

Chapter 9

Louis de la Forge and the Development of Cartesian Medical Philosophy

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Abstract Louis de la Forge (1632–1666) was a medical doctor and an early defender of the Cartesian philosophy. He is best known for his views on causation and his development of occasionalism within the Cartesian school. Commentators such as Balz (1932), Garber (1987), and Nadler (1998) have focused on the consequences of La Forge’s views for Cartesian metaphysics and physics, with little consideration of La Forge’s medical philosophy. We argue that La Forge provides a sophisticated version of Cartesian mind-body dualism, and he advances a mechanistic account of the animal spirits, corporeal memory, and a host of other topics relevant to Descartes’s conception of the human body-machine. We examine La Forge’s lengthy *Remarques* in the French edition of Descartes’s *L’Homme de Rene Descartes et un Traite de la Formation du Foetus* (1664, 1667) where he advances Descartes’s account of the generation and working of the animal spirits and its relevance to the human body-machine. We also examine La Forge’s *Traité de l’esprit de l’homme et de ses facultez et fonctions, et de son union avec le corps* (1666), where he explains the functions of the soul while defending dualism and the mechanism of the body-machine against scholasticism. We conclude that La Forge advances Descartes’s account of the generation and workings of the animal spirits and their interaction with the human soul, giving us an important vantage point to see the reception and development of the Cartesian medical philosophy in France.

Keywords Louis de la Forge • Rene Descartes • Medical philosophy • Mechanistic • Dualism • Mind-body union • Animal spirits • Aversion • Surprise • Corporeal memory • Habit • Inclination • Fermentation • Muscular movement • Pineal gland

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9.1 Introduction

Louis de la Forge (1632–1666) was a medical doctor and an early defender of the Cartesian philosophy. He was educated at La Flèche, the college where Descartes studied several decades earlier, and he practiced medicine in Saumur. He is best known for his views on causation and his development of occasionalism within the Cartesian school. (Clarke 2011) Commentators such as Balz (1932), Garber (1987), and Nadler (1998) have focused on the consequences of La Forge’s views for Cartesian metaphysics and physics, with little consideration of La Forge’s medical philosophy.

Assessments of his merit as a medical thinker are few, and when offered, various. According to Descartes’s biographer, Adrien Baillet, “one can say in praise of this work [*Traité de l’esprit*] that this disciple surpassed his teacher in his industry.”¹ By contrast, historian of medicine Thomas Steele Hall, when commenting on La Forge’s *Remarks on Descartes’s Treatise on Man*, wrote, “In elaborating upon Cartesian hypotheses, La Forge exceeds his master in the invention of unverified detail.”² Of the same work Clerselier writes, “So that I could almost say his Commentary is a perfect text, which says everything and assumes nothing, leaves nothing behind, and contains the solution to all the most difficult questions . . .”³

The absence of any comprehensive assessment of La Forge as a medical thinker is what we hope to address here. With the growing interest in Descartes’s thought as it applies to medicine, such a study is timely.⁴ The main elements of Descartes’s medical philosophy that influenced La Forge were Descartes’s appeal to the laws of mechanics and the simplicity of his suppositions. More specifically, Descartes’s view of matter as extended in three dimensions and bodies as assemblages of divisions of matter moving together provided the framework to explain all physical phenomena, including the functions of the human body. In order to study how the parts of the human body are assembled requires anatomy, and in order to understand how the parts moved in relation to other parts requires an understanding of mechanics. This metaphysical and explanatory framework attracted La Forge to Descartes’s posthumously published *Traité de l’homme*. In La Forge’s commentary (hereafter, *Remarks*) on the text he writes:

He [Descartes] supposed nothing except that there are extended bodies, in length, breadth, and depth, that have diverse shapes, and that are moved in diverse ways. This is so simple, and so intelligible, and so much proved by experience or reason, that our adversaries find nothing to say, except that they don’t believe that these principles are sufficient to be able to deduce knowledge of all the other things that make up the world.⁵

¹Baillet 1691, 1.vii, ch. xix, 398–99.

²Hall 1969, xli.

³La Forge 1974, xxxiv–xxxv. Author translation.

⁴See recent studies by Aucante 2006; Carter 1983; Bitbol-Herpéries 1993; 2000; Gaukroger 2002; Easton 2011; Shapin 2000; Verbeek 1993; Wilson 1997; Wright and Potter 2000, and Shapiro 2003.

⁵La Forge 1664, 407. Author Translation.

La Forge took Descartes's theory of the generation and function of animal spirits to be a prime example of this simplicity in reasoning. Descartes describes the generation and function of animal spirits in part V of the *Discourse on Method*. Descartes compares the generation of animal spirits to a fine wind or lively flame that rises upwards, as he imagined that the most agitated and fine particles of blood, which composed the animal spirits, rose to the brain from the heart.⁶ The idea is that only the size, shape, and motion of the particles of the blood in relation to the laws of mechanics need be appealed to in order to explain the function of the heart, brain, and the entire human body. As we will see La Forge keeps to this Cartesian framework throughout his *Remarks*, and consistently argues against the scholastic account in its appeals to faculties.

What Descartes and his contemporaries meant by "mechanism" and the "mechanical philosophy" varied greatly. According to Dennis Des Chene, mechanism in the late seventeenth-century could be adopted in two principal ways, as an ontology of nature, and/or a form of explanation.⁷ Mechanism as ontology of nature viewed all natural things as having only mechanical properties; and mechanism as form or method of explanation viewed some natural operations as mechanical but not all (such as animal souls). A mechanism of form or method permitted a non-reductionist approach to medicine that was not open to the more restrictive mechanism as ontology of nature. Des Chene argues that Descartes's view that animals are machines derives from a mechanistic and reductionist ontology of nature. We agree with Des Chene with regard to animal souls, but when it comes to human souls, and their effects on the body and vice versa, Descartes, like La Forge, departs from the purely ontological notion of mechanism and adopts a non-reductive mechanism as form of explanation. As we hope to show, this non-reductive mechanism has notable consequences for the Cartesian medical philosophy.

This brings us to the final piece in Descartes's medical philosophy, too often ignored but adopted by La Forge, namely Descartes's view on the union of mind and body, and their causal interaction. Mind-body interaction provides for the effect of ideas, initiated in the mind but embodied in the corporeal imagination, on the functions of the body. It also provides for the effect of the body, through the corporeal imagination, on the functions of the human soul. We see this aspect of Descartes's medical philosophy at work in La Forge's account of aversion, found in his *Treatise on the Human Mind* (1666, 1669). In this work, he provides a sophisticated version of Cartesian mind-body interactionism, of the sort that has some surprises given his dualism and occasionalism. The central question is how the body-machine interacts with the mind and the mind with the body-machine. He dispels the Galenist theory of sympathies and antipathies to explain phenomena such as aversion, and instead explains it in terms of the mechanism of animal spirits and the force of the imagination. (*Treatise*, Chapter 22) La Forge's thesis is that the thoughts of the soul determine the direction of the animal spirits, which in turn produce certain patterns on the pineal gland, which in turn carry out the functions of the soul. As we will see,

⁶Descartes 1984–91. CSM I, 138–139.

⁷Des Chene 2005, 245–260.

the body-machine is primarily responsible for carrying out all the “useful” functions of the soul, with a few mental functions such as intellectual memory left as the province of the mind alone.⁸

In what follows, we hope to show that La Forge, in his *Remarks* (1664), advances Descartes’s mechanical model of the body providing a genuine scientific framework for reasoning about and testing the operations of the body—some of which results in falsifying Descartes’s account. This advancement made by La Forge will be demonstrated by reviewing his stance on generation and working of the animal spirits and its relevance to the human body-machine and his position on muscular movement.⁹ Further, La Forge, in his *Treatise on the Human Mind*, explains the functions of the soul while defending dualism and the mechanism of the body machine against scholasticism thus paving the way for a study of the functions of the soul-body in the form of a non-reductive mechanism. In section I of this paper, we will examine how La Forge’s *Remarks* furthers Descartes’s account in two important respects: it provides greater anatomical detail along with a robust Cartesian explanation of animal spirits, and second, raises problems for the explanation of muscular movements given the virtually instantaneous communication of motion from the brain to the muscles. Using Descartes’s description of animal spirits, La Forge shows how there is insufficient time for the motions of the animal spirits to account for reflex and other muscular motions. In section II, we focus on La Forge’s defense of dualism as it relates to the functions of the soul-body.

We hope that a thorough consideration of La Forge’s *Remarks* and *Treatise on the Human Mind* will aid in understanding how La Forge develops the Cartesian account of animal spirits, sense perception, appetite, corporeal memory, and soul-body. In doing so, we propose that the Cartesian model of the body-machine provides a strong framework for medical thinking and merits more study than it has received.

⁸Descartes 1984–1991 gives only cursory treatment of intellectual memory. See, for example, his exchange with Burman, CSMK III, 336, and his letter to Huygens, CSMK III, 216.

⁹Another example of La Forge advancing Descartes’s work, not discussed here, is found in Wilkin 2008. Wilkin discusses how La Forge takes Descartes’s explanation of how spirits move through the pores of the brain and the heart to be distributed throughout the body when a passion is felt to explain how some mother’s passions can yield a birthmark while others do not. La Forge develops the above Cartesian notion by appealing to the speed by which the animal spirits pass through the mother’s body. There must be sufficient exertion of force to “send the animal spirit whizzing through various nerves and arteries so that they pull other spirits along” thus generating the speed to create various stimuli that can generate a birthmark in some cases but not in others. La Forge draws on Descartes account “of how different passions (in the strictly corporeal sense) produce different bodily responses...differences are determined by the pathway taken by the animal spirit” but it is La Forge who attempts to ground the explanation of how birthmarks are generated into a mechanical hypothesis and provide a corporeal explanation for their cause. 552–555.

9.2 La Forge's *Remarks on Descartes's Treatise on Man* (1664)

Shortly after Descartes's death in 1650, copies of a French manuscript of what came to be known as *Treatise on Man*, circulated among his friends and correspondents. It was later edited and published in Latin and French (*De homine*, 1662; *Traité de l'homme*, 1664). The 1662 edition was a Latin translation by Florentius Schuyl. Clerselier reportedly found the images in the Latin edition inadequate to illustrating Descartes's descriptions, which were dynamic and often not observable by the naked eye or a microscope. Because Descartes's descriptions required illustration of physiological processes that took place at the minutest physical particles, it was a challenge for the illustrators, Schuyl, and later La Forge, and Gutschoven, to imagine and depict these small structures. The "illustrators were required to interpret the text and create images that rendered its meaning understandable."¹⁰ It was precisely this understanding of Descartes's text that Clerselier was seeking in the 1664 French edition that he felt the 1662 Schuyl edition lacked.

The illustrations found in La Forge's lengthy *Remarks*, appended to the 1664 French edition of Descartes's *L'Homme de René Descartes et un Traité de la Formation du Foetus* (1664), help bring to life Descartes's idea that the body is a machine. La Forge's commentary fills over 200 pages of a 500-page volume, following Clerselier's French translation of *The Treatise on Man*, and *Description of the Human Body*. The translation includes illustrations by La Forge and Gérard van Gutschoven, both asked by Clerselier to produce the illustrations Descartes had desired to accompany the text. Both medical doctors by practice contributed their medical knowledge to the illustrations.¹¹

Rebecca Wilkin attests to the importance of "this foundational text of post-Cartesian debate," recounting the oft-cited first encounter by Nicolas Malebranche:

... he discovered such luminous truths, deduced in such marvellous order, and especially a mechanics [*une mécanique*] of the human body so admirable and divine, that he was ravished by it. ... the joy of making so many discoveries caused such violent palpitations in his heart, that he was obliged to put the book down time and again in order to catch his breath.¹²

Wilkin attributes the importance of the text to Post-Cartesians and what struck so calm a figure as Malebranche to the illustrations themselves: "... it seems that he can only be referring to Gutschoven's and La Forge's stark and stylized figures. Single units portraying discrete mechanical systems, they stand out from the mass of print by which Clerselier approximates the unfinished and deformed manuscript of *L'Homme*."¹³ While the illustrations help to bring to life Descartes's idea that the body is a machine, the text with its descriptions and metaphors would have sufficed

¹⁰Zittel 2011, 221.

¹¹*Ibid.*

¹²André 1970. Translated and cited in Wilkin 2003. Note that Wilkin attributes Malebranche's attraction to the figures, not the body as machine message.

¹³Wilkin 2003, 60. Thanks to Gideon Manning for drawing our attention to this paper.

to awaken the Oratorian from his dogmatic slumber. The model of the body as a machine is constructed clearly in Descartes's text, accented and developed in La Forge's *Remarks*, and richly illustrated by the figures.

Remarks contains a number of notable discussions: a lengthy description of the nature and generation of animal spirits, how animal spirits produce muscular movements, sensory impressions, appetites and inclinations, a sustained defense of the pineal gland as the seat of the soul, the difference between a brain in a state of wakefulness v. sleep, and the nature of corporeal habit and how it is established. La Forge concludes with a defense of Cartesian physiology and its principle of fermentation by a comparison to Cartesian physics. We take each of these up in turn.

9.2.1 *Animal Spirits: Generation and Function*

La Forge alerts us to the importance of fermentation in contrast to faculties in the explanation of the movement of the heart: "Most doctors do not attribute the beating of the heart or the blood that flows there without cessation and with each beat, to fermentation, but rather to a Faculty of the soul called the Pulsating faculty."¹⁴ Fermentation is what Descartes attributes to "a continual heat in our heart", which he designated as the first principle of life in the body-machine.¹⁵ Descartes draws on this notion in Part V of the *Discourse on Method*,¹⁶ and in his Letter to Plempius, 15 February 1638, in his discussion of blood circulation and the flow of blood through the heart. Descartes compares the expansion of blood in the heart to the action of a "yeast-like liquid" coming into contact with another liquid and causing it to expand. As Des Chene explains, a culture containing yeast is needed to start the fermentation process in the making of bread dough; in the same manner the blood in the heart requires a starter.¹⁷ The heat created in the heart acts like a starter—a heat that is started without light or fire. For Descartes the heat of the heart is just like "new wine when it ferments... causes some of the particles to collect in a part of the space containing them, and then makes them expand, pressing against the others."¹⁸ This expansion and the repetition of particles resisting and moving away moves the heart to beat, the body to pulse, the muscles to move, and the animal spirits to generate.

¹⁴La Forge 1664,185.

¹⁵Descartes, 1984–1991. *Passions of the Soul* I, 8, CSM I: 331.

¹⁶"I supposed, too, that in the beginning God did not place in this body any rational soul or any other thing to serve as a vegetative or sensitive soul, but rather that he kindled in its heart one of those fires without light which I had already explained, and whose nature I understood to be no different from that of the fire which heats hay when it has been stored before it is dry, or which causes new wine to seethe when it is left to ferment from the crushed grapes." Descartes, 1984–1991. CSM I, 134.

¹⁷Des Chene 2001, 21.

¹⁸Descartes 1998,187.

This change is a sudden fermentation that is made possible via “the entire fabric of the heart, the heat in it, the very nature of blood”¹⁹

The animal spirits are generated from the blood, which upon fermentation in the heart separates the blood into grosser and finer particles. According to La Forge, “By animal spirits we understand not only the first and second elements but also and principally all the smallest parts of the blood, which because of their solidity retain better than any others the agitation they receive in the heart.”²⁰ He likens this process to distillation whereby liquors are separated by heat into their gross particles and finer spirits.²¹ The lighter, smaller, and more agitated particles are the animal spirits, which rise and move more easily to the brain while the grosser particles are blood circulated to the rest of the body. La Forge refers his reader to a figure that illustrates the relative routes of the animal spirits depending on their quantity and level of agitation. The finer particles rush up to the brain while the coarser ones descend towards the testicles:

In my opinion, this dependence and communication between the brain and the testicles is confirmed by experience, which shows that men of study, who exercise their imagination and brain a great deal, are not ordinarily strong in the functions of generation.²²

La Forge then turns to the explanation of muscular movements, whereby the animal spirits move mechanically through the brain, down the brain stem and into the muscles. According to La Forge, explaining muscular movements by animal spirits raises special problems for the general claim that animal spirits are motions of the body.²³ Muscular movements are not achieved through the power of spirits or faculties: “But in fact, in neither dogs nor man are there any spirits, nor spiritual or corporeal faculties, that can breathe wind into a muscle, without filling the entire body.”²⁴

The objection La Forge takes especially seriously is how to explain the promptness evident in the movement of a limb—from the command to the execution. Given the relatively small quantity of animal spirits and their location in the brain, La

¹⁹Fermentation during the early modern period was understood in various ways. Antonio Clericuzio 2012 discusses the view of acid as a fermenter and a cause of digestion and further elaborates the process of digestion as a purely chemical, purely mechanical, or a combination of both chemical and mechanical digestion. 335. Catherine Wilson 1995 discusses how by the nineteenth century, Pasteur differentiated between bad and good infection when the theory of infectious diseases was combined with the chemistry of fermentation. 141.

²⁰La Forge 1664, 206.

²¹La Forge 1664, 205–206.

²²La Forge 1664, 210.

²³Des Chene 2005, discusses the issue of muscle movement. Des Chene showcases the difference between Perrault and Descartes by their views on the work that animal spirits do in case of muscles. For Perrault animal spirits “operate to relax the muscles and not to tighten or shorten them. They shorten of their own accord after being stretched” while according to Descartes that “the entry of the animal spirits into a muscle shortens it.” Perrault recognizes that the animal machine is like a mechanical machine however, the machine requires a “mover” and a pure machine is incapable of providing it.

²⁴La Forge 1664, 220.

Forge questions how they traverse the body in sufficient time and quantity to move our extremities.²⁵ Given what we now know about the electro-chemical transmission of these signals, and the limitations of the mechanical explanation, La Forge's observations are astute. For several pages La Forge painstakingly describes the complex structure of the ventricles, the tiny double canals with valves, the branching pathways—a complex network of spaces and interwoven fibers directing the animal spirits from the brain along the spine to the muscles.

He responds to the promptness problem by supposing that the narrowing and doubling of the canals, the action of valves, the heating of the spirits to increase agitation, are sufficient to explain how the animal spirits could carry out muscle movements in a purely mechanical manner. Given we are not aware of the command as it passes through the body, we merely experience the desire and subsequent action, he reasons that it is again demonstrated that the communication of motion is purely mechanical.²⁶

La Forge defends Descartes's reasons for supposing that the pineal gland is the seat of the soul. La Forge likens the pineal gland to a boat floating on water, attached by a few loose ties; relatively free to move about with the motions of the water.²⁷ The pineal gland is not only a singular structure, as Descartes pointed out, thus making it a natural location for the common sense, it also has the flexibility and mobility to receive a variety of patterns and images on its surface. In beasts, there are three general causes of motion that can affect the images traced on the pineal gland: first, the action of the exterior object on the senses; second, memory—the opening and closing of pores depending on the regularity of the pattern of the animal spirits; and third, the animal spirits themselves, their force, abundance, and course. In men, there is a fourth cause, the force of the soul to determine the movement of the gland, but even here, the pattern of the animal spirits not the soul produces the corporeal image. This mechanical explanation of the animal spirits and the pineal gland is employed to explain a range of phenomena from perception, remembering, dreaming, waking, and the communication and sympathy between a mother and her unborn child. Concerning the latter, La Forge writes, “when the mother has a strong imagination which includes a violent passion, it makes a considerable opening on

²⁵La Forge 1664, 241.

²⁶La Forge 1664, 244. Cf. Descartes 1984–1991; CSMK III: 225–226. Letter to Vorstius, 19 June 1643; “These animal spirits flow from the cavities of the brain through the nerves to all the muscles of the body, where they serve to move the limbs. Finally they leave the body by transpiration that cannot be detected—not merely those which pass along the nerves, but others as well which merely travelled in the arteries and veins. Whatever leaves the animal's body by this undetectable process of transpiration necessarily has the form of spirits ... Only the animal spirits are pure; but they vary in strength depending on the differences in the particles which make them up.” According to Descartes more can be found on vapours and exhalations and winds in Chapters 1, 2, 3, of his *meteorology*, “... for what I wrote there of vapours, exhalations and winds can easily be applied to spirits ...” See also, Des Chene 2001, 37. “The primary difference between blood-particles, and the aereous particles and spirits, is size.” Particles that are spirits, which are solid and excited, are unlike the aereous particles; spirit particles do not linger in the lungs but rather make the added journey into the aorta and toward the brain.

²⁷La Forge 1664, 302.

the surface of the ventricles of the brain, whose figure is traced on the gland, where it subsists for as long as it takes to become this opening in the network... Because this machine [of the fetus] is similar to that of its mother ... the same openings are made in the network of the infant."²⁸

La Forge treats memory or recollection as the organ of memory which he illustrates as the space between the interior surface of the ventricles and the exterior surface of the brain in which ideas are retraced on the gland by the animal spirits, the same movements that the object originally produced.²⁹ La Forge develops his account of corporeal memory in *Treatise on the Human Mind*, treating corporeal memory in mechanical and structural terms:

By the term ‘corporeal memory’ here I understand only a certain facility to re-open what remains in those pores of the brain’s ventricles which have already been opened by the spirits and in the fibres through which the spirits passed, whatever the cause which had made the opening.³⁰

In Fig. 9.1 (below) La Forge shows how the corporeal image is produced by multiple networks beginning with the object perceived, in this case, an apple: the first image is traced on nerves of the eyes; then reflected on the surface of the gland then impressed in the pathways of the brain tissue where it becomes “memory” and capable of retrieval.

La Forge depicts the multiple gateways to the brain that make possible or prevent sensory perception; depending on the quality of the animal spirits along the way, the motions may or may not be communicated to H: the pineal gland. From these examples and illustrations, La Forge concludes that only the pineal gland has the central location, the mobility, and the structure to receive the multiple pathways of motion in the brain.

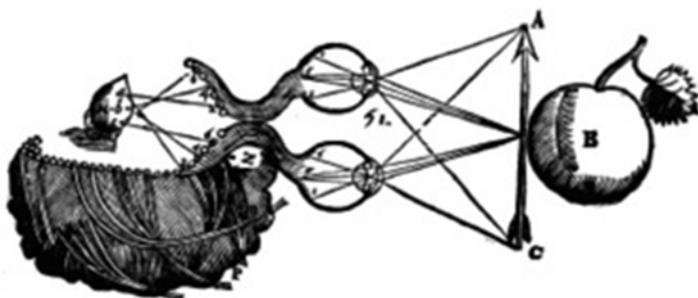


Fig. 9.1 Corporeal image

²⁸La Forge 1664, 339–341. The term “reseuil” has been translated from old French as “network”; according to the 1694 *Dictionnaire de l’Académie française*, it is the same term as “réseau” meaning small nets or interlacings; it later acquired the anatomical meaning of interlacing of vessels.

²⁹La Forge 1664, 331–332.

³⁰La Forge 1997, 178.

Descartes's pineal gland hypothesis received a great deal of criticism by his defenders and critics alike. Willis in England argued that animals have the gland and are "most destitute of imagination."³¹ Danish doctor, Niels Steensen, pointed out that Descartes's basic anatomical assumptions were wrong because the pineal gland is not suspended in the middle of the ventricles and is surrounded by veins not arteries.³²

Perhaps a more biting blow came in 1675 by the Cartesian doctor, François Bayle, who gave detailed anatomical evidence and arguments for why the pineal gland could not perform the functions assigned to it.³³

If the trouble is taken to observe thoroughly the substance of the pineal gland, its situation, the disorder and obstruction of the vessels that surround it, the disposition of the parts that form the cavities or ventricles of the brain, the extremity [aboutissement] of the marrow of the backbone surrounding the corpus callosum, the substance that separates them, and the other particularities that have until now escaped the most exact anatomists, and the knowledge of which is very necessary here—by exactly observing all these things, one will then be convinced that it is impossible that the pineal gland could serve the uses that Descartes attributes to it.³⁴

Bayle's arguments moved Malebranche's opinion from favorable to unfavorable, such that in 1674 he wrote that, "... for it must be remarked that even if [Descartes] were mistaken, which I do not believe," to a revised comment in 1678 "as appears very likely." Yet Bayle himself adds that Descartes's access to the medical information at the time was limited and one should not fault Descartes for holding the pineal gland hypothesis. The implication is that if Descartes had had the anatomical evidence that Bayle and others had, he would have agreed that the pineal gland could not function as the site of interaction between the mind and the body.

Le Forge admires Descartes's description of the brain, which he likens to a thick forest, Figs. 9.2 and 9.3 (below), "... we compared the brain to a very thick forest; the body of fibers represents the trunk of the tree, and the tiny hairs that advance out from their body, represent the branches and twigs." Moreover, the animal spirits are like a man who enters an opening in the woods and has a tendency to go to the right or left or straight ahead; but when he finds an open and worn pathway, rather than make a new one, he is likely to follow it.³⁵

In Fig. 9.4 (below) La Forge illustrates the contrast between the waking brain and the sleeping brain. During sleep the animal spirits are slower, weaker, less abundant and the gland is smaller and its cavities are straightened and less receptive to exterior motions and the generation of muscular movements. By contrast, during wakefulness the animal spirits are faster, stronger, and more abundant. The implication is that there are structural and well as functional differences between the sleeping and the wakeful brain.

³¹ Willis 1681, chapter 14. Cited in Lokhorst, Gert-Jan 2011.

³² Steensen 1669.

³³ Bayle 1675; 1677.

³⁴ Lennon and Easton 1992, 91.

³⁵ La Forge 1664, 306.

Fig. 9.2 Decartes's
Forest-like Brain:
Cross-section

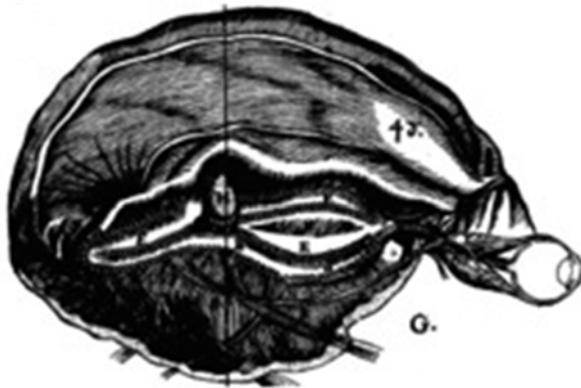


Fig. 9.3 Lateral View

La Forge again examines the hypothesized structural difference of a waking and sleeping brain in *Treatise on Human Mind* when he discusses memory. He reasons that during a wakeful state the animal spirits are plentiful but the brain is occupied with numerous activities when the senses are being used thus, making it very difficult to have a constant flow of the animal spirits. In contrast, during sleep when there are not as many animal spirits, the brain is also not distracted by external objects striking the senses, so that if during sleep animal spirits happened “to come

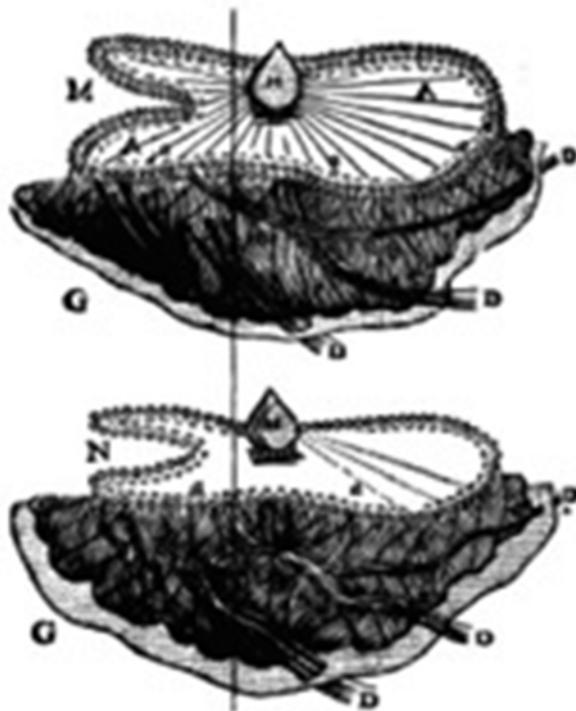


Fig. 9.4 Wakeful brain above; sleeping brain below

close to one of these traces [previous ideas or experience], it can re-open them much more than they were opened by action of the senses because the adjacent fibers are not squeezed as much.”³⁶ This form of animal spirits can sometimes have a more forceful stimulation on the brain than having experienced the object via the senses. This is because, “all the animal spirits, or at least most of those which are in the gland at that time, are not diverted by any other action and can therefore flow towards that particular place.”³⁷ Again, here too the consequence is that there are structural and functional variances between the sleeping and the wakeful brain.

Towards the end of his *Remarks*, La Forge discusses how corporeal habits are formed. He describes how to train a dog to jump for the King by pairing the sound of the words “jump for the King of France” with a piece of bread so that the words will be associated with the reward. Later the bread may be removed and the dog will continue to jump upon hearing the words uttered.³⁸ La Forge argues that this is because the process of the animal spirits and the images produced is mechanical, causing the physical traces to become physically associated with the images traced

³⁶ La Forge 1997, 163.

³⁷ *Ibid.*

³⁸ La Forge 1664, 385–386.

in the brain; it is not a process involving knowledge but rather corporeal habit/training. He re-visits the making of corporeal habits in the *Treatise* as well, this time in the example of a guard dog. Upon first encounter you chase the dog away with a stick; in subsequent encounters the dog runs away from you even without the stick:

For as a result of having struck it, the flow of spirits that our presence stimulates became joined with that caused by the blows of the stick. The paths taken by these two flows having met somewhere in the mass of the brain and combined into one, it hardly matters by which of the two it is subsequently re-opened in the brain's ventricles ...³⁹

La Forge's description of this mechanical process of the animal spirits and its habitual associations identifies what Pavlov in the twentieth century called "classical conditioning." This likely was not without predecessors prior to La Forge, and certainly other Cartesians, such as François Bayle, held a similar view. However, what seems to differ from the Pavlovian view is the potential role of ideas in the case of humans for countering the corporeal conditioning.

Lastly in this section, we will discuss La Forge's defense of Cartesian physiology and its principle of fermentation by a comparison to Cartesian physics and the application of this useful model and reasoning to medicine:

Anyway, to explain how the two seeds of man and woman could produce a machine capable of all the bodily functions we have just described, it assumes nothing else, but that they are of such a nature that in coming to mix together they serve as the leaven to each other, and are fermented. Can there be anything simpler? And so if it is possible to judge each part by the aggregate, and if what is sketched in the Second Treatise can be used to speculate about what he might have done had he completed his project, he would have explained the formation of all the parts of the human body, and all its functions, had death not taken him.⁴⁰

Thus fermentation is responsible for the beating of the heart, the production of animal spirits, the movement of blood and the animal spirits, the production of muscular movements, and reproduction itself. In La Forge's *Remarks*, we have seen developments of specific anatomical, physiological, and medical phenomena that are consistent with Descartes's work and developments of it. What La Forge evaluates as the most admirable in Descartes's physiological and medical reasoning is the simplicity of the suppositions and the comprehensiveness of its principles in the explanation of all biological phenomena. What Descartes's mechanical philosophy provided was a unified framework within which to understand the body-machine. Yet, there remains one significant chapter to the story of Cartesian medicine, namely, the role of the human soul and mind-body interaction, and its effects on the functions of the body.

³⁹La Forge 1997, 181–182.

⁴⁰La Forge 1664, 407–408.

9.3 La Forge's *Traité de l'esprit de l'homme et de ses facultez et fonctions, et de son union avec le corps* (1666)

Whereas the purpose of La Forge's *Remarks* was to elaborate and clarify Descartes's explanation of the functions of the body and his physiology, the purpose of the *Treatise on the Human Mind* is to explain the functions of the soul. In the opening of Chapter 16 of the *Treatise*, La Forge is concerned with establishing how the mind can move the body or the body can move the mind—which he argues is no more difficult than conceiving how a body has the power to communicate motion to another body. And, he takes it as a given that his audience assumes they “conceive only under a corporeal form and representation.”⁴¹ The problem enters in conceiving of mind-body interaction:

However these people should admit either that they know nothing about most natural phenomena and do not know what they are saying when they explain them according to scholastic principles, or at least that they represent them to themselves in a manner or under an idea which is completely spiritual.⁴²

His strategy is to argue that the case of mind-body interaction is as natural to conceive as body-body interaction: “That is why I said at the beginning that it was no more difficult to conceive how the mind moves the body than to know how one moves another, because, in fact, one must have recourse to the same universal cause in both cases.”⁴³ La Forge's description veers clear away from scholastic references to powers and occult qualities of bodies or of minds. God is the universal source of motion in bodies and minds, and thus, conception of all interactions is equally difficult, even though body-body interaction appears more intelligible. As in *Remarks*, the importance of the body-machine in carrying out the functions of the body-soul union remains evident in the *Treatise*:

You should also know that since no part of our body has power to act on the mind except through the mediation of the gland, likewise the soul has no power to move the body's limbs except by its mediation, by determining the movement of the gland and the flow of animal spirits towards the side of the brain's ventricles ... this gland is the principal seat of the soul and the point at which their mutual communication begins and ends.⁴⁴

La Forge saw the interaction of the mind and body as the *power of each to determine the direction of the animal spirits*—downward from the will to the movements of the body, and upwards from the motions in the body to the patterns on the pineal gland. This is illustrated nicely in Chapter 19: *Of Memory and Recollection*. He opens with a discussion of the hydraulic machine that Descartes describes at the beginning of the *Treatise on Man*. He completes the metaphor, which is worth quoting here in full:

⁴¹ La Forge 1997, 143.

⁴² *Ibid.*

⁴³ *Ibid.*

⁴⁴ *Ibid.*, 150–151.

To complete the comparison, one could add that there is a mill nearby which provides and moves the water which makes all the parts of the machine work and that it sometimes provides more and sometimes less water. In the middle of the opening where the greatest discharge takes place, there is a little boat which is situated in such a way that, depending on the flow of water coming from the mill or the impulse which the fountaineer gives it (I imagine him lodged inside it and so attached to it that he cannot raise his head above the sides), it pushes the water into some of the tubes which terminate at this opening and thereby moves the figures into which these tubes discharge. It must also be assumed that these tubes are made of leather rather than of wood, lead or earthenware, so that they can expand in proportion to the volume of water which enters them. One will easily see that this fountaineer, thus hidden in the boat—which sometimes leans in one direction and sometimes in another, depending on the impact of the water which flows from the mill or the effect of the tubes which have just opened—should be aware of four very significant things.⁴⁵

The “four very significant things” he outlines are as follows:

1. Actions of patrons walking in the Grotto/actions of external objects on the body-machine
2. Impulses of the fountaineer/effects of the gland itself on the corporeal image
3. Impact of the boat on the flow of water/actions of the animal spirits rising up from the heart
4. Facility of paths formed to be reopened after original path is forged/traces of memory

La Forge notes that all of this could happen without 2 (the impulses of the fountaineer). And, it is worth noting that the effect of the fountaineer/soul is on the direction of the animal spirits, which in turn produce the patterns on the pineal gland. The metaphor of the pineal gland as a boat that is made to move to and fro from above by the fountaineer (mind) and from below by the flow of water from the mill is not uniquely Cartesian. It harkens back to Aristotle’s notion of the soul as a captain in the ship in Book II of *De Anima*. What is perhaps unique is the detailed role La Forge gives to the material mechanical function and how it interacts with the human mind. The mind exerts force on the body, causing the animal spirits to trace a corporeal image in the brain, whose corporeal form or structure affects the direction and pattern of animal spirits in the brain, thereby directing the movements of the body.

In Chapter 22, La Forge takes up the question of love and aversion, and offers a fascinating account. According to La Forge, it is not sympathies or antipathies that explain aversion, but rather the cause is surprise. He begins by arguing against the “obscure” terms that mask our ignorance, such as the account of sympathy and antipathy found in the work of Digby:

The learned and subtle Chevalier Digby, in the treatise he wrote on the power of sympathy, introduces a very remarkable example of these kinds of aversion in the person of King James of Great Britain, who had such an aversion to unsheathed swords that he could not see one without extreme fright. He even says that the origin of the aversion came from the

⁴⁵ *Ibid.*, 177.

fact that his mother the queen, when pregnant with him, was very frightened by the murder of one of her officers who was killed in her presence in her bedroom.⁴⁶

The point about surprise is further explained with an example of a pregnant woman. It is that surprise produces a very noticeable change in the mother's animal spirits, which in turn can disturb the child she carries in her womb because of the intimate connection between the child and mother at the time. Again, the details of the mechanical explanation defend the Cartesian mechanical account:

To understand this, consider that the principal effect of this surprise is to stop the gland at the place from which the species comes which caused the fright (as Mr Descartes well remarked when he spoke about wonder) and to carry the spirits in that direction so much that they are taken away from all other directions. This species is traced not only on the gland of the mother but also on that of the child (as I explained at length in my *Comments*, pages 335ff.) and even more forcefully than on that of the mother, because the child's gland is more tender and more capable of being disturbed by it. That is why if, after the child's birth, some cause traces the same species on their gland, it produces the same effects and causes one of those aversions for which we cannot find a reason, and many other things, which I have explained in my *Comments*. Indeed, there is something very significant to notice here. These kinds of impression are sometimes so strong that it is not always necessary for the object which usually excites a certain passion in us to be present to the senses. It is often enough to imagine it in order to excite the passion. That happened one day to a friend of mine, who had such an aversion to garlic that he could not eat it without vomiting. One day he had eaten a sauce in which there was no garlic and had found it very good when someone in the group said to him afterwards, as a joke, that there was garlic in the sauce and he vomited up everything he had eaten.⁴⁷

La Forge notes that these impressions need not be caused from external objects, but possibly by the ideas in the mind, the imagination, itself. The mind can call up an image, and that in turn, causes a certain passion in us that is present to the senses. He recounts the experience of his friend whose aversion to garlic was so strong due to the very idea and its associated effects, that the mere mention of it caused him to vomit.

La Forge concludes:

That, in my opinion, is the most genuine cause one could find for these kinds of natural aversion and inclination. I also think that those who like to have recourse to sympathy and antipathy, which are obscure terms which mean nothing and which are only good for disguising our ignorance under the mask of some fancy words, according to the usual style of peripatetic philosophy, should not be preferred to us.⁴⁸

Inclinations that depend on intellectual knowledge get cursory treatment in La Forge because he believed that intellectual inclinations are better known by us so don't carry with them the obscurity and difficulties of the physical inclinations. Likewise, La Forge grants the existence of intellectual memory but provides no explanation of it beyond what Descartes said. What the *Treatise on the Human Mind* shows is that the Cartesian account of the functions of the mind cannot, in large part,

⁴⁶ *Ibid.*, 201.

⁴⁷ *Ibid.*, 202.

⁴⁸ *Ibid.*, 204.

be carried out without consideration of the nature of the body, and the soul-body union and its interaction. Explanations of the functions of the soul depend, as Descartes argued, on understanding the mind alone, the body alone, and the union of mind and body.⁴⁹ Explanations of aversion require understanding of the role of ideas and the imagination, *and* the body and imagination. The animal spirits are essential to the communication of motion from the mind to the body, and from the body to the mind.

9.4 Conclusion

As we have seen in the *Remarks*, and in the *Treatise on the Human Mind*, La Forge develops a detailed mechanical account of the animal spirits, of sense perception and appetite, of corporeal memory and habit, and a host of other topics relevant to the Cartesian conception of the human body-machine. We know that many of the specifics of Descartes's physiology did not stand the test of time. For example, the pineal gland hypothesis did not fare well after Descartes's death. Similar criticisms can be found of Descartes's theory of the heart and its movements, and of muscular movements. Descartes's views fare better in his studies of optics and motor reflexes, and in his descriptions of corporeal habit as an early conception of the cognitive mechanisms behind classical conditioning. There are some grounds for thinking that Descartes's account of corporeal memory and localization of function have relevance if not merit in the development of psycho-physics and later in neuroscience. However, the most significant impact Descartes seems to have had is in offering the model of the body-machine itself, and the mechanical-functional explanations that accompanied it, which promised to yield a science of the body. We have argued that Descartes and La Forge after him adopted an ontological and reductionist sense of mechanism in the development of the body-machine hypothesis, but that humans and the role of the mind and its interaction with the body, demanded a non-reductionist sense of mechanism. Both senses of mechanism inform and shape the Cartesian medical philosophy.

Study of the early Cartesian doctors, long neglected, gives us the opportunity to reassess Descartes's contributions to the biological and medical sciences. In studying La Forge, we hope we have shown that his work provides a rich account of the generation and workings of the animal spirits and their interaction with the human soul, giving us an important vantage point to see the reception and development of the Cartesian medical philosophy in France.

⁴⁹Descartes 1984–1991. *Passions*, Part I.

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