist that Descartes's career-long commitment to a sensitive, flexible, and creative machine psychology indicates that the corporeal ideas produced by physiological mechanisms are components of—rather than mere prerequisites for—the process of remembering.

Descartes's distinction between direct and reflective thought also tells against Főti- and Scribano-style incorporealism. In the second letter to Arnauld, Descartes clarified his point about infant memory: “if ever I wrote that the thoughts of children leave no traces in their brain, I meant traces sufficient for memory, that is, traces which at the time of their impression are observed by the pure intellect to be new” (CSMK 356; AT 5:220). Infants have the capacity for “direct and not reflective” phenomenal ideas, but lack the reflective capacity to distinguish between novel ideas and reconstructions. Descartes explained that “when an adult feels something, and simultaneously perceives that he has not felt it before, I call this second perception *reflection*, and attribute it to the intellect alone, in spite of its being so linked to sensation that the two occur together and appear to be indistinguishable from each other” (CSMK 357; AT 5:220–221). Descartes was careful to distinguish active intellectual reflection on ideas from the direct occurrence of those ideas in thought. Főti and Scribano rightly take reflection on corporeal ideas to enable sensory remembering, but wrongly identify sensory memories with the products of this reflection.

Throughout his career, Descartes identified sensory memories with patterned flows of animal spirits that represent objects to the mind-body union. When he wrote (in Rule 12, the Fifth Replies, and elsewhere) that the soul remembers sensory ideas, he must have meant that the soul wills the mind-body union to remember, is phenomenally presented with a direct representation of a sensory object via the mind-body union, and then reflectively recognizes the corporeal idea underlying that phenomenal presentation as a reconstruction. Intellectual acts of the soul are components of this process of remembering, but so are physiological processes of the body. If this is right, then sensory memories are not the conscious products of interpretation; they are the bodily objects of recognition. To be precise, sensory memories are physical patterns in the flow of animal spirits. However, they are not just physical patterns: they are physical patterns appropriately housed in mind-body unions. When a mind-body union remembers, the soul feels its body constructing an idea, and then actively renders that corporeal idea a memory by recognizing it as a reconstruction.

#### 4.3. An intermediate interpretation

On this intermediate reading, sensory remembering is a uniquely human capacity comprising both physiological and intellectual components. Animals physically reconstruct sensory particulars and angels intellectually remember universals, but neither animals nor angels can remember where they left their keys. One pragmatic disadvantage of this interpretation is that it

entails that a complete account of Cartesian memory requires a viable understanding of Descartes's metaphysics of the union of body and mind. Then again, this entailment may indicate why Descartes wrote only enigmatic scraps about the metaphysics of memory: he infamously failed to articulate the nature of mind-body unions.

There are almost as many ways of articulating human nature on Descartes's behalf as there are Descartes scholars. Some scholars take Cartesian bodies and minds to be causally connected by either divine fiat or (divinely instituted) psychophysical bridge laws (Garber, 1993; Koivuniemi & Curley, 2015; Loeb, 2005; Wilson, 1978); other scholars take the mind-body union to be a third substance, metaphysically distinct from body and mind (Broughton & Mattern, 1978; Clarke, 2003; Cottingham, 2008; Hoffman, 2009). Most recently, Alison Simmons has argued that Descartes considered the mind-body union to “fall outside the domain of any humanly possible metaphysics.” On Simmons's reading, “Descartes' position is that we have an internal-sense access to ourselves as mind-body unions that provides a rich phenomenology of embodiment that is of both theoretical and practical interest to a Cartesian study of human nature,” but does not furnish clear and distinct ideas useable in the search for metaphysical truths (2017, p. 2).

Fortunately, my intermediate interpretation of Descartes's view of sensory memory does not rely on any particular metaphysics of the mind-body union—or even on the notion that a metaphysics of the mind-body union is humanly possible. On the contrary, understanding Cartesian sensory remembering as corporeal reconstruction paired with intellectual recognition sheds light on whichever conception of mind-body relations is latent in Descartes's philosophy. If Descartes is a dualist, then corporeal ideas cause direct phenomenal ideas, which prompt the intellect to reflect on their status as sensations, memories, or mere imaginings. If Descartes is a trialist, then corporeal ideas appear directly in consciousness, and thereby prompt the intellect to reflect on their status. If Descartes is a metaphysical quietist about the mind-body union, then human beings mysteriously feel corporeal ideas (God only knows how), which prompts the intellect to reflect on the status of those ideas. (I will use the term ‘phenomenal face’ to refer to the second grade conscious idea that directly accompanies a first grade corporeal idea housed in a mind-body union, whether as effect, flip side, or mysterious feeling.)

In any case, Descartes identified sensory memories with corporeal ideas reconstructed thanks to memory traces dispositionally retained in the folds of the Memory. Nevertheless, he denied animals the capacity to remember. Cartesian critters can't remember because sensory remembering is an essentially psychophysiological act. Sensory remembering is essentially psychophysiological because intellectual reflection is a necessary companion to sensory memories, which are themselves patterns—different release points, subtlety gradients, volumes, and velocities—of animal spirits in human bodies. Whether these corporeal ideas are causally connected or token-identical to their phenomenal faces, their felt effect on (or appearance in) consciousness is crucial for securing their status as memories. There is no physiological mark that distinguishes memories from mere imaginings. Only the intellectual power of the soul—reflecting on feelings present in consciousness—is capable of distinguishing the case in which you remember that your keys are in your coat pocket from the case in which you merely imagine that your keys are in your coat pocket. Recognition bestows a nonphysical property to a reconstruction: the relational property of being appreciated as a non-novel idea by the rememberer. (If Descartes was a trialist, and physiological ideas housed in mind-body unions are identical to their phenomenal faces, then memories have phenomenal

properties as well.<sup>37</sup>) Indeed, on my reading, Descartes held that brain processes *become* memories only upon achieving this relational distinction. Nonhuman animals are incapable of appreciating the (non-)novelty of their ideas. It follows that animals do not qualify as true rememberers, even though their brains sometimes execute physiological processes that physically mirror processes in human brains that constitute memories when intellectually recognized as such.

Descartes sensibly stressed that humans need not grasp the details of our own neuroanatomies in order to recognize our corporeal ideas as reconstructions.<sup>38</sup> When willing ourselves to remember, “we are not conscious of the manner in which our mind sends the animal spirits into particular nerves; for that depends not on the mind alone but on the union of the mind with the body.” The pineal gland automatically obeys the conscious will “because of the appropriate way the body is constructed, of which the mind may not be aware, and because of the union of the mind with the body, of which the mind is certainly conscious” (CSMK 357; AT 5:222). When the pineal gland reconstructs a corporeal idea at the will’s bequest (or via idle swaying), the phenomenal face of that idea occurs directly in thought (whether via causation or token-identity). The soul then acts a second time, and reflectively recognizes the idea as a reconstruction—something the mind-body union has sensed before—without understanding the idea’s precise physical mode. This confused recognition of reconstruction transforms the corporeal idea into a memory.

Admittedly, Descartes failed to provide a wealth of insight into precisely how this intellectual recognition works. As discussed at the end of §4.1, when a new idea is constructed, the attentive soul will reflect on its novelty, and thereby become disposed to recognize a reconstruction of that idea as a reconstruction. In a long 1641 letter to Hyperaspistes, which both Fóti and Scribano cite in support of the conflation of intellectual memory and recognition, Descartes remarked in passing that “where purely intellectual things are concerned, memory in the strict sense is not involved,” since “purely intellectual things ... are thought of just as readily irrespective of whether it is the first or second time that they come to mind” (CSMK 190; AT 3:425). In 1640 correspondence with Mersenne (CSMK 148; AT 3:84; CSMK 151; AT 3:143) and 1644 correspondence with Mesland, however, Descartes explicitly avowed memory “traces which remain in the mind itself” (CSMK

233; AT 4:114), enabling intellectual memory. Both incorporealists and corporealists usually take these letters to be incompatible, but a straightforward reading unifies them. Strictly speaking, memory involves reconstruction. But the memory of “purely intellectual things”—that is, innate ideas—does not (strictly speaking) involve construction at all, since innate ideas are always equally accessible within consciousness. Hence Descartes’s remark to Hyperaspistes. So what are the traces of intellectual ideas which Descartes told Mersenne and Mesland exist in the mind? They are incorporeal traces of intellectual recognition, which come in a couple of varieties. Some are traces of recognition of the meanings of words (CSMK 336–337; AT 5:150). Others are traces of recognition of novelty: traces of having previously consciously experienced an idea.

In the same letter to Mesland, Descartes delineated the sources from which the intellect passively receives ideas: “partly from objects which come into contact with the senses, partly from impressions in the brain, and partly from prior dispositions in the soul and from movements of the will” (CSMK 232; AT 4:113–114). Given the impossibility of corporeal traces of novelty, conscious ideas of novelty must have their source in mental dispositions. I thus suspect that Descartes believed incorporeal traces of novelty, like innate ideas, to “exist within us potentially” (CSM 1:361; AT 8B:361). On an influential interpretation of Cartesian ‘potential existence,’ innate ideas are latent in our conscious thoughts (McRae, 1972; Simmons, 2012). Because they are *innately* potentially existent, innate ideas are always latent in our conscious thoughts. Incorporeal traces of novelty, on the other hand, *become* potentially existent through our interaction with the world. Recognizing an innate, adventitious, or factitious idea as *novel* changes our thinking. When we recognize an idea as novel, the intellectual ability to recognize a reconstruction of that idea becomes latent in our thoughts, available to be dredged up by reflection. The reflective recognition of novelty thereby dispositionally enables both intellectual memory and sensory memory.

Descartes attributed both willful recall and reflective recognition to the soul, but he attributed transformed sensory memories themselves to the body, despite the three “being so linked ... that [they] occur together and appear to be indistinguishable from each other” (CSMK 357; AT 5:221). This psychophysical separation of the components of remembering bears a striking similarity to Descartes’s denial of sentience to animals. He infamously wrote that “I do not explain the feeling of pain without reference to the soul. For in my view [the feeling of] pain exists only in the understanding. What I do explain is all the external movements which accompany this feeling in us; in animals it is these movements alone which occur, and not pain in the strict sense” (CSMK 148; AT 3:85). My contention is that Descartes propounded a similar understanding of memory. In the *Treatise*, Descartes explained all of the physiological movements that reconstruct ideas and accompany the direct feeling of remembering in humans. In soulless animals (and the fabled, soulless humans of the *Treatise*) it is these movements alone which occur, and not memory in the strict sense. Just as only ensouled and embodied humans can feel their sensations as pains—and thereby experience painful sensations—only ensouled and embodied humans can entertain the phenomenal faces of corporeal ideas, recognize those ideas as reconstructions, and thereby remember. Painful sensations and memories are patterns of animal spirits leaving the pineal gland. But they are also more than that: they are corporeal ideas that bear an intimate relationship to particular passivities and activities of the soul. Physiological ideas become memories only when accompanied by the soul’s conscious recognition that

<sup>37</sup> My intermediate reading may fit best with trialism about the mind-body union. Intuitively, phenomenal faces—second grade images formed in the mind’s eye—are components of (rather than caused by) sensory memories. Descartes seems to support this idea in the correspondence with Arnauld, reporting that memories “occur in our thought” and are “presented to ... the pure intellect” (CSMK 356; AT 5:220), as well as the Sixth Replies, where he writes that both first and second (but not third) grade sensations “should be referred to the sensory faculty, if we wish to distinguish it clearly from the intellect” (CSM 2:295; AT 7:437). Indeed, this identity is so intuitive—*surely* my memories intrinsically feature (not merely efficiently cause ideas of) phenomenal colors, sounds, and odors—that some readers may think trialism and my intermediate reading will stand or fall together. In this connection, Gary Hatfield (personal communication) has suggested that corporeal ideas provide the specific contents of sensory ideas, phenomenal faces bring those contents under a conscious aspect, and then reflective recognition transforms that whole psychophysiological package into a memory. (I myself interpret Descartes as either this kind of trialist or a quietist, depending on the day of the week.) However, I am not *sure* Descartes’s texts definitively settle this issue on the side of intuition. It may be that, contrary to intuition, Cartesian people consciously experience the direct phenomenal effects of their sensations, imaginings, or sensory memories—which, strictly speaking, are to be identified with first grade ideas alone. Regardless, sensory remembering—the process of crafting sensory memories—always comprises first grade, second grade, and third grade sensations.

<sup>38</sup> I am hereby putting more of my metaphysical cards on the table, insofar as I reject a strong version of the ‘direct inspection’ model of Descartes’s theory of sensation (cf. Chignell, 2009).

the mind-body union is remembering, just as physical sensations become painful only when accompanied by human suffering.<sup>39</sup>

Corporealists and incorporealists alike might reasonably wonder what kind of transformation—what kind of *becoming a memory*—is posited by this intermediate interpretation. Does recognition actually transform reconstructed corporeal ideas into memories in some genuine way? Or is the difference merely a matter of how an independent theorist might designate each case?<sup>40</sup> The short answer is that the recognition of reconstruction *functionally* transforms ideas, and that this functional transformation is a variety of genuine transformation. The necessary linkage of sensory memories with the reflective recognition of them as reconstructions causes memories to function genuinely differently than mere reconstructions, even though their formal physiological qualities (and direct phenomenal effects or qualities) remain unaltered.

When a human being feels pain, their corporeal sensation is functionally transformed into a state that the human can will themselves to avoid—or grit their teeth and bear. In the same way, when a human being recognizes a reconstruction, their corporeal idea is functionally transformed into a memory: the sort of sensory idea that the thinker can treat as old hat—or attempt to forget. In Descartes's view, animals cannot do anything for which sensation and imagination fail to suffice. Humans, when they remember, do an extra thing with their sensory ideas: they use them to reminisce about the past. A poet who actually remembers verses can recite them with a distinctly human humility, and either attribute them to the true artist or intentionally plagiarize. Indeed, both sensory memories and intellectual memories play important roles in Descartes's metaphysical method that mere imaginings could not possibly play. Skepticism can give birth to certainty only insofar as doubting enables the Cartesian Meditator to ascertain the provenances of her ideas (Curry, 2016). Memory serves the Meditator as a way of reviewing prior meditations, as an epistemological scapegoat—received ideas from childhood are epistemologically problematic not merely because they are reconstructed, but because the Meditator recognizes them as reconstructed from her dogmatic Aristotelian schooling (CSM 2:12; AT 7:17)—and as a pragmatic savior in the search for truth—since the Meditator cannot spend all of her time clearly and distinctly perceiving truths, she must sometimes instead recognize memories as reconstructions of ideas that she has previously clearly and distinctly perceived (CSM 2:48; AT 7:70; CSMK 228; AT 3:695). In order to play each of these functional roles, it is crucial that remembering both reconstruct previous ideas and occasion a distinctive phenomenology: the felt act of realization that a memory is a recollection, rather than a mere figment of the imagination.

On the reading I have advanced, a Cartesian idea is a memory only if it functions as a memory, and functioning as a memory necessarily involves being recognized as a reconstruction. Imagining (the past, present, or future) constructs ideas for processing. Remembering constructs ideas for reminiscent processing as recognized reconstructions. The fabulous machines Descartes envisaged in the *Treatise* function in intricate—sensitive and imaginative—ways, but never as though they (not just reconstruct but) truly remember.

<sup>39</sup> There is a disanalogy here, in that the feeling of pain is direct, whereas the recognition of a memory as such is reflective. The feeling of a sensory memory, qua direct phenomenal face of a corporeal idea, is indistinguishable from the feeling of a sensation or imagining. What makes a memory feel *like a memory* is the second-order recognition that it is not a novel idea.

<sup>40</sup> Thanks to an anonymous reviewer for posing these (paraphrased) questions.

## 5. Conclusion

I have argued that Descartes held the following account of declarative memory: to remember is to reconstruct an idea that you intellectually recognize as a reconstruction. To have an intellectual memory is to intellectually reconstruct a universal idea that you recognize as a reconstruction, and to have a sensory memory is to neurophysiologically reconstruct a particular idea that you recognize as a reconstruction.

More specifically, I have taken up the question of whether Descartes thought animals remember. Corporealists say 'yes'; incorporealists say 'no' (or, to be precise, 'not at first, then he did for a while, but ultimately no'). I have proposed that Descartes never thought animals remember. He held that Cartesian critter brains feature the Memory. Moreover, animal brains physiologically reconstruct ideas that parallel the sensory memories of humans in all physical respects. Nevertheless, the corporeal ideas that flow from the pineal glands of soulless animals are not memories, because memories necessarily feature a nonphysical property: the relational property of being recognized as a reconstruction by the rememberer. Descartes endorsed a neurophysiology that could not differentiate the psychological faculties of memory and imagination. Only intellectual reflection on the fact that ideas are reconstructions transforms those ideas into memories. Cartesian sensory memory, like Cartesian suffering, is a uniquely human capacity that arises "from the union and, as it were, intermingling of the mind with the body" (CSM 2:56; AT 7:81). It takes a chimera like you—a mishmash of body and soul—to really remember where you've left your keys.

## Acknowledgements

This article results from a graduate career whiled away arguing about Descartes with Gary Hatfield. (I should have been writing my dissertation.) Thanks also to Patrick Ball, Dave Barack, Justin Bernstein, Colin Chamberlain, Andrew Chignell, Amelia Curry, David Curry, Karen Detlefsen, Martha Farah, Andree Hahmann, Nabeel Hamid, Jorge Secada, Jordan Taylor, and two extraordinarily thorough and thoughtful anonymous reviewers, as well as audiences at the 2015 Penn Workshop in the History and Philosophy of Science and 2017 Representing Reality conference at SUNY Potsdam.

This research was partially supported by a Mellon/ACLS Dissertation Completion Fellowship from the American Council of Learned Societies.

## References

- Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagining the future: Common and distinct neural substrates during event construction and elaboration. *Neuropsychologica*, 45(7), 1363–1377.
- Bernecker, Sven (2010). *Memory: A philosophical study*. OUP.
- Broughton, J., & Mattern, R. (1978). Reinterpreting Descartes on the notion of the union of mind and body. *Journal of the History of Philosophy*, 16, 23–32.
- Chignell, Andrew (2009). Descartes on sensation: A defense of the semantic-causal model. *Philosophers' Imprint*, 9(No 5), 1–22.
- Clarke, Desmond (2003). *Descartes's theory of mind*. OUP.
- Cottingham, John (2008). *Cartesian Reflections: Essays on Descartes' philosophy*. OUP.
- Curry, Devin Sanchez (2016). Cabbage à la Descartes. *Ergo*, 3(No. 24), 609–637.
- Debus, Dorothea (2010). Accounting for epistemic relevance: A new problem for the causal theory of memory. *American Philosophical Quarterly*, 47(No. 1), 17–30.
- Dennett, Daniel (1978). *Brainstorms: Philosophical essays on mind and psychology*. MIT Press.
- Des Chene, Dennis (2000). *Life's Form: Late Aristotelian theories of the soul*. Cornell UP.
- Des Chene, Dennis (2001). *Spirits and Clocks: Machine and organism in Descartes*. Cornell UP.
- Descartes, René (1964–1976). In C. Adam, & P. Tannery, *Oeuvres de Descartes* (Vols. 1–11). CNRS/J. Vrin.
- Descartes, René (1985–1991). In J. Cottingham, R. Stoothoff, D. Murdoch, & A. Kenny (Eds.), *The philosophical writings of Descartes*. CUP.

- Descartes, René (1996). *Treatise of man*, Thomas Steele Hall, translator. Prometheus Books.
- Drieux, Philippe (2016). Machine and communication of corporeal dispositions in Descartes and La Forge: The mysterious 'article 83' of L'Homme and La Forge's Comments. In D. Antoine-Mahut, & S. Gaukroger (Eds.), *Descartes' Treatise on man and its reception* (pp. 127-138). Springer.
- Edwards, Michael (2013). *Time and the science of the soul in early modern philosophy*. Brill.
- Fernández, Jordi (2008). Memory, past and self. *Synthese*, 160(1), 103-121.
- Fóti, Véronique (2000). Descartes' intellectual and corporeal memories. In S. Gaukroger, J. Schuster, & J. Sutton (Eds.), *Descartes' natural philosophy* (pp. 591-603). Routledge.
- Garber, Daniel (1993). Descartes and occasionalism. In Steven Nadler (Ed.), *Causation in early modern philosophy: Cartesianism, occasionalism, and pre-established harmony* (pp. 9-26). Pennsylvania State Press.
- Gassendi, Pierre (1649a). *Esse animos hominum immortales, contra Epicurum*. In *Animadversiones in decimum librum Diogenis Laertii, I* (pp. 549-609). Lyon: G. Barbier.
- Gassendi, Pierre (1649b). In *Syntagma philosophiae Epicuri cum refutationibus dogmatum quae contra fidem christianam ab eo asserta sunt*. Lyon: G. Barbier.
- Gaukroger, Stephen (2000). The resources of a mechanist physiology and the problem of goal-directed processes. In S. Gaukroger, J. Schuster, & J. Sutton (Eds.), *Descartes' natural philosophy* (pp. 630-658). London: Routledge.
- Gaukroger, Stephen (2002). *Descartes' system of natural philosophy*. CUP.
- Goclenius, Rudolph (1613). *Lexicon philosophicum*. Marburg.
- Hatfield, Gary (2000). Descartes' naturalism about the mental. In S. Gaukroger, J. Schuster, & J. Sutton (Eds.), *Descartes' natural philosophy* (pp. 630-658). London: Routledge.
- Hatfield, Gary (2007). The passions of the soul and Descartes' machine psychology. *Studies in History and Philosophy of Science*, 38, 1-35.
- Hatfield, Gary (2008). *Animals*. In J. Carriero, & J. Broughton (Eds.) (pp. 404-425). Blackwell: Companion to Descartes.
- Hatfield, Gary (2012). Mechanizing the sensitive soul. In Gideon Manning (Ed.), *Matter and form in early modern science and philosophy* (pp. 151-186). Leiden: Brill.
- Hatfield, Gary (2016). L'Homme in psychology and neuroscience. In Stephen Gaukroger, & Delphine Antoine-Mahut (Eds.), *Descartes' Treatise on man and its reception* (pp. 269-285). Springer.
- Hobbes, Thomas (1651). *Leviathan*. Original folio.
- Hoffman, Paul (2009). *Essays on Descartes*. OUP.
- Jorgensen, Larry (2011). Leibniz on memory and consciousness. *British Journal for the History of Philosophy*, 19(5), 887-916.
- Joyce, Richard (1997). Cartesian memory. *Journal of the History of Philosophy*, 35(3), 375-393.
- Kirwan, C., Brock, A., Stefania, R., & Nash, M. I. (2014). Remembering and imagining differentially engage the hippocampus: A multivariate fMRI investigation. *Cognitive Neuroscience*, 5(3-4), 177-185.
- Koivuniemi, M., & Curley, E. (2015). *A kind of dualism, Oxford studies in early modern philosophy* (Vol. 7, pp. 83-122) OUP.
- La Forge, Louis de (1997). In Desmond M. Clarke (Ed.), *Treatise on the human mind*. Kluwer.
- Landormy, Paul (1902). La Mémoire corporelle et la mémoire intellectuelle dans la philosophie de Descartes. *Bibliothèque du Congrès Internationale de Philosophie*, 4, 259-298.
- Leibniz, G. W. (1996). In P. Remnant, & J. Bennett (Eds.), *New essays on human understanding*. CUP.
- Locke, John (1975). In Peter H. Nidditch (Ed.), *Essay concerning human understanding*. OUP.
- Loeb, Louis (2005). The mind-body union, interaction, and subsumption. In C. Mercer, & E. O'Neill (Eds.), *Early modern Philosophy: Mind, matter, and metaphysics* (pp. 65-85). OUP.
- MacIntosh, J. J. (1983). Perception and imagination in Descartes, Boyle, and Hooke. *Canadian Journal of Philosophy*, 13, 327-352.
- Malebranche, N. (1674-1675/1997). In T. M. Lennon, & P. J. Olscamp (Eds.), *The search after truth*. CUP.
- Martin, C. B., & Deutscher, M. (1966). Remembering. *Philosophical Review*, 75, 161-196.
- McRae, Robert (1972). Innate ideas. In R. J. Butler (Ed.), *Cartesian studies* (pp. 32-54). OUP.
- Michaelian, Kourken (2016). *Mental time travel: Episodic memory and our knowledge of the personal past*. MIT Press.
- Michael, E., & Michael, F. S. (1988). Gassendi on sensation and reflection: A non-Cartesian dualism. *History of European Ideas*, 9(5), 583.
- Michael, E., & Michael, F. S. (1989). Corporeal ideas in seventeenth-century psychology. *Journal of the History of Ideas*, 50(No. 1), 31-48.
- More, Henry (1659). *The immortality of the soul, so farre forth as it is demonstrable from the knowledge of nature and the light of reason* (Vol. 10) London: Preface section.
- Morris, John (1969). Pattern recognition in Descartes' automata. *Isis*, 60(4), 451-460.
- Ott, Walter (2017). *Descartes, Malebranche, and the crisis of perception*. OUP.
- Schacter, D., Addis, D. R., Hassabis, D., Martin, V. C., Nathan, S. R., & Szpunar, K. K. (2012). The future of Memory: Remembering, imagining, and the brain. *Neuron*, 76, 677-694.
- Scribano, Emanuela (2016). La Forge on Memory: From the Treatise on man to the Treatise on the human mind. In S. Gaukroger, & D. Antoine-Mahut (Eds.), *Descartes' Treatise on man and its reception* (pp. 139-254). Springer.
- Sepper, Dennis (1998). *Descartes' imagination*. Cal Press.
- Shapiro, Lisa (2015). Memory in the *Meditations*. *Res Philosophica*, 92(1), 41-60.
- Simmons, Alison (1999). Are Cartesian sensations representational? *Noûs*, 33(3), 347-369.
- Simmons, Alison (2012). Cartesian consciousness reconsidered. *Philosophers' Imprint*, 12(No. 2), 1-21.
- Simmons, Alison (2017). Mind-body union and the limits of Cartesian metaphysics. *Philosophers' Imprint*, 17(No. 14), 1-36.
- Squire, Larry R. (2009). Memory and brain systems: 1969-2009. *Journal of Neuroscience*, 29(41), 12711-12716.
- Sutton, John (1998). *Philosophy and memory traces*. CUP.
- Sutton, John (2016). Memory. In Larry Nolan (Ed.), *The Cambridge Descartes lexicon* (pp. 490-492). CUP.
- Sutton, J., & Windhorst, C. (2009). Extended and constructive remembering: Two notes on Martin and Deutscher. *Crossroads*, 9(1), 79-91.
- Wilson, Margaret (1978). *Descartes*. Routledge.