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DESCARTES ON THE DISPOSITION OF THE BLOOD AND THE SUBSTANTIAL UNION OF MIND AND BODY

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ABSTRACT. This essay addresses the interpretation of Descartes' understanding of the mind-body relationship as a substantial union in light of a statement he makes in the Passions de l'âme regarding the role of the blood and vital heat. Here, it seems Descartes cites these corporeal properties as the essential dispositions responsible for accommodating the soul into the human fetus. I argue that this statement should be read in the context of certain medical texts with which Descartes was familiar, namely those of Jean Fernel and William Harvey. Reviewing Fernel's comments on substantial union, one finds that the soul joins the body on the basis of a celestial spirit that not only bears the vital heat, it also directs the generation of the body. Similar to Harvey, Descartes locates these properties in the blood itself, although, in contrast to Harvey, Descartes reduces these processes to matter and motion. Finally, I highlight the role this heat plays in Descartes' embryological writing, contrasting it with that of Fernel. I conclude that although Descartes makes various comments supporting a reading of the mind-body relation as a substantial union, his physiological writings on generation and his idea of 'life' contradict this interpretation.

Keywords: mind-body union; substantial form; substantial union; generation; Jean Fernel; William Harvey

Discussion of Descartes' mind-body union commonly focuses on comments from the Sixth Meditation. Interpretations of these passages can be broadly grouped into arguments for either the coextension hypothesis or the argument for natural institutions.[1] Focusing on these and other similar passages, authors have framed the debate in terms of mind-body interactions that occur on the basis of sensations. However, scholars such as Genevieve Rodis-Lewis, Paul Hoffman and Justin Skirry have drawn attention to evidence that suggests Descartes interprets the union in

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[1] For example, see: Tad Schmaltz, *Descartes on Causation,* Oxford University Press, 2008; Margaret Wilson, *Descartes,* Boston, Routledge, 1978; Marleen Rozemond, *Descartes' Dualism,* Boston, Harvard University Press, 2002; Nicholas, E Okrent, "Descartes' Two Accounts of Mind-Body Union", *Kinesis,* v. 24, No. 1 (Summer 1997), pp. 39-53.

terms of substantial forms and matter, a metaphysical language he otherwise rejected.[2] Initially, it does seem that Descartes took the idea of a substantial union seriously. Authors have noted passages where Descartes writes, for example, "the mind is substantially united with the body"[3] or the "human being is made up of body and soul, not by the mere presence or proximity of one to the other, but by a true substantial union. For this there is, indeed, required a natural disposition of the body and the appropriate configuration of its parts."[4] These scholars argue that repeated references to a substantial union indicate that Descartes recognizes the mind or soul as a substantial form that actualizes the human body, preserving its identity over time. Similar comments from the correspondence with Arnauld, Mesland and others have been marshaled to support the notion that the metaphysics of substantial forms strongly influenced Descartes' understanding of the mind-body union.[5] Hoffman and Skirry have attempted to buttress Descartes' comments on the substantial union by comparing them to the doctrines of Duns Scotus, Ockham, Aquinas and others.

I approach the question of a substantial union in Descartes' writing through a different context: late Scholastic medical writings with which Descartes was familiar. In declaring that God creates the mind while the parents generate the body, Descartes followed a long established tradition of granting the human being two efficient causes. The problem of how two really distinct things, form and matter, with separate genealogies, could generate a human being was a problem not only for Descartes, but his predecessors as well. The physiology of this initial union of mind and body at birth was often explained in terms of 'dispositions' or 'accommodations' on the side of matter. I argue that Descartes was no different on this account, citing a curious passage where he asserts that the body's primary disposition to accommodate the soul is the blood producing a vital heat in the walls of the heart:

> [I]t seems to me that when our soul began to be joined to our body, its first passions must have arisen on some occasion when the blood, or some other juice entering the heart, was a more suitable fuel than usual for maintaining the heat of the heart, which is the principle of life: this caused the soul to join itself to this aliment and love it.[6]

[2] Geneviève Rodis-Lewis, *L'individualité selon Descartes,* Paris, Vrin. 1950; Paul Hoffman, "The Unity of Descartes' Man", *The Philosophical Review,* Vol. 95, No. 3 (July 1986), pp. 339-370; Justin Skirry, "A Hylomorphic Interpretation of Descartes' Mind-Body Union", *Proceedings of the American Catholic Philosophical Association,* v. 75, 2001, pp. 267-283.

[3] René Descartes, *Oeuvres de Descartes*, Vols. I-XII, ed. Charles Adam and Paul Tannery, Paris, J. Vrin, 1996. (cited as AT. Translations are my own unless noted.) AT VII 228.

[4] AT III 491.

[5] See AT III 493; AT III 508; AT IV 166; AT VII 219; AT VII 228; AT IV 346.

[6] AT XI 407.

This position finds inspiration in authors Descartes acknowledges, namely the medical texts of Jean Fernel and William Harvey. These thinkers offered a complex picture of the blood and the body's vital heat that granted a celestial or divine status to these aspects of the body. Because spirit or blood were thought to be celestial bodies, they served as the intermediary joining a soul born from the heavens to a mundane body. In spite of these parallels, I conclude that Descartes' mind-body union cannot be comprehended on the model of a substantial union as Skirry and Hoffman have argued. Descartes' notion of the human being ultimately cannot be understood as a hylomorphic compound because the accommodation found in the heat of the heart has no particular relation to the soul. Instead, in Descartes' work, this accommodation is neither particularly 'divine' nor is it even living, and it has no unique disposition to receive the soul since it cannot be distinguished from other mundane processes found outside the human body. That is, because no part of the body is generated for the sake of the soul, Descartes lacks any explanation how or even why the soul might bond to a human body.

This essay begins with an introduction to Fernel's thinking on substantial union. Upon establishing that the human being derives from two efficient causes, I pose two questions. First, what is the physiological or corporeal condition for the possibility of the reception of form? Second, what distinguishes this disposition from other body parts, granting it a unique relationship to the soul? Fernel is clear that this disposition is a certain spirit, and its unique nature is found in its divine or celestial status. This quality not only provides a unique affinity to the soul, it also carries the body's vital heat and directs the generation of the body. The second section addresses the problem of why Descartes seems to assert that the soul joins itself not to a divine spirit, but rather an 'aliment' responsible for the body's vital heat, that is, the blood. Recognizing Descartes' extensive interest in Harvey's work on circulation, one also realizes that Harvey had attributed each and every characteristic of Fernel's celestial spirit to the blood itself. This furnished Descartes with an important precedent in prioritizing the blood in relation to the vital heat, corporeal generation and the soul. Finally, one must understand how the nature of the body's disposition to receive the soul is derived from sexual generation. I conclude by contrasting Descartes' account of generation with that of Fernel in order to better grasp the nature of the vital heat and its origins. In conclusion, a thorough analysis of the generation of the substantial union of soul and body must reckon not only with Article 107 of the *Passions*, but much of Descartes' physiology. Ultimately, studied in this context, it becomes unlikely that Descartes understood the human being as a substantial union in the Scholastic sense. While he does assert that the soul joins to the body on the basis of certain dispositions, most notably the blood and the body's vital heat, he simultaneously strips those dispositions of any unique relation to the soul, depicting them as inorganic, mechanical processes. This particular historical context not only makes

a Cartesian substantial union impossible to understand, it has the further effect of resituating Descartes' mind-body problem on the terrain of generation rather than sensation or interaction.

The Union of Form and Matter in the Work of Jean Fernel

Although Aristotle never used the term 'substantial form' himself, the traditional framework of hylomorphism requires that every natural thing be composed of form and matter.[7] Long before Descartes, the questions of how matter might produce a form, if forms reproduce other forms, if 'life' is a property of form or matter, if matter has its own formative power, and what role God plays in the production of forms were well established.[8] Here, I survey relevant aspects of Fernel's work. His Platonized rendition of Galenism argued not only that, in the case of human beings, form and matter derived from separate origins, but also that bodies were generated and 'disposed' to receive the form on account of a vital heat carried by a celestial spirit.

The notion that mind and body derive from distinct origins is not uncommon for this historical period. Aquinas, the Coimbra Commentators, Eustachius and Suarez all maintained this doctrine in various forms. For instance, in 1597, Suarez argued that most forms are educed from matter through the course of substantial generation, while the human soul is unique in that it is created ex nihilo by God. Suarez was certainly not the first or only philosopher to argue this position, but his writings from the 15th, 28th and 29th Disputations have compared favorably to Descartes'. Jean-Luc Marion has demonstrated that Descartes' own views on God's creation of the soul in his third Meditation and 5th Reply is profitably interpreted against the background of Suarez's thought.[9] And while the two do not agree on the precise meaning of 'ex nihilo', they continue a long tradition in claiming that the human being is generated by two efficient causes.

Suarez recognizes that if the mind is simple, immaterial and divine, it is not immediately clear how it joins with a diverse, material and mundane body. In order for soul and body to bond, there must be from the outset a third thing to bring the two substances into relation.[10] Citing Plato's Timaeus and following long historical precedent, this construction of a middle term is performed by invoking certain dispositions or proportions inherent in the body. Suarez explains,

[7] See Ellen Stone Haring, "Substantial Form in Aristotle's 'Metaphysics' Z, I", *The Review of Metaphysics*, Vol. 10, No. 2 (Dec. 1956), pp. 308-332.

[8] A complete discussion of these questions can be found in Hiro Hirai, *Medical Humanism and Natural Philosophy: Renaissance Debates on Matter, Life and Soul,* Boston, Brill, 2011.

[9] Jean-Luc Marion, *On the Ego and On God: Further Cartesian Questions,* translated by Christina M. Gschwandter, New York, Fordham University Press, 2007, pp. 139-160.

[10] Plato, 31c.

> How can form, which is so distant in its nature from matter be immediately united to matter through itself? This seems especially difficult in the case of the rational soul, which is spiritual. I respond, in the first place that there is not so great a distance that form and matter do not agree in genus. I respond secondly, that distance is not a hindrance if there is a due proportion.[11]

Though Suarez says little about the precise nature of this 'proportion' or 'disposition', the medical community of the time had been investigating and elucidating their nature. Anyone who reads Descartes' own Traité de l'homme will find a virtual catalogue of dispositions, and he was particularly interested in the movement of the heart. In his publications and correspondence, Descartes favorably mentions two physiologists whose work he drew upon in this regard: Jean Fernel and William Harvey.

The full extent of Descartes' familiarity with Fernel is not entirely clear. It is known that Fernel's works enjoyed widespread popularity and extensive distribution due, in part, to technological developments in printing as well as an influx of medical students in France seeking a systematic textbook.[12] As Gilson has noted, Descartes was likely introduced to Fernel through his Jesuit education, where the Coimbrian commentary on the Parva naturalia repeatedly cited Fernel as a contemporary authority on anatomy and medicine.[13] Descartes himself cites Fernel as a respected medical expert in a letter to Plempius from February 15, 1638.[14] From that date, we know that Descartes was familiar with Fernel's writings before penning any of his thoughts on the mind-body union or the human being as a substantial form. Nevertheless, I do not claim that Descartes necessarily worked through Fernel's texts in the level of detail I provide below, and Descartes might have learned similar ideas through various other sources.[15] Suffice it to say, Fernel is a common

[11] Francisco Suárez, *Opera Omnia. Disputatio XV. De Causa Formali Substantiali*, Paris, Vives, 1856-1858, 28 volumes, p. 518. English translation is from: Francis Suárez, *On the Formal Cause of Substance: Metaphysical Disputation XV*, translated by John Kronen and Jeremiah Reed, Milwaukee, WI, Marquette University Press, 2000, p. 81. On Suárez's relationship to Descartes, see: Denis Des Chene, *Physiologia: Natural Philosophy in Late Aristotelean and Cartesian Thought,* Ithaca, NY, Cornell University Press, 1996.

[12] Jean Fernel, *Jean Fernel's On the Hidden Causes of Things: Forms, Souls and Occult Diseases in Renaissance Medicine,* translated by John M. Forrestor, Boston, Brill Academic Publishing, 2005, pp. 15-16.

[13] Étienne Gilson, *Études sur la role de la pensée medieval dans la formation du système cartésien*, Paris, J. Vrin, 1951, p. 52.

[14] AT I 533.

[15] See, for example, Daniel Sennert, *Practica Medicinae VI*, p. 740, in *Opera Omnia*, Vol. III, 1650. Sennert formulates the soul's bond with the body's innate heat as the standard Aristotlean view. However, it should also be noted that when Sennert refutes the soul's divine origin and the physiology of its subsequent bond with the innate heat, it is specifically Fernel to whom he directs his attack. See: Daniel Sennert, *Hypomnemata Pysica,* 1637, Book IV, Chapter II, pp. 134-141; Emily Michael, "Daniel Sennert on Matter and Form: At the Juncture of the Old and the New", *Early Science and Medicine,* Vol. 2, No. 3 (1997), pp. 294-295.

point of reference for both Descartes and Scholastic physiology, and as such, a close reading of his work provides a helpful point of contrast to aid an evaluation of Descartes' alleged substantial union. Specifically, Fernel's work is significant because it provides background for Descartes' thoughts on concepts such as spirit, the origin of the soul and the role of sexual reproduction, all relevant to his thoughts on substantial union. On the question of the mind-body union, two of Fernel's texts are essential: his Physiologia from 1567 and De abditis rerum causis from 1584.[16]

Regarding the origins of body and soul, Fernel too believes that the human being derives from two efficient causes: "a human being and the sun beget a human being."[17] That is to say, the rational soul derives from the sun, while the body is created by the parents.[18] Fernel indicates in the Physiologia that only the rational soul has this celestial origin, while natural and sentient souls are educed from matter.[19] Regarding the mind, Fernel makes clear, "[I]t is mind pure and simple [*mens illa simplex*] alone, neither provided with nor in need of the earthy bulk of the body, that accrues from outside."[20] The body and its dispositions are inherited from the parents in the act of sexual generation, but the mind or rational soul derives from an eternal or immortal source, an inheritance not from sex, but from the celestial bodies, specifically the Sun.[21]

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[16] A partial bibliography of Fernel includes: Leon Figard, *Un Médecin philosophe au XVI^e siècle*: *Étude sur la psychologie de Jean Fernel*, Paris, 1903; Charles Sherrington, *The Endeavor of Jean Fernel*, Cambridge, 1946; Jacques Roger, *Jean Fernel et les problèmes de la médecine de la Renaissance*, Paris, 1960; Giancarlo Zanier, "Platonic Trends in Renaissance Medecine", *Journal of the History of Ideas*, Vol. 48, No. 3 (Jul.-Sep., 1987), pp. 509-519; Hiro Hirai, "Alter Galenus: Jean Fernel et son interprétation platonico-chrétienne de Galien", *Early Science and Medicine*, Vol. 10, No. 1 (2005), pp. 1-35.

[17] Jean Fernel, *Jean Fernel's On the Hidden Causes of Things: Forms, Souls and Occult Diseases in Renaissance Medicine,* ed. cit., p. 318 Latin, 319 English.

[18] Fernel does not believe that the sun sends down a form that had been generated and completed extra-terrestrially. However the sun does instill the power of a form into a freshly generated being by illuminating it. Fernel explains, "[Heavenly bodies] instill into the freshly generated thing the power and nature of the substances from which they emanated, and insert a form in such a way that the illumination radiating from the Sun's light into a visible and prepared body, and bathing in it, introduces into that body not just illumination, but also in the end some of its own light too", *ibid*., 320 Latin, 321 English. This hinges on a complex relationship between *lux* and *lumen*, which is well beyond the scope of this essay. See John Forrestor's introduction to the *Physiologia* (p. 76-83).

[19] *Ibid*., 552 Latin, 553 English.

[20] *Ibid*., 548 Latin, 549 English.

[21] There is a long and notable history of heat's role in conception. See for example: Friedrich Solmsen, "The Vital Heat, the Inborn Pneuma and the Aether", *The Journal of Hellenic Studies*, Vol. 77, Part 1 (1957), pp. 119-123; A.J. Kleywegt, "Cleanthes and the 'Vital Heat'", *Mnemosyne*, Fourth Series, Vol. 37, Fasc. ½ (1984), pp. 94-102; Mohan Matthen, "The Four Causes in Aristotle's Embryology", *Apeiron: A Journal for Ancient Philosophy and Science,* Vol. 22, No. 4 (December 1989), pp. 159-179; George Kimball Plochmann, "Nature and the Living Thing in Aristotle's Biology", *Journal of the History of Ideas,* Vol. 14, No. 2 (Apr. 1953), pp. 167-190; Anthony Preus, "Galen's Criticisms to Aristotle's Conception Theory", *Journal of the History of Biology,* Vol. 10 (1977), pp. 65-85; Michael Boylan, "Galen's Conception Theory", *Journal of the History of Biology,* Vol. 19, No. 1 (Spring, 1986), pp. 47-77.

Addressing the union of form and matter in *De abditis rerum causis*, Fernel confronts the problem of how a human body, composed of diverse materials including flesh, bones, and fluids, can possibly be a simple 'this' – a human being. Fernel must demonstrate "that the form of a composite body is simple and similar, and also dispersed through the parts,"[22] a concern Descartes addresses in his *Réponses* through the analogy of heaviness.[23] If the form is simple, how can a simple and uniform soul unite with all the diverse parts of the body? What relates this matter to create *a* body to which the mind can join itself? Fernel writes,

> If you are prepared to think straight about this resemblance of parts, what needs to be reckoned is, as I said before, not the temperament or thickness of the substance, but its own special property, and the spirit that makes it ready in a special way for the arrival of form.[24]

But what is this 'special property' or 'spirit'? Fernel devotes much of his attention to this question not only in Book 1 of *De abditis rerum causis* , but also throughout his *Physiologia*. However, what is most important to comprehend from the outset, and it is implicated in the previous quote, is that matter is not strictly passive, as it has an inherent force which readies it to receive a certain form. This force is not the essence of the being, nor is it completely uniform throughout all of nature. The matter of each organism, be it a dog, a mule, or a human, has a particular disposition or amenability to receive an appropriate form, and this amenability preexists the form that is said to differentiate the material. The union of the two is made possible by the dispositions that 'predispose' matter to receive a certain form.

Fernel explains, "In the bodies of all living things, at least three preparations must be in place for the reception of form."[25] The first of these is "a proper and suitable temperament,"[26] while the second is "a harmonious combining, accord, and adaption" of each organic part.[27] As the above quote indicates, these are not as essential as the third, which Fernel states is "a spirit pervading the whole, in which the salutary vital heat resides."[28] In Fernel's works there are several different kinds of spirit, each of which plays a specific role in organic processes. *Natural spirits* are formed in the liver, which mediate the functions of the nutritive

[22] Jean Fernel, *Jean Fernel's On the Hidden Causes of Things: Forms, Souls and Occult Diseases in Renaissance Medicine,* ed. cit. Text in Latin and English, p. 198 Latin, 199 English.
[23] AT VII 441-2.
[24] *Jean Fernel's On the Hidden Causes of Things: Forms, Souls and Occult Diseases in Renaissance Medicine*, ed. cit., p. 204 Latin, 205 English.
[25] *Ibid.*, p. 212 Latin, 213 English.
[26] *Ibid*., 212 Latin, 213 English.
[27] *Ibid*.
[28] *Ibid*., p. 214 Latin; 215 English.

and vegetative soul. *Vital spirits* are formed in the left part of the heart out of blood and air and they distribute heat throughout the body. *Animal spirits* are formed out of the vital spirits, and, as for Descartes, they travel through the nervous system to facilitate motion and sensation. In addition, there is a fourth, more fundamental spirit, which Fernel calls the *divine* or *celestial spirit*. Not only is celestial spirit the source of all vital functions, it is the essential prerequisite for the soul's unification with the body, since it is nearest in nature to the soul. The effects of this spirit are in large part due to the vital heat it carries, a heat distinct from that found in inorganic nature. Fernel argues at length how, "This heat is above the nature of elements,"[29] deriving from a divine origin. Because the spirit's vital heat is a kind of celestial body present in the fetus, it serves as an ideal mediator uniting soul and body. In Fernel's words, "[I]t is exceedingly intimate with both, and not being devoid of body, can be placed in a coarse body. But being more rarefied and bright it can be linked to the mind. Sharing thus in both after a fashion, it bonds a nature without body to corporeal nature, the immortal to the mortal, the pure to the impure, the divine to the earthly."[30] That is to say, the soul only bonds to the body through this 'third term', the celestial spirit. This spirit is not itself a body part, but rather it is that which readies the body parts as a living being. This is the essential disposition for the reception of the soul.

In review, Fernel did not deviate from the received notion that the human being was generated through two distinct genealogies. In uniting mind and matter, Fernel invoked a certain celestial spirit featuring qualities unique from both body and mind. First, its celestial or divine nature granted it an affinity for a soul born from the sun. Moreover, its heat, a heat more divine than that created by ordinary fire, maintained the living body such that the soul might bond with a living being and not merely undefined matter. By locating these supra-elemental qualities in the body, this spirit created the bond necessary to unify the human being. Descartes of course also insists on the distinct origins of mind and body, and while he does believe the soul bonds to a particular aliment producing the vital heat, he considers this to be the blood.

The Blood

When Descartes discusses the body's vital heat, it is almost always with the work of William Harvey in mind. Harvey appears in several of Descartes' letters and texts, but perhaps he is most notable in Section V of the *Discours*, which Descartes devotes almost entirely to the functioning of the heart and

[29] Jean Fernel, *The Physiologia of Jean Fernel*, translated by John M. Forrester, Philadelphia, American Philosophical Society, 2003. Text in Latin and English, p. 258 Latin; 259 English.
[30] *Ibid*., 262 Latin, 263 English.

Harvey's anatomical methods. Although Harvey makes several key breakthroughs in anatomy, his thought still resides in the Scholastic world, relying heavily on material tendencies and substantial forms.[31] However, in spite of this discrepancy with Descartes, Harvey's work relocates the functions Fernel had attributed to the celestial spirit in the blood itself.

On Harvey's account, the blood, not spirits, is the source of the innate heat crucial to life. Moreover, in contrast to thinkers like Fernel, the heat and spirits unique to the blood are actually identical to the blood. Harvey writes,

> There is, in fact, no occasion for searching after spirits foreign to, or distinct from, the blood; to evoke heat from another source; to bring gods upon the scene and to encumber philosophy with any fanciful conceits; what we are wont to derive from the stars is in truth produced at home: the blood is the only *calidum innatum*, or first engendered animal heat; a fact which so clearly appears from our observations on animal reproduction, particularly of the chick from the egg, that it seems superfluous to multiply illustrations.[32]

In *De Generatione*, Harvey further clarifies that it is blood and not spirit that acts on account of its own immanent, spiritual nature:

> The tenuity, subtlety, mobility, etc. of the spirits, therefore, bring no kind of advantage more than the blood, which it seems they constantly accompany, and already possess. The blood consequently suffices, and is adequate to be the immediate instrument of the soul, inasmuch as it is everywhere present, and moves hither and thither with the greatest rapidity.[33]

That is, the blood, a corporeal substance, acts in a way that cannot be explained by the mere interaction of the four elements. The blood is a kind of material, but an acting material with its own spiritual nature. It is this latter quality that allows the blood to effectively replace Fernel's celestial spirits, a notion that finds

[31] On Harvey's relationship with Descartes see: Thomas Fuchs, *The Mechanization of the Heart: Harvey to Descartes*, translated by Marjorie Greene, Rochester, NY, University of Rochester Press, 2001; Roger French, *William Harvey's Natural Philosophy*, Cambridge, Cambridge University Press, 1994. On Harvey's relationship to Fernel, see: James J. Bono, "Reform and the Languages of Renaissance Theoretical Medicine: Harvey versus Fernel", *Journal of the History of Biology*, Vol. 23, No. 3 (Autumn, 1990), pp. 341-387. A general bibliography of William Harvey includes: Pagel, Walter, *William Harvey's Biological Ideas*, New York, Karger, 1967; *idem*, *New Light on William Harvey,* New York, Karger, 1976; Charles Webster, "Harvey's *De generatione*: Its Origin and Relevance to the Theory of Circulation", *British Journal of the History of Science*, 3 (1967), pp. 262-274.; John S. White, "William Harvey and the Primacy of the Blood." *Annales of Science*, 43 (1986), pp. 239-255.

[32] Guilielmo Harveo, *Exercitationes de Generatione Animalium*, Ex Officiana Heredum Pauli Frambotti, 1666. p. 490; William Harvey, *The Works of William Harvey*, translated by Robert Willis, London, Sydenham, 1847, p. 502.

[33] *Ibid*., 491; 504. See also: William Harvey, *The Anatomical Exercises*, edited by Geoffrey Keynes, Dover: NY, 1995, p. 157.

no role in Harvey's work. Descartes read *De Motu Cordis* in 1632[34] and he studied Harvey's work when he was working on his *Traité de l'homme*, one of his most prolonged engagements with human anatomy. Although Harvey's *De generatione* was not published until 1651, a year after Descartes' death, the *De Motu Cordis* addresses the body's vital heat and the blood on several occasions. Reference to the blood's celestial nature is quite explicit in Harvey's appropriation of Aristotle's circular symbolism. To Harvey, the circulation of the blood mirrors the circulation of the heavens, granting the heart and blood a uniquely divine status. Harvey writes in De motu cordis,

> So the heart is the center of life, the sun of the Microcosm, as the sun itself might be called the heart of the world. The blood is moved, invigorated, and kept from decaying by the power and pulse of the heart. It is that intimate shrine whose function is the nourishing and arming of the whole body, the basis and source of all life.[35]

Whereas Fernel believed a celestial spirit carried the vital heat, Harvey makes this a property of the blood itself as it passes through the heart. This made the blood not only the principle of life, but also a material featuring an element analogous to the divine and immortal realm of heavenly bodies.

Although Descartes devotes a full paragraph of Section V of the *Discours* to a summary and conditional approval of Harvey's theory of the circulation of the blood and his methods of demonstration,[36] he nevertheless strongly criticizes Harvey's characterizations of the blood and the heart several times in his written correspondence.[37] Just what does this point of disagreement consist of? Both agree that the heart and the blood in conjunction produce the body's heat. While Harvey believes that the blood is the source of vital heat on account of its celestial power, Descartes insists that this heat of the blood and heart is due to strictly mechanical causes. He introduces a *feu sans lumière* that is responsible for heating the heart by way of the blood. That is to say, Descartes attempts a complete reformulation of vital heat in mechanistic terms while maintaining it as the principle of life.

It is well known and as the concluding remarks of *Le Monde* make clear,[38] Descartes believes the body, *qua* body, to be comprehensible strictly on the basis extension and the movement of its particles. Of course, this stands in stark

[34] Étienne Gilson, *Études sur la role de la pensée medieval dans la formation du système cartésien*, Paris, J. Vrin, 1951, p. 73, my translation.

[35] William Harvey, *Exercitatio anatomica de motu cordis et sanguinis in animalibus,* translation Chauncey Leake, Baltimore, C.C. Thomas, 1949, p. 71.

[36] Roger French, *William Harvey's Natural Philosophy*, New York, Cambridge University Press, 1994, p. 179.

[37] AT VI 46-50; AT I 263; AT II 501.

[38] AT XI 202.

contrast to statements by Fernel arguing that the vital heat is *not* an elemental fire. According to Descartes, the blood and the heat in the heart are not anything peculiar to living beings, but rather the 'principle of life' is the same phenomenon that is found in any fire. Descartes details how this *feu sans lumière* functions in the walls of the heart. Arguing that neither the blood, the spirits nor the vital heat have any immanent divine properties, Descartes states that life is owed to a kind of combustion through fermentation. In attempting to explain this, he writes that this heat is not "at all of another nature than that which heats hay, when we have stored it before it was dry, or that boils new wines when we leave them to rest on the grate."[39] Similarly, in the *Description*, he makes another reference to inanimate processes of fermentation writing, "We cannot doubt that there is a heat in the heart, because we can even feel it with our hand when we open the body of a living animal. And it is not necessary to imagine that this heat is of another nature than is generally all those that are caused by the mixing of a liqueur or agent of fermentation…"[40] In the *Discourse*, he repeats this thought, writing, "[God] excited in its heart one of these fires without light which I had already explained, and which I conceived to be of the same nature as that which heats grain, when we store it before it is dry, or which makes new wines boil, when we leave to ferment in the pulp."[41] In his *Principes*, Descartes gives a detailed explanation of how a *feu sans lumière* is created in inorganic matter, using the example of wet hay.[42]

Whereas Fernel maintained that the fuel for this fire in the heart was a kind of oily '*vitale et salutare humidum*',[43] in Descartes' work the fuel is nothing other than the blood itself. As Descartes claims in the Fifth Book of the *Discours*, the blood is "used to feed the fire in the heart," and just as the liquid in wet hay facilitates the heat, so it is with blood, as the first element particles agitate the pores in the walls of the heart. Descartes maintains through his final publication, *Les passions de l'âme*, "the blood, or some other juice entering the heart, was a more suitable fuel than usual for maintaining the heat which is the principle of life."[44] In this regard, Descartes is aligned with Harvey, who positioned the blood as the basis of the vital heat as well as the mediator between soul and body. However, Descartes believes that this 'vital' heat is not unique to the organic world at all. It is nothing

[39] AT VI 46.
[40] AT XI 228.
[41] AT VI 46.
[42] See Annie Bitbol-Hespériès, *Le Principe de vie chez Descartes,* Paris, Vrin, 1990; Dennis Des Chene, *Spirits and Clocks: Machine and Organism in Descartes,* Ithaca, NY, Cornell University Press, 2001, Chapter 2.
[43] Jean, Fernel, *The Physiologia of Jean Fernel*, translated by John M. Forrester, Philadelphia, American Philosophical Society, 2003, p. 272 Latin, 273 English.
[44] AT XI 407.

more than the inorganic movement of particles, and ultimately Descartes' 'principle of life' is not an organic principle. Life's 'organic' distinction becomes a casualty of the mechanical view of nature, as the heart and its heat are merely an instance of a process of fermentation found in various inorganic materials.[45]

The Generation of the Body

Hitherto, I have argued that Descartes and others believe that substantial forms do not derive from the parents, but a higher power, be it the heavenly bodies or God. In joining these two genealogies, Fernel invoked a celestial spirit carrying the vital heat. Although Article 107 of the *Passions de l'âme* indicates Descartes' belief that the soul bonds with the body on account of a vital heat, he seems to follow Harvey in rejecting any role of a celestial spirit. Instead, Descartes describes a *feu sans lumière* produced by the blood, and it is this aliment to which the soul unites. Here, I describe how the nature of this disposition derives from the process of generation as described by Descartes and Fernel respectively. One discovers that the distinct quality of the disposition uniting soul and body derives from each thinker's unique understanding of the semen and fetal development.

Descartes' corpus provides significant evidence that he felt it necessary to give an account of generation on the basis of his mechanical physics.[46] In fact, as Descartes wrote his *Description* and *Traité*, he was immersed in the embryological treatises of his contemporaries, hypothesizing the nature of the seed, how the organs are formed and the role of God. There are four places in Descartes' oeuvre that address generation directly: *Primae Cogitationes circa generationem animalium*, first published in 1692, the Excerpta anatomica and Remedia et vires medicamentorum, which both survive thanks to Leibniz who recopied them into his notebooks, and finally the *Description* itself, published in 1664 by Clerselier. Add to this his Third Meditation and Fourth Reply, which concern the origins of the soul, and one finds a rather extensive body of work on the topic. Here, I focus on the *Description*, which is arguably Descartes' most polished writing on the question of corporeal generation.

[45] Details on the meaning of 'life' in Descartes can be found in Annie Bitbol-Hésperiès, *Le principe de vie chez Descartes,* Paris, Vrin, 1990.

[46] However, there are several excellent works on the topic. See for example: Vincent Aucante, "Descartes' Experimental Method and the Generation of Animals", *The Problem of Animal Generation in Early Modern Philosophy*, edited by Justin Smith, New York, Cambridge University Press, 2006; Stephen Gaukroger, "The Resources of a Mechanist Physiology and the Problem of Goal-Directed Processes", *Descartes' Natural Philosophy*, Routledge, New York, 2000. For a complete overview see: Jacques Roger, *Les sciences de la vie dans la pensée francaise du XIII^e siècle. La génération des animaux de Descartes à Encylopedie,* Paris, Armand Colin, 1963.

Descartes believes that as the site of the vital heat, life can only be said to begin once the heart is formed.[47] His challenge is to describe its formation without recourse to final causes, Aristotelean souls or Galenic faculties as his predecessors had done. Descartes explains the action of the semen and the formation of the heart and other organs as follows:

> It suffices to say that [the particles of the seed] of plants, being hard and solid, can have its parts arranged and situated in a certain way […] but it is not the same with the particles of animal semen, which are completely fluid, and ordinarily produced by the conjunction of the two sexes, and which seem only to be a confused mix of two liquids which serve as a leaven for each other, heating each other in such way that some of their particles acquire the same agitation as fire, dilate and press upon the others, and in this way arrange [disposent] the particles little by little in the way required to form the organs.[48]

This heat produced in the womb is of the same nature as the heat in the heart. The heat produced by the mixture of semen ferments and creates an identical kind of *feu sans lumière*, which results in the formation of the heart. Descartes writes, "I believe that the first thing to appear in the mixture of semen, and which makes all of its droplets stop from being the same, is that the heat is excited here, and acts in the same way as in new wines when they boil, or in hay when it has been shut away before dry, and here it dilates, they press the others that surround them and begin to form the heart."[49] Once these particles press on each other enough to form a solid substance, their continued dilation forces some particles to expand outward. Following the principle of rectilinear inertia, these particles begin to move in a straight line, but they do not travel far until they encounter resistance and are pushed back the way they came. This point of resistance is nothing other than what will become the walls of the heart. As the heat pushes particles outward to the wall, and the particles circulate back toward the heat, a circle of movement is formed. As the particles continue in this circular movement, each time they expand and move away, following the same path. With each circulation the particles move away from the heat a little father until bit by bit the walls of the heart are pushed out and all of its cavities are formed. In this sense, Descartes believes it is a process of growth without a final cause much like nutrition whereby particles of matter are carried farther away by a steady flow of liquid, be it blood or first element particles.[50] In this way, the male and

[47] See AT XI 507; AT XI 506; AT XI 509.
[48] AT XI 253.
[49] AT XI 254.
[50] On fetal development as a sort of nutrition see Stephen Gaukroger, "The resources of a mechanist physiology and the problem of goal directed processes", *Descartes' Natural Philosophy*, New York, Routledge, 2000, p. 393.

female semen combine to create heat, heat creates the heart, the heart is the first organ formed and becomes the source of heat for the animal throughout the course of its life. Again, note that this heat, a *feu sans lumière*, is always of the same nature be it in generation or the heartbeat, and Descartes even invokes the same metaphors of fermentation to explain the heat that propels generation as well as that which resides in the fully formed heart.

In his writings on generation, Descartes is at once very close to and very distant from what one finds in Fernel's work. Fernel's explanation of generation begins with the assertion that celestial spirit is responsible for all generation:

> [T]his spirit, the regulator of heat and all the faculties and the originator of procreation, gathers into the center of the semen. It does not vanish or fly off from the semen, although many people take Aristotle this way, but continues in it as the craftsman fashioning all the parts, is utterly and fundamentally imbedded in them, and becomes their original nature.[51]

Yet, even though the spirit and the vital heat it carries are embedded in the whole body, it is most concentrated in the heart. This is due to the fact that the semen is not uniform, but rather the celestial spirit is concentrated in the center of the semen. Each organ that develops takes on the particular character of that part of the semen from which it develops. As Fernel explains,

> First of all, swelling with much spirit, [the semen] spreads itself out, and pervading everything, it separates off the different parts in the semen (which looks simple and uniform, yet is not so), the hot from the cold, the thin from the thick and earthy, so that individual parts end up adopting their own nature, and are assembled for the fashioning of the parts from which in the past they withdrew.[52]

The heart develops out of the hottest, most spirituous, and most divine bit of semen, and this is how Fernel accounts for the heart as the residence of this heat and divine spirit. Accordingly, as the soul unites with the body, the bond will occur on the basis of this spirituous heat in the heart. It is crucial to note here how the fundamental possibility of this union is ultimately derived not from the nature of the heart itself, but the semen that forms the heart out of its dense accumulation of divine spirit. Hence, the primary accommodation for the reception of the rational soul is founded upon this specific account of the semen and sexual reproduction.

Elements of this doctrine are reflected in Descartes' understanding of the mind-body union at conception, as he adopts a similar position. The heat driving fetal development first generates the heart and then remains there, fueled by the blood, which in turn serves as the living body's disposition for the mind. Yet his

[51] Jean Fernel, *The Physiologia of Jean Fernel*, ed. cit., p. 572 Latin, 573 English.
[52] *Ibid*., 578 Latin, 579 English.

account does not permit the accommodations provided by a celestial spirit. In its place, the formation of the heart and its resident heat are composed of strictly corpuscular motion. These particles are in no way celestial or divine. For Descartes, the semen is inorganic, and so is its heat which drives the process of generation. Accordingly, the heat of the heart is no more organic, as it is the first product of the movement of the semen's particles. We find Descartes emphasizing this position in the *Description*, such as when he claims, "And I do not know of any fire or heat in the heart other than this agitation of the particles of the blood…" or "this movement of the diastole has been caused from the beginning by heat, or by the action of fire, which, following what I explained in my *Principes*, is not able to consist of anything other than the first Element."[53] This is just to say that the body's disposition to receive the soul is the concentrated residue of the materials and processes responsible for fetal development. The way Descartes characterizes the heat of the heart is an extension of his explanations of sexual reproduction. This is equally true of Fernel's account, and one finds both thinkers agreeing on the homogeneity of the materials responsible for fetal development, the body's vital heat and the disposition charged with the reception of the soul. In this light, it seems clear that the way Descartes and Fernel each considered fetal development ultimately determined their characterization of the disposition responsible for joining soul and body.

However, this is where the similarities end. In Fernel's work, I have detailed how the celestial spirit accounted for sexual generation as well as serving as the source of vital heat. Beyond these duties, celestial spirits made the union of rational soul and body possible insofar as their Janus-faced nature served as the accommodation necessary for the reception of the soul. It is this quality of celestial spirit that allows Fernel to say, "The body of each living thing, and especially the human body, is constructed for the sake of the soul."[54] As I have shown, Descartes will have no part in this physiology of the substantial union. Not only is there an explicit rejection of a physiology based on final causes, there is no intermediary substance present in the body to accommodate the soul. Thus, in spite of Descartes' repeated references to substantial forms and unions, which have been cited as evidence in favor of a Scholastic interpretation of the mind-body union, Descartes systematically dismantles the physiological foundation of that doctrine. While Descartes does state in Article 107 of the *Passions* that the soul, at birth, 'loves' the blood responsible for the heat in the heart, there is no explanation of what makes this disposition uniquely human or what makes this heat particularly

[53] AT XI 281.

[54] Jean Fernel, *The Physiologia of Jean Fernel*, ed. cit., p. 16 Latin, 17 English. For context on the teleological nature of dispositions beyond Fernel's writings, see Denis Des Chene, *op. cit.*, pp. 179-181.

attractive to the soul.[55] If this disposition is no different from fermenting wine or decomposing hay, why does the soul not love those materials as well? In other words, beyond the customary question of *how* mind and body unite, Descartes must reckon with the further problem of *why* they unite. Why does the soul love *my* body when this body presents no distinct accommodation for the soul? Descartes states this 'joining' is a kind of love, but what guides the soul's love to human bodies? This question, ultimately rooted in Descartes' account of generation, cannot be answered within the parameters of dualism, since no 'third term' or mediating accommodation can distinguish the human body as the uniquely appropriate residence for the divinely created human soul. For these reasons, it is unlikely that Descartes understood the union on the Scholastic model as Hoffman and Skirry have suggested. In spite of his invocation of certain Scholastic terminology, the physiology needed to support a substantial union is entirely missing. However, though a solution may not be found in approaching Descartes' mind-body problem on the basis of substantial forms, this context does have the positive result of resituating the terms of the problem such that the questions of love, sexual generation, the nature of the semen, the concept of blood and the generation of the soul are brought to the foreground of the mind-body discussion. While Descartes' comments on the pineal gland and sensation will always serve as legitimate insights into how he understood the mind-body union, the context I have presented here highlights the extent to which other aspects of his writings impact our understanding of his mind-body problem.

[55] It is important to note here that love is not the only passion at the start of life. In subsequent paragraphs of the *Passions* Descartes explains the origins of hate, joy, sadness and desire. These passions arise as a result of the suitability of the 'aliment' in the heart. That is to say, the suitability of the body's accommodation incites various passions in the soul. For example, the soul may 'hate' the body at the beginning of life if a foreign fluid enters the heart and cannot properly maintain the vital heat. Thus, several passions aside from love may be endured at the beginning of life. Yet, Descartes prioritizes love insofar as this is the passion felt when the accommodation is most suitable, thus causing the soul to bond with the body, instituting the union. Other passions originate at the commencement of life as a result of various occurrences in the heart, but this is only possible once the bond has been created. Love is, in a way, the condition for the possibility of the processes described in Articles 108-111. A possible precedent for this prioritization of love in regard to the soul-body union at the beginning of life could perhaps be found in Marsilio Ficino, *Commentary on Plato's Symposium on Love*, translated by Jayne Sears, Dallas, TX, Spring Publications,1985, pp. 112-114.