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Carol Collier

FROM NATURALISM TO MECHANISM:

Ambiguities and Contradictions in Descartes' Mechanistic Physiology

A dissertation submitted to the School of Graduate Studies and Research in partial fulfilment of the requirements for the degree of Doctor of Philosophy from the Department of Philosophy at the University of Ottawa



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ABSTRACT

The thesis provides an analysis of the metaphysical and epistemological shift from naturalism to mechanism in the seventeenth century, specifically in relation to the human body, and the evolution of the notion of the body-machine in Cartesian philosophy.

The thesis starts from the position that Descartes' metaphysical dualism is a fundamental presupposition of both his method and his physics, including his physiology. It supports Jean-Luc Marion's thesis of the 'grey ontology' of the *Regulae* and argues against the position of Alquié, Gaukroger and others that Descartes' science and metaphysics are distinct aspects of his work, with the latter arriving only after the former had been fully formulated. Then, using Lenoble's thesis that the development of mechanism in the seventeenth century was more a reaction to the naturalism of the Renaissance than to Scholasticism, it traces the rejection of certain 'occult' notions of the Renaissance conception of nature and body, in particular, the notions of world-soul and final causes. It then analyses the application of the principles of mechanism to the human body as elaborated by Descartes in his principal work on the body, *L'Homme*, and shows how his mechanistic physiology created a rupture not only between mind and body but also between body and nature, resulting in a changed anthropology. At the same time it brings out ambiguities and contradictions inherent in Descartes' mechanistic explanation of body, particularly in relation to animal perception and sensation; and it shows, further, that his mechanistic explanation relies, in its turn, on 'occult' concepts, in the form of animal spirits and continuous creation, metaphysical supports that weaken the effectiveness of the mechanistic explanation. Finally, the thesis looks at Descartes' notion of mind-body union and, analysing Gueroult's interpretation of the Cartesian position, demonstrates that this notion does not result in a modification of his mechanism of the body.

The thesis concludes that Descartes' application of a unified method of science to the human body suffered from an inherent and irreconcilable ambiguity: his mechanistic physiology could not yield an anthropology while, at the same time, his emphasis on mind-body union in his later writings could not yield a science. It proposes a re-examination of mechanistic physiology in the light of other models of mechanism in the seventeenth century (e.g. Leibniz, Hobbes) and a re-assessment of the anthropology displaced by the rupture between body and nature, body and mind.

***to Stephanie and Deryn,
who have always believed...***

FOREWORD

To spend several years immersed in the writings of René Descartes is to live in the presence of a genius. A giant of philosophical and scientific exploration and discovery, he challenged accepted thought and received ideas—along with those who held them. A master of clear thought and expression, he surpassed most of his challengers in logic and nuance of argument and scoffed at those who could not keep up with the originality of his ideas or the magnitude of his philosophical revolution.

At the same time, it is to live in the presence of an enigma. The few scant details of his personal life do nothing to lift the mask of the public persona or to soften the edges of the hard-nosed thinker. The gaps in his biography, especially concerning the early and formative years, elicit questions about the influences on, and the development of, his thought and have left the door open to considerable speculation.

It is also, ultimately, to live in the presence of a dogmatist, in whom rationalist often battled and conquered empiricist, leaving ambiguity and even contradiction in the midst of rational systematising. Descartes was not a team player; he had to be first and he had to be right; he did not suffer fools gladly and those who disagreed with him, in his mind, were fools.

It is Descartes the dogmatist whom I confront in this thesis. The discovery, in his youth, of his vocation to develop and promulgate the *mirabilis scientiae fundamentae* instilled in him a missionary zeal that never waned. The dogmatic application of the principles of physics to the human body—within the unquestioned framework of a dualistic metaphysics—resulted in the mechanisation of the body picture that, in spite of its inherent ambiguities and contradictions, was (along with the disembodied *self* that

went with it) his most lasting legacy to the history of modernity.

Cartesian mind-matter dualism is supported by two metaphysical pillars: the *Cogito* and God. But that is only half the equation, i.e. the side of mind. On the side of matter, or body, dualism is supported again by two pillars: mechanism and God. As the *Cogito* finds its ultimate grounding in a God who guarantees the truth of our clear and distinct ideas, so Cartesian mechanism is ultimately grounded in God as the efficient cause of the world. In fact, mind and body can only be conceived separately because God holds up each. The justification for the Cartesian body-machine rests on God as external cause; yet, while God has long ago been erased from the equation, the body machine is still with us.

This thesis is an attempt to lay bare some of the inadequacies of Cartesian mind-body dualism as it pertains to the body side of the equation, in order to better assess the legacy of the body-machine. It is also an attempt to bring to the fore some of the notions that governed the idea of body for the naturalists of the Renaissance, and to determine how and why Descartes rejected them. It has been a journey through the work of a philosopher who has haunted my thinking for decades, one with whom I find myself often in disagreement but whose capacity for clear thought and expression of novel and even radical ideas has demanded my complete attention and gained my total respect.

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ABBREVIATIONS

Descartes' Works:

AT	Adam, Charles and Tannery, Paul (eds.), <i>Oeuvres de Descartes</i> , 11 volumes (Paris: Librairie philosophique J. Vrin, 1974-86)
CSM	Cottingham, John, Stoothof, Robert and Murdoch, Dugald (eds.), <i>The Philosophical Writings of Descartes, Volumes I and II</i> (Cambridge: Cambridge University Press, 1984)
CSMK	Cottingham, John, Stoothof, Robert, Murdoch, Dugald and Kenny, Anthony (eds.), <i>The Philosophical Writings of Descartes, Volume III, The Correspondence</i> (Cambridge: Cambridge University Press, 1991)
<i>Le Monde</i>	The World
<i>L'Homme</i>	Treatise on Man; and Bitbol-Hespériès and Verdet, Jean-Pierre, <i>René Descartes, Le Monde, L'Homme</i> (Éditions du Seuil, 1996). Includes a translation of The Description of the Human Body.
<i>World</i>	Gaukroger, Stephen, <i>Descartes, The World and Other Writings</i> (Cambridge: Cambridge University Press, 1998).
<i>Discours or DM</i>	Discourse on Method
<i>Meditationes or Med.</i>	Meditations on First Philosophy
<i>Passions</i>	The Passions of the Soul
<i>Principia or PP</i>	The Principles of Philosophy
<i>Regulae or Reg.</i>	Rules for the Direction of the Mind
<i>Description</i>	The Description of the Human Body

Others:

<i>De vita</i>	Marsilio Ficino, <i>Three Books on Life</i> , transl. Carol V. Kaske and John R. Clarke (Binghamton, N.Y.: The Renaissance Society of America, 1989)
<i>Descartes</i>	Gaukroger, Stephen, <i>Descartes: An Intellectual Biography</i> (Oxford: Clarendon Press, 1995).

INTRODUCTION

Cartesian dualism landed speculation on the nature of life in an impasse: intelligible as, on principles of mechanics, the correlation of structure and function became within the res extensa, that of structure-plus-function with feeling or experience (modes of the res cogitans) was lost in the bifurcation, and thereby the fact of life itself became unintelligible at the same time that the explanation of its bodily performance seemed to be assured.

Hans Jonas, *The Phenomenon of Life*¹

This thesis is about the body in the philosophical writings of Descartes. It is not about the mind-body problem that has occupied philosophers since Descartes first uttered the well-known *cogito ergo sum*. It will only address that question peripherally as it relates to Descartes' mechanistic description of the human body. Thus, when it does examine this question, it will be less concerned with how mind and body interact, than with the problems Descartes created for himself as he attempted to describe the workings of the human body in purely mechanistic terms, following the laws of physics and without regard to mind or soul.

Further, even as the thesis lays emphasis on the distinction between body and mind in Cartesian mechanism, it will be equally, or even more so, concerned with the separation of body from nature which was the direct result of Descartes' physics in general and the principle of inertia in particular. While the naturalism of the Renaissance and, to a lesser but still meaningful extent, the Aristotelianism of the Scholastics, saw a unity or at least a hierarchy encompassing human life and the natural world, Descartes'

mechanistic physics, of which his mechanistic physiology is a part, in emptying both nature and the body of mind or soul, created a rupture in the ancient holism where man occupied a place in the natural hierarchy and saw himself connected to it through notions of life and soul, macrocosm and microcosm, and a web of different levels of causality. The thesis will address the Cartesian body, reduced to matter in his mind-matter dualism, subsumed under the law of physics and restricted, in all aspects of movement and change, to the limits of efficient causality.

Some might question my position of regarding the separation of body and nature in Descartes in light of the fact that his major work on the body—*L'Homme*—formed a part of his larger work, *Le Monde*. However, as this thesis will show, this integration of man and world is only apparent since the notion of soul that had previously connected them has, in Descartes' vision, been cut off from the idea of nature; soul will reside henceforth only in the human mind, thus allowing man to hold himself above nature in order to control and dominate it. In fact, what links man to nature in Descartes' system is an epistemological and methodological framework that subsumes the body under the laws of physics.^{2 3}

This introduction will address several aspects of Descartes' physiology by setting out in a preliminary manner:

- his writings on the body that I will be examining in the thesis;

¹ Hans Jonas, *The Phenomenon of Life* (New York: Dell Publishing Co., Inc., 1966), p. 58.

² P. Mesnard writes: "Le domaine de la biologie est nettement défini par Descartes. *L'Homme* est un fragment du *Monde*, et quelle que soit sa complexité, il n'échappe point à la prise de la méthode scientifique." (P. Mesnard, "L'esprit de la physiologie cartésienne", in G. Rodis-Lewis, *La science chez Descartes* (New York and London: Garland Publishing, Inc., 1987). Mesnard is here playing on the words of the titles of Descartes' works and the fact that *L'Homme* is a part of *Le Monde*. But the comment also underlines a major shift from Renaissance thought where the link between man and world was not methodological but ontological. Man was a fragment of the cosmos, one might say, and whatever his complexity, he could not escape its fate.

- whether or not his thinking on the body evolved over the period of his writings;
- how these writings were received by Descartes' contemporaries;
- the place of these writings in his philosophy and the importance attributed to them in recent scholarship;
- the particular direction of this thesis and its place in recent scholarship on the Cartesian body;
- methodology and plan of the thesis .

0.1 Descartes' Biological Writings⁴

While Descartes began his biological writings fairly early in his career, little of what he wrote about the body was published in his lifetime. *L'Homme*, his principal work on the body, was completed in 1633 but published posthumously (by Clerselier) in 1664, along with *La description du corps humain*, written in 1648. A summary of *L'Homme* is contained in Part V of the *Discours*, published in 1637, and in Part IV of the *Principia*, published in 1644. In the former, Descartes refers to matters, which he explained "in sufficient detail in the treatise I previously intended to publish,"⁵ while in the latter he refers to "what must be borrowed from [my proposed] treatise on animals and on man in order to complete our knowledge of material things."⁶ In addition, the first part of the *Passions* (1649) gives a "brief account of the parts of the body and of some of

³ By 'laws of physics' I am referring to Descartes' laws of physics or laws of nature as set out in *Le Monde*.

⁴ Using the term 'biological' or even 'physiological' in relation to Descartes is anachronistic since these terms were not in use in his time. However, as pointed out by Annie Bitbol-Hespériès, the etymology of the word 'biology' refers to "discours sur la vie, étude des manifestations de la vie", something that Descartes was certainly doing, regardless of how it was named. See Annie Bitbol Hespériès, *Le principe de vie chez Descartes* (Paris: Librairie philosophique J. Vrin, 1990). For Descartes, biology was in fact the 'physics of the body' and, for him, physics included all the natural sciences (see Ch. 2, footnote 86).

⁵ CSM I, 139 (AT VI, 55).

⁶ CSM I, 279 (AT VIIIa, 315). This is the heading for section Part IV, section 188. The sections

their functions."⁷

In discussing Descartes' mechanistic physiology, this thesis will concentrate principally on *L'Homme*, the most detailed and extensive of his writings on the body, but will refer occasionally to the other texts referred to above.

0.2 Was there an evolution in Descartes' thinking about the body?

This question presents itself and demands an answer because it appears to many that the radical dualism that underlies Descartes' mechanistic physiology (whereby mind and body are distinct substances and that body is pure extension and mind pure thought) was tempered by his efforts to explain mind-body union in Meditation VI, in the letters to Elisabeth, and in the *Passions*. Or, at the very least, that the radical dualism that is apparent in Meditation II is tempered by the explanations of mind-body union in Meditation VI.

One approach to this question, taken by Gaukroger, is that there are really two streams in Descartes' philosophy: the sceptically driven epistemology of the *Meditationes* and the naturalistic accounts of *Le Monde* and *L'Homme*, which he finds reflected in the *Passions*:

Whereas in the *Meditations* we are led to natural philosophy through the sceptically driven epistemology on which Descartes grounds a metaphysically formulated natural philosophy, in *The World* we are offered a more direct access to the whole world of natural philosophy, from cosmology to cardiology to the psycho-physiology of perception.⁸

following, up to section 204, deal with sensation and sensory awareness.

⁷ CSM I, 330 (AT XI, 332). This is the heading of section 7, which, along with sections 8-15, summarizes Descartes' description of blood circulation, the movement of the heart and muscles and, in particular, the role of animal spirits.

⁸ Stephen Gaukroger, *The World and Other Writings* (Cambridge: Cambridge University Press, 1998), p. xxix. This text is hereafter referred to as *World*.

Gaukroger believes that the *Description* was draft material for the proposed fifth book of the *Principia* and the *Passions*, "employing Descartes' idea of a 'substantial union of mind and body' rather than the radical dualism of his foundational projects" would have formed the sixth part, which was meant to deal with the soul. This would seem to suggest that, had Descartes ever completed the project of the *Principia*, his radical dualism would have been supplanted or modified.

The *Principia* was to be the culmination of Descartes' system, integrating into one work his entire philosophy in "a comprehensive university textbook which would rival and, he hoped, eventually replace the traditional texts based on Aristotle."⁹ It would be reasonable to assume that, if Descartes were to deal with the substantial union rather than the radical dualism of mind and body, he might be forced to reconsider the radical mechanism of his account of the human body as set out in *L'Homme* and that this would be reflected in his later writings on the body. Such is not the case, however, if the potential draft items are taken into account.

Whether or not completion of the *Principia* would have resulted in an evolution in Descartes' thinking about the body will never be known since it was published before the parts dealing with man and the soul could be completed. Descartes himself wrote in section 188:

But I am not yet completely clear about all the matters which I would like to deal with there, and I do not know whether I shall ever have enough free time to complete these sections.¹⁰

What is known, however, is that both the *Description* and the *Passions* (which, as pointed out above, can be considered as draft material for the *Principia*) were written after

⁹ Introduction to *PP* in CSM I, 177.

¹⁰ CSM I, 279 (AT VIIIA, 315).

Descartes had developed the notion of the substantial union of mind and body and that in these two works his mechanistic description of the body had not fundamentally changed from the time of *L'Homme* written 10-15 years earlier. Whatever the substantial union meant,¹¹ it still entailed a physical body distinct from mind and operating on mechanistic principles.

This can be seen clearly in the *Passions* where Descartes maintains that both heat and movement proceed from the body and thoughts from the soul and that it is an error to believe that the soul moves the body:

In this way we shall avoid a very serious error which many have fallen into, and which I regard as the primary cause of our failure up to now to give a satisfactory explanation of the passions and of everything else belonging to the soul. The error consists in supposing that since dead bodies are devoid of heat and movement, it is the absence of the soul which causes this cessation of movement and heat. Thus it has been believed, without justification, that our natural heat and all the movements of our bodies depend on the soul; whereas we ought to hold, on the contrary, that the soul takes its leave when we die only because this heat ceases and the organs which bring about bodily movement decay.¹²

The brief description of bodily functions that follows this section and, in particular, the description of the movement of the heart and animal spirits is unchanged from those of *L'Homme*. Similarly, in the *Description*, while there is new material on the development of the foetus, Descartes maintains the fundamental position of *L'Homme* that he can

explain the entire machine of our body in such a way that we will have no more reason to think that it is our soul that excites in us those movements that we do not experience as being directed by our will, than we have to judge that there is a soul in a clock that makes it tell the time.¹³

Both of the above citations reflect Descartes' closing comments at the end of *L'Homme* where he states unequivocally:

¹¹ This question will be addressed in detail in Chapter 6.

¹² CSM I, 329 (AT XI, 330).

¹³ *World*, 171 (AT XI, 226).

I desire, I say, that you should consider that these functions follow in this machine simply from the disposition of the organs as wholly naturally as the movements of a clock or other automaton follow from the disposition of its counterweights and wheels. To explain these functions, then, it is not necessary to conceive of any vegetative or sensitive soul, or any other principle of movement or life, other than its blood and its spirits which are agitated by the heat of the fire that burns continuously in its heart, and which is of the same nature as those fires that occur in inanimate bodies.¹⁴

More importantly, between *L'Homme* and the *Description*, Descartes did not modify at all his position on the movement of the heart, a position that was at the root of his controversy with William Harvey (1578-1657) about whose book, *De Motu Cordis* (1628) Descartes wrote to Mersenne: "I find it differs slightly from my own view, although I saw it only after having finished writing on this topic."¹⁵ In fact, while Descartes agreed with Harvey on the circulation of the blood, his view on the movement of the heart, which was a fundamental tenet of his mechanism of the body, differed more than 'slightly' from that of Harvey. Descartes' idea of the movement of the heart being caused by heat as a result of a process of fermentation (which caused the blood to flow in the dilation phase or diastole) could not be reconciled with Harvey's idea that the heart acted as a pump (causing the blood to flow in the contraction phase or systole). For Descartes, Harvey's thesis would necessitate a power or action (such as spirit or soul)¹⁶ to move the pump and Descartes could not admit such an entity and maintain his mechanistic description of the body. As he wrote to Beverwijck (1594-1647), the first Dutch physician to openly defend Harvey's contested theory, in response to the latter's demand for his proof of the circulation of the blood:

¹⁴ *World*, 169 (AT XI, 202).

¹⁵ CSM I, 40 (AT I, 263).

¹⁶ Descartes states in the *Description*: "Now supposing that the heart moves in the way that Harvey describes, not only must we imagine some faculty which causes the movement, the nature of which is much more difficult to conceive than what it is invoked to explain: we must also suppose the existence of yet

Although to be sure I am in full agreement with Harvey in regard to the circulation of the blood...yet with regard to the motion of the heart I am in entire disagreement with him. For he will have it...that the heart in the diastole by expanding permits blood to enter and in the systole forces it out by contracting.

Descartes then goes on to explain his theory whereby the blood which expands on entering the heart "forcibly pushes out the walls of the ventricles in all directions", causing valves to open and close:

for such is the construction of those valves that *in accordance with the laws of mechanics* they are necessarily opened and closed respectively merely by this expansive force of the blood; and this expansion of the blood causes the diastole of the heart.¹⁷

The importance of this issue to Descartes' description of the body is dealt with in Chapter 4. What is of interest here is the fact that Descartes did not change his position on the movement of the heart between the writing of *L'Homme* and the *Description*. As will be discussed below, in spite of objections from learned colleagues such as Plempius (Vopiscus-Fortunatus Plem, 1601-61) and Fromondus (Liebert Froidmont, 1587-1653), he maintained his position that the movement of the heart was caused by heat resulting from the ordinary mechanical action of fermentation. Bitbol-Hespériès raises the question of why Descartes resisted Harvey's explanation:

On peut donc se demander pourquoi Descartes ne s'est pas rallié à la conception harvéienne du mouvement du cœur. Sans doute est-ce parce qu'il estimait que seule sa propre chronologie du mouvement cardiaque pouvait s'accorder avec l'explication qu'il donnait de l'origine de la chaleur du cœur conçue comme principe de vie.¹⁸

Equally, however, is the fact that giving up the idea of fermentation and heat as the

other faculties that alter the qualities of the blood while it is in the heart." *World*, 181 (AT XI, 243).

¹⁷ *The Correspondence on the Motion of the Heart and the Circulation of the Blood Between Descartes and Plempius* in G. A. Lindebloom, *Descartes and Medicine* (Amsterdam: Editions Rodopi N.V., 1978), p. 106-7. Emphasis added.

¹⁸ Bitbol-Hespériès, *op. cit.*, p. 50. Lindebloom refers to Descartes' "strange obstinacy" in the face of Harvey's discoveries and experiments and blames his "mental attitude" whereby "he held that all the ideas he once believed that he had seen clearly and distinctly were true, and that all movements and phenomena

principle of life would have necessitated the introduction (or re-introduction) of soul into the explanation of the body and, whatever his notion of mind-body union was to mean, it was not to be that. The mechanical body moves without soul and the mind thinks without body. This was the position in *L'Homme* in 1633 as it was in the *Passions* in 1649.

Neither this nor any other important aspect of Descartes' thinking on the body evolved in the interval, in spite of the questions and objections raised by the *Discours*, the *Meditationes* (especially Meditations II and VI), the letters from Elisabeth, and the drafting of the *Passions*. Descartes' notion of the substantial mind-body union, set out in Meditation VI and in his letters to Elisabeth, did not change in any fundamental way his mechanistic view of the body.

0.3 Reception of Descartes' Mechanistic Physiology

The only substantive writing on the body that was published in Descartes' lifetime was Part V of the *Discours*. The most important reaction to this came from Plempius and, through him, from Fromondus, Professor of Philosophy at the University of Louvain with whom Plempius studied philosophy. The latter raised questions regarding Descartes' doing away with the sensitive soul and replacing it with the mechanical functions emanating from the fermentation of the blood (and the animal spirits):

il [Descartes] semble dire qu'un feu, de même nature que celui qui échauffe le foin, peut effectuer dans le corps de l'homme toutes les opérations de l'animal, excepté les propres actions de l'âme raisonnable. Ainsi donc la chaleur du foin, sans une autre âme, comme l'âme sensitive, peut voir, entendre, etc. Des opérations si nobles ne semblent pas pouvoir provenir d'une cause aussi vile et toute matérielle.¹⁹

He also worried that Descartes' view of the soul could "perhaps open the way for atheists

could be derived from the general laws of nature that rule the universe." *Op. cit.*, p. 72.

to deny the presence of a rational soul even in the human body."²⁰ He raised objections to Descartes' theory about the heat of the blood causing the heart to expand saying that "it would take the heat of a furnace to rarefy the drops of blood sufficiently rapidly to make the heart expand,"²¹ as well as to the fact that Descartes recognised "no sensation save that which takes place in the brain."²² Descartes was not concerned by Fromondus' objections concerning noble actions such as sight coming from such an ignoble and material cause as heat. He answers that Fromondus has misunderstood him:

He supposes that I think that animals see just as we do...But in the whole of that part...I explain quite explicitly that my view is that animals do not see as we do when we are aware of what we see, but only as we do when our mind is elsewhere.

Further, explaining that the animal soul is nothing but their blood while the human soul is the rational mind, he states:

This theory involves such an enormous difference between the souls of animals and our own that it provides a better argument than any yet thought of to refute the atheists and establish that human minds cannot be drawn out of the potentiality of matter.²³

And he dismisses Fromondus' objection about the temperature needed for blood to be rarefied, explaining that the temperature needed for a liquid to rarefy depends on the nature of the liquid and that "the blood in the veins of any animal comes very close to the temperature which it must have in the heart if it is to be rarefied there instantaneously"²⁴, a circular argument that was unlikely to convince Fromondus.

Plempius was a friend of Descartes and probably the first medical practitioner

¹⁹ Bitbol-Hespériès, *op. cit.*, p. 95 (AT I, 403).

²⁰ CMSK, 62 (AT I, 414).

²¹ CMSK, 63 (AT I, 416).

²² CMSK, 64, (AT I, 420).

²³ CMSK, 62 (AT I, 414).

²⁴ CMSK, 63 (AT I, 416).

with whom Descartes became closely acquainted in Amsterdam. Plempius himself could not accept Descartes' position on the movement of the heart and wrote two long letters (in January and March 1638) to Descartes on this subject and elicited two long responses (in February and March 1638). Plempius pointed out to Descartes that "Galen has taught that the heart is moved by some faculty and until now this has been the teaching of all physicians..."²⁵ He also suggests that Descartes' idea of fermentation comes from Aristotle, a suggestion that irritated Descartes who responds that even if he arrived at the same conclusion as Aristotle, he got there by the proper route which Aristotle did not:

he who from false premisses... arrives by chance at a true conclusion seems to me to be no better reasoner than if he drew some false deduction from them; nor, if two, one by losing his way, the other by proceeding along the right path, come to the same place, can one be thought to have followed in the other's footsteps.²⁶

Descartes objects to the comparison with Aristotle since, although both rely on the heat of the heart to explain its movement, the soul or 'form' of the body is the principle of life for Aristotle, while for Descartes it is the fermentation of the blood alone which is the principle of life and, as such, causes the movement of the heart. In addition, the heat of Aristotle (or of Plato or Galen) is not the heat of ordinary fire but a vital heat with a cosmic or celestial element. For Descartes, fire is fire, and the fire without light that expands the heart is the same fire as that which causes fermentation in wine or hay. There is no cosmic component in the Cartesian fire.²⁷ This position represents a radical departure from the physiology of Ficino—which was still being taught in Descartes' time—along with that of Aristotle.

Descartes responds at length to Plempius with descriptions of his proofs and

²⁵ Lindeboom, *op. cit.*, p. 108. (CSMK, 80; AT I, 522).

²⁶ *Ibid.*, p. 111.

²⁷ This reflects an essential principle of *objectivity*, that things are what they are and, as objects of science,

experiments (including one where he opened up a live hare) but he did not succeed in convincing Plempius about his theory of the movement of the heart which the latter referred to as a figment of Descartes' imagination.²⁸ Plempius did, however, come around to accepting the theory of circulation of the blood, an idea that he had resisted for some time: "Your other arguments for the circulation of the blood—at any rate hold the field, and I find no great fault with that theory."²⁹ Whether or not it was Descartes' arguments which helped convince him on circulation of the blood,³⁰ he resisted completely Descartes' arguments about the movement of the heart.

There were objections sent to Descartes on other aspects of the *Discours* (e.g. *Optics, Meteorology*) but, in a letter to Mersenne in June 1638 where Descartes summarizes objections to date, those from Plempius and Fromondus were the only substantial commentaries on Part V. Their objections covered the most important aspects of Descartes' mechanism of the body, however: the denial of the need for the multi-levelled soul of the Aristotelians and the satisfaction of this perceived need through a purely mechanical process.

The denial of the sensitive soul was an issue for Gassendi as well and he discussed this in his objections to the *Meditationes*. Writing about the fact that Descartes limits the soul to rational soul or mind only he states:

I ought to have remembered this from the discussion in your *Discourse on Method*, where you seemed to want to say that all the functions which are attributed to the vegetative and sensitive soul do not depend on the rational soul

are known separately from other things. The fire of the heart *cannot be* connected with the cosmic fire.

²⁸ *Ibid.*, p. 118.

²⁹ *Ibid.*, p. 118.

³⁰ Gilson held that it was Descartes' influence on Plempius—as a result of this correspondence—that caused the latter to change his position: "Il est remarquable que, pour une fois, la discussion entre Descartes et Plempius aboutit, au moins sur ce point précis, à un résultat positif. Plempius se déclara satisfait et prêt à se ranger parmi les partisans de Harvey." See Étienne Gilson, *Études sur le rôle de la pensée médiévale dans la formation du système cartésien* (Paris: Librairie philosophique J. Vrin, 1967), p. 79.

but can be exercised before the rational soul arrives in the body, as is the case with the brutes, who, on your view, possess no reason.³¹

Many of Gassendi's objections revolve around Descartes' attempt to prove that thinking does not require a body or, in Gassendi's words, "that this solid body of yours contributes nothing whatever to your thought...", objections that were raised by others as well. Gassendi also discusses questions relating to imagination and animal reason (which by limiting soul to the rational mind, in Gassendi's view, deprives animals of these capacities). With respect to the reasoning of humans and animals, Gassendi holds that "the difference seems to be merely one of degree."³² To the extent that all the objections to Descartes' metaphysical dualism in the *Meditationes* reflect an uneasy reception of his mechanistic description of the body they are all relevant to this analysis. However, I am limiting myself here to those that deal directly with issues raised in section V of the *Discours*.³³ (The problems raised regarding sensation and thought in animals that result from Descartes' account in *L'Homme*, including some raised in the objections to the *Meditationes*, are discussed in detail in Chapter 4).

0.4 Cartesian Physiology and Recent Scholarship

In the foreword to Hall's *Treatise of Man*, the first English translation of *L'Homme*, published in 1972, I. Bernard Cohen states:

Despite Descartes's outstanding importance in the development of science and medicine, his major writings are not for the most part available in well-annotated

³¹ CSM II, 184 (AT VII, 263).

³² CSM II, 189 (AT VII, 271).

³³ J.L. Marion holds the theory that the *Meditationes* are, in fact, a considered response to objections made earlier to the *Discours*. He believes that we should "consider the *Meditations* themselves as first and essentially replies given in 1641 to the objections formulated in 1637." However, he is referring mainly to Part IV of the *Discours* covering the metaphysics of Descartes' dualism. See Jean-Luc Marion "The Place of the Objections in the Development of Cartesian Metaphysics", in Roger Ariew and Marjorie Grene, *Descartes and His Contemporaries* (Chicago and London: University of Chicago Press, 1995), p. 16.

scholarly editions or translations, save for certain contributions to 'pure' philosophy.³⁴

The 'pure' philosophy is, of course, the two classic Cartesian texts: the *Discours* and the *Meditationes*, and commentaries on the former text do not usually include any substantial references to the précis of *Le Monde* and *L'Homme* contained in Part V³⁵, while commentaries on the latter, if they deal with the body at all, do so within the limits of the question of mind-body union in Meditation VI.³⁶ Further, Cohen points out that while the situation at that time was somewhat better with respect to Descartes' science and mathematics, "even in these areas there is a want of translations and annotated texts."³⁷

In spite of Mesnard's opinion that in Descartes' work "l'étude de l'homme et de son pouvoir réel y reste un point capital",³⁸ the situation was similar across the ocean where the great Cartesian commentators in Descartes' homeland wrote largely, if not exclusively, on metaphysical themes.³⁹ Only Gilson's *Études sur le rôle de la pensée médiévale dans la formation du système cartésien* deals to any great extent with Descartes' physiology. An occasional essay, like P. Mesnard's "L'esprit de la physiologie cartésienne" dots the landscape of Cartesian scholarship before 1980, but no major

³⁴ I. Bernard Cohen, foreword to Thomas Steele Hall (transl.) *Treatise of Man* (Cambridge, Mass: Harvard University Press, 1972), p. xi. Cohen further points out that not only had *L'Homme* never before been translated in its entirety in English, but no part of it was included in the Haldane and Ross collection of Descartes' works (which was the standard English edition before the arrival of Cottingham, Stoothoff and Murdoch's edition in 1986), and it was "conspicuously absent from N. Kemp Smith's book of Descartes' philosophical writings" (p. xvi). Kemp Smith's later version of Descartes' philosophical writings, *New Studies in the Philosophy of Descartes* (London: MacMillan, 1966) does contain a chapter on physiology.

³⁵ See for example, L.J. Beck's classic study *The Method of Descartes* (Oxford: Clarendon Press, 1952) which, while focussed on the *Regulae*, also covers the *Discours*. The only mention of Part V refers to it as "a disjointed summary of the topics which the author treated in the ill-fated volume of *Le Monde*." (p. 4).

³⁶ See L.J. Beck's other classic study, *The Metaphysics of Descartes* (Oxford: Clarendon Press, 1965) where only 20 of its 300 pages are devoted to "the composite nature of man."

³⁷ Hall, *op. cit.*, p. xi.

³⁸ Mesnard, *op. cit.*, p. 199.

³⁹ For example, F. Alquié, *La découverte métaphysique de l'homme chez Descartes*; H. Gouhier, *La pensée métaphysique de Descartes, Cartésianisme et Augustinisme au XVII^e siècle*; M. Gueroult, *Descartes selon l'ordre des raisons*, etc.

collections or monographs existed which covered, in any meaningful way, Descartes' biological writings.

This situation has changed, on both sides of the ocean, in the past twenty years. In France the work of Geneviève Rodis-Lewis has covered Descartes' physics and biology and, more recently, her student, Annie Bitbol-Hespériès, has published a thorough and scholarly thesis, *Le principe de vie chez Descartes*, which represents the first serious monograph, from a philosophical perspective, of Descartes' writings in biology and physiology. In addition, her recent translation (with Jean-Pierre Verdet) of *Le Monde* and *L'Homme* contains, aside from its extensive annotations, an historical introduction that brings this neglected work into the full light of day on the shelves of Cartesian scholarship.⁴⁰

Similarly, in the last twenty years, the Anglo-Saxon world has seen a proliferation of texts on Descartes' physics and physiology. Philosophers such as Daniel Garber, Gary Hatfield, Stephen Gaukroger, Margaret Wilson and others have produced and continue to produce important works relating in whole, or in part, to Cartesian science, including biological science.⁴¹ With respect to the latter, however, the philosophical world is still waiting for a scholarly monograph, in English, on Descartes and the human body.⁴²

⁴⁰ In addition to this relatively recent edition, a reprint of Clerselier's 1664 edition of *L'Homme* was published in 1999 by Fayard, including Clerselier's Preface and Remarks by Louis de la Forge. (See Louis de la Forge, *L'Homme de René Descartes*, Paris: Fayard, 1999).

⁴¹ See, in particular, Daniel Garber, *Descartes' Metaphysical Physics* (Chicago and London: University of Chicago Press, 1992); Stephen Gaukroger, *Descartes: Philosophy, Mathematics and Physics* (Brighton: Harvester Press; New York: Barnes and Noble, 1980); *Descartes, An Intellectual Biography*, (London: Clarendon Press, 1995); *Descartes: The World and Other Writings* (Cambridge and New York: Cambridge University Press, 1998); *Descartes' Natural Philosophy* (London: Routledge, 2000).

⁴² In spite of the growing interest in Descartes' biological writings in general and in *L'Homme* in particular, philosophical discussion of his mechanistic physiology remains marginal. Of the more than 200 papers given at the 1996 congress of L'Association des Sociétés de Philosophie de Langue Française (ASPLF) which, in honour of the 400th anniversary of the birth of Descartes, was dedicated to *l'esprit cartésien*, barely thirteen dealt directly or indirectly with issues relating to the body. See Bernard Bourgeois and Jacques Havet, *L'Esprit cartésien (Actes du XXVII^e Congrès de l'ASPLF)* (Paris: Librairie philosophique J.

This lack is all the more evident in the face of a proliferation, both inside and outside of the philosophical domain, of works on the body generally, most notably in anthropology and gender studies. For example, David Le Breton has written extensively about the body and modernity, in particular from the point of view of the objectification of the body as a result of mechanistic science.⁴³ Feminist writers have pointed to the devaluation of the body perceived as a direct result of "dichotomous thinking [which] necessarily hierarchizes and ranks the two polarized terms so that one becomes the privileged term and the other its suppressed, subordinated, negative counterpart."⁴⁴ In a similar vein, others have pointed out that as a result of dualism, "philosophers have focused on the concept of self-consciousness and the complexities in explaining it inherited from Descartes, and have tended to neglect the complexities of the way we use and represent our bodies."⁴⁵ Much, if not all, of the analysis in these works lays the blame for modernity's objectification of the body squarely at the feet of Descartes, his dualism and his mechanism. At the same time, there is a lack of in-depth study of how and why Descartes arrived at the mechanistic view of the body that has left its mark so indelibly on the modern psyche.

According to Gaukroger,

Descartes' almost canonical status has led to his thought being assimilated to a range of very different philosophies and put to a wide variety of different and incompatible uses. More than any other modern philosopher, he has been fashioned according to the philosophies of the time and interpreted accordingly, a

Vrin, 2000).

⁴³ See *Anthropologie du corps et modernité* (Paris: Presses universitaires de France, 1990); *La sociologie du corps* (Paris: Presses universitaires de France, 1992); *La chair à vif* (Paris: Éditions A.M. Métailié, 1993); *L'Adieu au corps* (Paris: Éditions A.M. Métailié, 1998).

⁴⁴ Elisabeth Grosz, *Volatile Bodies, Towards a Corporeal Feminism* (Bloomington and Indianapolis: Indiana University Press, 1994), p. 3.

⁴⁵ José Luis Bermudez, Anthony Marcel and Naomi Eilan, *The Body and the Self* (Cambridge, Mass: The MIT Press, 1995), p.2.

fashioning that places him at the roots of particularly modern developments.⁴⁶

Similarly, John Sutton writes about the 'caricature' of Cartesianism, which he describes as follows:

A curious consensus in analytic history of philosophy, medical anthropology, feminist theory, and cultural studies at large coalesces around the image of Descartes as anti-magus, stripping nature and the human body of all powers and activity... The removal of mind from body is but one symptom, on this view of multiple damaging Cartesian schisms, dividing philosophy from biology, science from history, power-mongering manipulators of nature from the dead ecology which they exploit, active rational male observers from passive fragmented female bodies, or mechanistic interventionist medicine from a more watchful psychosomatic physic of the whole person.⁴⁷

Whether or not it is fair or accurate to fashion Descartes according to modern developments regarding the body, or to put on his earnest seventeenth-century shoulders the blame for all the dualisms of the following centuries, it is undeniably true that the Cartesian dualistic vision of mind and body is still with us and that the many recent discoveries and predictions relating to, for example, genetic manipulation or artificial intelligence could not have proceeded apart from that vision. Could we be replacing human livers with pig livers if we believed that the 'self' and the 'body' were identical? Could we allow cloning (even of animals) or genetically 'made-to-order' babies if we did not believe that the human mind (or, at least the scientific mind) was superior to nature and truly capable of controlling it? Could we talk seriously about integrating human tissue into computers or of 'downloading consciousness' into machines if we did not believe that the body is ultimately only a machine (and that in creating the 'spiritual machine' we are doing no more than improving on evolution)?⁴⁸ Could we accept the

⁴⁶ Gaukroger, *op. cit.*, p. 3.

⁴⁷ John Sutton, *Philosophy and Memory Traces* (Cambridge: Cambridge University Press, 1999), p.82.

⁴⁸ In this respect see Ray Kurzweil, *The Age of Spiritual Machines* (New York and London: Penguin Books, 1999), p. 45-47 where he compares evolution's "ponderous pace" with "the sophistication of our

market in human organs (both 'legitimate' and criminal) or put ever-increasing pressure on people to donate their body parts (at death or even before) if we did not fundamentally believe that the body is only a well-constructed bundle or collection of organs?⁴⁹

These are complex questions without clear answers but they point to the extent to which mind-body dualism is alive and well and driving our science as biology and cybernetics mesh in the nanotechnology of the 21st century. They also point to a need for analysis of where that vision came from, what vision or visions it displaced, and why it has prevailed through the centuries.

0.5 Objective and Direction of the Thesis

This thesis strives, in one small way, to address the first two aspects of that need. It undertakes an analysis of Descartes' writings on the body from a philosophical perspective, asking, with respect to the 'machine' that he describes in detail in *L'Homme*: what was Descartes trying to accomplish and why? I do not attempt the kind of detailed analysis of the biological descriptions and their sources that has been more than adequately accomplished by Bitbol-Hespériès. Rather, I am looking at the metaphysical

creations over a period of only a few thousand years": "So human intelligence, a product of evolution, is far more intelligent than its creator. And so, too, will the intelligence that we are creating come to exceed the intelligence of its creator." A dissenting opinion comes from Bill Joy, a well-known computer guru and no luddite, who admits to having changed his mind about the future world of 'human machines' that could ultimately replace their creators: "Having struggled my entire career to build reliable software systems, it seems to me more than likely that this future will not work out as well as some people may imagine. My personal experience suggests we tend to overestimate our design abilities." Bill Joy, "Why the Future Doesn't Need Us" in *Wired*, April 2000.

⁴⁹ With respect to the latter question, the answer may not be so clear cut since there appears to be a deep-seated resistance to giving 'the gift of life' that is pushing medical and political authorities to develop ever more sophisticated marketing strategies to correct a situation where the demand for organs greatly exceeds the supply. For a discussion of how perceptions of the body influence organ donation and transplantation, see James Shanteau and Richard Jackson (eds.) *Organ Donation and Transplantation: Psychological and Behaviour Factors* (Washington: American Psychological Association, 1990). In particular see the article by Russell Belk entitled "Me and Thee versus Mine and Thine" where he demonstrates that those who perceive the body as a machine are more amenable to giving and receiving organs than those who perceive

presuppositions that underscore Descartes' innovations in thinking about the body to try to uncover his purpose and whether or not he succeeded in his quest. In doing so I look closely at certain metaphysical presuppositions of the Renaissance that were displaced by his efforts.

My position is a critical one. I do not accept either that Descartes was simply following the medical writers of the past or that his innovations were as unproblematic as some seem to think.⁵⁰ In fact, Descartes was not simply repeating the conceptual framework of his predecessors even when he said that he was. Most of his 'repetitions' were 'reductions' and, as I will attempt to demonstrate in the chapters that follow, these reductions were often questionable, either in method or result. They also represented major conceptual shifts the importance of which often went unrecognized or unacknowledged by their author and by later commentators. For example, in the Introduction to his translation of *L'Homme*, Hall lists certain "modified Greek premises, the physiological 'isms' that seemed to Descartes to require revision or even rejection and replacement", but he offers no critical assessment of Descartes' transformations.⁵¹ Mesnard states that the Cartesian reductions are "puissants et justes, et constituent à chaque fois un véritable pas de géant dans la compréhension des phénomènes."⁵² However, he neglects to analyse these reductions in any detail and appears to accept them as given. I will question this assessment that the reductions were a giant step in the understanding of phenomena by raising concerns about their efficacy.

the body as a 'self' (p. 139-146).

⁵⁰ For example, Bitbol-Hespériès does not seem to question the basis for the Cartesian transformation of the principle of life when she states: "Et si Descartes emprunte certains éléments à Aristote et à Harvey, il se sépare aussi notablement de ces deux auteurs, pour élaborer un principe de vie dont il nous semble que la grande originalité n'a pas été soulignée." Bitbol-Hespériès, *Le principe de vie*, op. cit., p. 52.

⁵¹ Hall, op. cit., p. xxvii. The 'isms' Hall lists 'humoralism', 'dualism', 'galenic faculties', 'pneumatism' and 'animism'.

The various reductions will be addressed throughout the thesis, but I will summarise them here. They are all related to Descartes' fundamental enterprise: to describe matter, including the human body, in mechanistic terms, according to the laws of physics.⁵³ In order to do so, traditional concepts that connected man to nature or the cosmos had to be 'reduced' and the thread of their cosmic connection broken. As I will demonstrate throughout this thesis, this is what was happening, consciously or unconsciously, in all or most of the Cartesian reductions.

1) The reduction of the principle of life and the notion of the heat of the heart, which has already been discussed in this introduction. It is true that Descartes borrowed the idea of heat from his predecessors--but his heat was the heat of ordinary fire, not the innate heat of Galen or the cosmic fire of Aristotle. In his predecessors, the principle of life was soul or a variation of soul and it drove the heat of the heart. In Descartes, the heat of the heart itself became the principle of life. This will be discussed at length in Chapter 4.

2) The reduction of the notion of animal spirits. Again, this was a notion borrowed from his predecessors, but, as will be shown in Chapter 5, animal spirits in Galen or Ficino or Fernel were connectors and mediators: they connected body and soul, man and cosmos. In Descartes' reduction of the concept the thread to soul and cosmos was broken; animal spirits became a rarefaction of blood, devoid of any spiritual component or cosmic role.

3) The reduction of multiple causality to efficient causality and the evacuation of final causes. This will be discussed at length in Chapter 3; again, it was a question of breaking the connection of the part to whole, of individual and cosmos.

4) The reduction of soul to mind. This reduction was probably the most dramatic,

⁵² Mesnard, *op. cit.*, p. 218.

⁵³ As set out in *Le Monde*. These are discussed in Chapter 2 (2.4).

effected by Descartes with the least explanation as to reason or proof. It was also the one that raised the most objections. I will maintain, in Chapter 4, that Descartes' efforts to eliminate the sensitive soul from his explanatory framework were at the root of the many difficulties he encountered in trying to explain animal perception and cognition.

5) The reduction of the concept of continuous creation. This is connected to the reduction of multiple causality to efficient causality. In order to explain the continuance and direction of the universe without final causality, Descartes calls upon God as the ultimate *efficient* cause. The concept of continuous creation was borrowed from the Scholastics but, divorced from the notion of matter and form, it lost its explanatory power. Descartes did not elaborate on this very often, but he did fall back on it as a replacement for final cause. This will be discussed in Chapter 5.

In spite of Mesnard's praise of Cartesian reductionism, he admits that it was not without its problems and that mechanistic physiology had to eventually be tempered to accommodate notions of finality in explaining living beings:

Aujourd'hui quelles que soient les théories que professent les biologistes, ils s'accordent en pratique pour concilier dans l'étude de la vie les habitudes mécanistes de la science expérimentale et l'interprétation finaliste qui seule correspond à l'intuition de l'être vivant.⁵⁴

And, he points out, Descartes' mechanism might have been less excessive if he had spent more time in the forest with the conifers and less time in his laboratory dissecting the heads of sheep, since "les lentes transformations de la plante permettent de mieux comprendre la continuité de la nature..."⁵⁵ At the same time, Mesnard believes that Descartes' extreme mechanism was essential to the development of a scientific physiology, a position that I will not attempt to address in this thesis.

⁵⁴ Mesnard, *op. cit.*, p. 219.

In assessing what Descartes was trying to do and why, I am not following the usual interpretation that he was reacting to Scholasticism; at the same time, while I see this interpretation as a limited one, I am not rejecting it. I am assessing Descartes' need to explain the body in mechanistic terms as being at least in part a reaction to the naturalism of the sixteenth century. While this position cannot be proven with any certainty, it can be supported with a high degree of probability, and this is discussed in Chapter 3. Increasingly, recent scholarship is demonstrating that there is a much greater link between Cartesian and Renaissance thought than most of Descartes' commentators have wanted to admit.⁵⁶ At the same time, a closer look at the influences of the Renaissance on Cartesian thought provides an insight into how clearly Descartes was rejecting them in his effort to set philosophy on a new path. As Hans Blumenberg has pointed out, "Descartes painstakingly effaced and disavowed the traces of his historical background in order to constitute the myth of the radical beginning of reason."⁵⁷ In part, he accomplished this by simply ignoring, or rarely mentioning, his sources in his writings. But also, and more importantly as I maintain in this thesis, he accomplished this by modifying notions or concepts to fit with his mechanistic ideas. Either way, it is difficult to maintain that he was ignorant of his philosophical roots or that he was rejecting them unconsciously. This is true both for the naturalistic philosophies of the

⁵⁵ *Ibid.*, p. 219.

⁵⁶ A recent publication, *Descartes et la Renaissance: Actes du colloque international de Tours des 22-24 mars 1996*, Emmanuel Faye, ed. (Paris: Honoré Champion, 1999), provides a variety of insights from different Renaissance and Cartesian scholars on the influences of the Renaissance on Descartes' thought. Roger Ariew provides an interesting perspective on Descartes and Scholasticism, making the point that while Descartes studied scholastic philosophy at La Flèche, he abandoned it for twenty years and "was not familiar with scholastic philosophy in the period of his greatest work, during 1637-40." See "Descartes and scholasticism: the intellectual background to Descartes' thought", in Cottingham, ed., *The Cambridge Companion to Descartes* (Cambridge: Cambridge University Press, 1992, p. 76.

⁵⁷ Hans Blumenberg, *The Legitimacy of the Modern Age*, transl. Robert M. Wallace (Cambridge, Mass. & London: MIT Press, 1983), p. 185..

Renaissance and for the philosophy of the Schools. At a certain point in relation to the body the objections to Aristotelian form and matter overlap with the objections to naturalism: in both cases what is looked for is an explanatory framework that removes consciousness from nature. In both cases what is rejected is a metaphysical link to the universe.

0.6 Methodology and Plan of the Thesis

The analysis in the thesis takes place on two levels, one structural and the other conceptual. The overall structure of the thesis reflects its title: *From Naturalism to Mechanism*; it deals with what are, in Descartes' view at least,⁵⁸ two competing paradigms at the beginning of the seventeenth century, the naturalism of the Renaissance and the budding mechanism of the Scientific Revolution. These are two distinct paradigms that in theory should not overlap, but I will question whether or not, with respect to Descartes, there are remnants of the former in the latter that weaken his mechanistic framework. My analysis of the transition from naturalism to mechanism frequently calls upon the question posed by Robert Lenoble regarding this same transition: *faut-il distinguer Nature et Conscience?*⁵⁹ This is the guiding question of the thesis and my discussion of Descartes' mechanistic physiology revolves implicitly, and sometimes explicitly, around it.

With respect to the conceptual analysis, I will be examining the foundations of Descartes' mechanistic physiology and his implicit and explicit assumptions (e.g.

⁵⁸ I do not hold the view that these two paradigms are mutually exclusive, in particular, with respect to finality. For example, not all mechanistic philosophers (e.g. Leibniz) rejected final causes.

⁵⁹ Robert Lenoble, *Mersenne ou la naissance du mécanisme* (Paris: Librairie philosophique J. Vrin, 1943), p. 8.

dualism, mechanism, causation, life, subject, object, etc.). I will also examine the epistemological obstacles and choices in relation to his mechanistic physiology (in particular, world-soul and final causes); and, with respect to the epistemological choices, I will try to show that they were based on *a priori* decisions and not empirical observations.

Within the analysis of naturalism and mechanism I will be examining Descartes' reduction and transformation and/or elimination of concepts. Thus the two levels of analysis will overlap. The result of the transformed notions and their impact on Descartes' mechanism and metaphysics will be assessed. In effect, I will be looking at the tension between Cartesian dualism and mechanism, and asking if Descartes succeeded in accomplishing what he wanted with his mechanistic physiology. I will also occasionally rely on comparative analysis, for example, using Ficino or Gassendi.

Chapter 1 sets out Descartes' writings on the body and, in particular, the texts on which the issues or problems that I will be discussing are based.

While the focus of this thesis is on the metaphysics underlying (and, to a lesser extent, the new anthropology resulting from) Descartes' mechanistic physiology, these questions cannot be addressed without an examination of Descartes' approach to method. Method and metaphysics are intertwined in Descartes and this will be the subject of Chapter 2: without his dualistic mind-body metaphysics, Descartes could not have elaborated his method; at the same time, the success of his method confirmed the metaphysics that supported it. The metaphysics is never apparent in Descartes' elaboration of his method—it is what Marion refers to as "*l'ontologie grise*", so named

"parce qu'elle ne se déclare point, et se dissimule dans un discours épistémologique."⁶⁰

Chapter 3 addresses certain epistemological obstacles to the implementation of Descartes' unified science that were mainly the result of the naturalistic philosophies of the Renaissance. The chapter examines the threat posed to mechanism by the prevalence of such notions as world-soul and final causes and demonstrates that the abolition of these two notions was a condition of possibility for the elaboration of Descartes' physics of the body. It also examines the influence of Mersenne on Descartes and on what Lenoble refers to as the need for mechanism to separate consciousness and nature.

In Chapter 4, I demonstrate that overcoming the epistemological obstacles of Chapter 3 results in an anthropological problem: the need to describe human life without soul and body without mind. This chapter sets out in detail Descartes' mechanistic description of the body in *L'Homme* and brings out problems and ambiguities inherent in this description as it pertains to the relation of body to mind and human life to nature. This chapter also traces the double influence of Copernicus and Vesalius on Descartes' mechanistic physiology by showing how their work contributed to the evacuation of soul from macrocosm and microcosm and the resultant objectification of both nature and the human body.

Chapter 5 undertakes to demonstrate that Descartes' mechanistic physiology required the importation of naturalistic and/or Scholastic concepts that he officially rejected but without which he was unable to explain the workings of the human body. I attempt to show that two notions in particular, animal spirits and continuous creation, can be seen as reductions of, or replacements for, the notions of world soul and final causes which were the epistemological obstacles addressed in Chapter 3.

⁶⁰Jean-Luc Marion, *Sur l'ontologie grise de Descartes* (Paris: Librairie philosophique J. Vrin, 1981), p. 186.

Chapter 6 addresses the question of whether or not Descartes' focus on mind-body union in Meditation VI, in his correspondence with Elisabeth, and in the *Passions* represents a softening of his mechanistic physiology or necessitates a change in the position on it that I have taken in this thesis. In that chapter I examine the arguments of several commentators who tend to play down the dualism of Descartes' earlier writings and maintain that there is no contradiction between the radical distinction of mind and body and their unity.

CHAPTER 1

Descartes' and the Body: *Corpus* and Issues

There is no more fruitful occupation than to try to know oneself. And the benefit that one expects from this knowledge does not just extend to morals, as many may initially suppose, but also to medicine in particular. I believe one can find very many reliable precepts in medicine...so long as one has studied sufficiently to know the nature of our body, not attributing to the soul functions which depend only on the body and on the disposition of its organs.

Descartes, *La description du corps humain*¹

Descartes' biological writings are set out principally in *L'Homme*, originally a chapter of his treatise on physics, *Le Monde*. This work, completed in 1633, was never published in his lifetime. Near the end of his life (1647-48), he wrote another treatise on the body, *La description du corps humain*, which was never completed and which also went unpublished in his lifetime. In the interval between these two treatises, he incorporated a description of the human body in Part V of the *Discours*, which summarised his main ideas about the body, and he included in both the *Passions* (Section I, 2-16) and in the *Principia* (Section IV, 188-204) short passages relating to the functioning of the body.

This chapter will set out the main elements of these works as they relate to Descartes' stated intention regarding the machine of the body, i.e. to show that "the functions follow in this machine simply from the disposition of the organs as wholly naturally as the movements of a clock or other automaton follow from the disposition of

its counterweights and wheels."² Descartes has a number of objectives in mind in his various descriptions of the body and these will be set out here, along with his own explanations dealing with them. In general, he wants to show:

- that knowledge of the body can be attained in the same way as any other knowledge; i.e. by the application of the principles of method based on the notion of the unity of science;
- that the functioning of body follows the principles of mechanism and thus, that the body is a machine;
- that, except in willed action, the bodies of animals (machines without souls) and the bodies of humans (machines with souls) function in a similar manner;
- that the principle of life is the heat of the heart and this heat is a physical phenomenon (subject to physical, and not metaphysical, explanation) similar to the heat of fermentation or, in Descartes' words, the *fire without light*;
- particularly with reference to the *Description*, that the growth of the foetus is based on the same mechanistic principles as the functioning of the body.

I will examine each of these objectives in turn, making reference to specific passages in the various works. As pointed out in the Introduction, Descartes' view of the body did not change in any substantial way from his earliest writings to his later writings, something that will again be emphasised here.

1.1 The application of method

¹ *World*, p. 170.

² *World*, p. 169.

Descartes' first public elaboration of his method³ occurs in Part II of the *Discours* and he summarised its four main thrusts as follows:

The first was never to accept anything as true if I did not have evident knowledge of its truth: that is, carefully to avoid precipitate conclusions and preconceptions, and to include nothing more in my judgements than what presented itself to my mind so clearly and so distinctly that I had no occasion to doubt it.

The second, to divide each of the difficulties I examined into as many parts as possible and as may be required in order to resolve them better.

The third, to direct my thoughts in an orderly manner, by beginning with the simplest and most easily known objects in order to ascend little by little, step by step, to knowledge of the most complex, and by supposing some order even among objects that have no natural order of precedence.

And the last, throughout to make enumerations so complete, and reviews so comprehensive, that I could be sure of leaving nothing out.⁴

The point of the *Discours* was to set out the method and then to show how it could be applied. Thus, Descartes' first published writings on the body occur in Part V of this work, which covers, according to his introduction,

the order of the questions in physics that [the author] has investigated, particularly the explanation of the movement of the heart and of some other difficulties pertaining to medicine, and also the difference between our soul and that of the beasts...⁵

That section elaborates on both *Le Monde* and *L'Homme* which comprised the same work (referred to by Descartes as his 'Physics') and which were completed but unpublished at the time of publication of the *Discours*, principally because of the condemnation of Galileo. Descartes makes this point right at the beginning of Part V, but also indicates how this part, dealing with both physics and physiology, fits into his overall work on method:

³ While the *Regulae* is a detailed work on method, it was not published in Descartes' lifetime.

⁴ CSM I, 120 (AT VI, 18).

⁵ CSM I, 111 (AT VI, 1).

I would gladly go on and reveal the whole chain of other truths that I deduced from these first ones. But in order to do this I would have to discuss many questions that are being debated among the learned, and I do not wish to quarrel with them. So it will be better, I think, for me not to do this, and merely to say in general what these questions are, so as to let those who are wiser decide whether it would be useful for the public to be informed more specifically about them.⁶

Descartes then re-iterates his basic principles regarding the existence of God and the soul along with the first principle of his method, i.e. "to accept nothing as true which did not seem to me clearer and more certain than the demonstrations of the geometers had hitherto seemed."⁷ Using these principles as the basis of his method has been fruitful:

...I venture to say that I have found a way to satisfy myself within a short time about all the principal difficulties usually discussed in philosophy. What is more, I have noticed certain laws which God has so established in nature, and of which he has implanted such notions in our minds, that after adequate reflection, we cannot doubt that they are exactly observed in everything which exists or occurs in the world.⁸

Descartes "acquired some general notions in physics... [and] began to test them in various particular problems" which led him to the discovery of "a practical philosophy which might replace the speculative philosophy taught in the schools."⁹ Descartes' objective was to apply this philosophy to everything in nature, including the human body and its health:

Through this philosophy we could know the power and action of fire, water, air, the stars, the heavens and all the other bodies in our environment, as distinctly as we know the various crafts of our artisans; and we could use this knowledge—as the artisans use theirs—for all the purposes for which it is appropriate, and thus make ourselves, as it were, the lords and masters of nature. This is desirable not only for the invention of innumerable devices which would facilitate our enjoyment of the fruits of the earth and all the goods we find there, but also, and most importantly, for the maintenance of health, which is undoubtedly the chief good and the foundation of all the other goods in this life.¹⁰

⁶ CSM I, 131 (AT VI, 40).

⁷ CSM I, 131 (AT VI, 41).

⁸ CSM I, 131 (AT VI, 41), *emphasis added*.

⁹ CSM I, 142 (AT VI, 61).

¹⁰ CSM I, 143 (AT VI, 62).

Application of the method made Descartes realise that experiments or observations were essential and "that the further we advance in our knowledge, the more necessary they become."¹¹ The application of method combined with observations reinforced Descartes' belief in the unity of science:

And now, reviewing in my mind all the objects that have ever been present to my senses, I venture to say that I have never noticed anything in them which I could not explain quite easily by the principles I had discovered.¹²

But it also led him to believe that the solution to all the problems relating to the knowledge of nature was within his grasp or, at the very least, within the grasp of those who would follow him:

For my part, if I have already discovered a few truths in the sciences... I can say that these discoveries merely result from and depend upon my surmounting of five or six principal difficulties in battles where I reckon I had fortune on my side. I even venture to say that I think I need to win only two or three other such battles in order to achieve my aims completely, and that my age is not so far advanced that I may not in the normal course of nature still have the time to do this.¹³

1.2 The principles of mechanism and the body-machine

Descartes sets out the principles of mechanism in Chapter 7 of *Le Monde* which was originally entitled, *By what Laws and by what Means the parts of this World will extricate themselves, by themselves, from the Chaos and Confusion they were in.*

Descartes refers to the Laws of Nature that God has imposed on the world and clarifies his meaning of the word 'Nature'¹⁴:

¹¹ CSM I, 143 (AT VI, 63). Cottingham et al translate the French *expériences* as 'observations' although, as they explain, it "sometimes comes close to meaning 'experiments' in the modern sense". (See note 1, p. 143). In the context of his work on the body, this would cover his observations arising out of the dissection of animal carcasses.

¹² CSM I, 144 (AT VI, 64).

¹³ CSM I, 145 (AT VI, 67).

¹⁴ See Chapter 3 (3.2) for a discussion of the Renaissance view of nature that Descartes' is attempting to overcome.

...by 'Nature' here I do not mean some deity or other sort of imaginary power. Rather, I use the word to signify matter itself, in so far as I am considering it taken together with the totality of qualities I have attributed to it, and the condition that God continues to preserve it in the same way that He created it.¹⁵

In Chapter 6, Descartes has discussed the qualities of matter which, in his 'world'¹⁶ is indefinite¹⁷ and continuous (i.e. there is no void). Its qualities are neither the basic forms of the ancients (i.e. earth, fire, air, etc.), nor the qualities of hot or cold, dry or moist, etc.), nor the "prime matter of the Philosophers", but rather "a real, perfectly solid body, which uniformly fills the entire length, breadth, and depth of this great space in the midst of which we have brought our mind to rest."¹⁸ The qualities of this matter consist solely in the size, shape and speed of movement of its particles, according to the laws of nature that God has established:

Let us add further that this matter may be divided into as many parts and shapes as we can imagine, and that each of its parts can take on as many motions as we can conceive. Let us also suppose that God does divide it into many such parts, some larger some smaller, some of one shape some of another, as it pleases us to imagine them... From the first instant of their creation, He causes some to start moving in one direction and others in another, some faster and others slower (or even, if you wish, not at all); and He causes them to continue moving thereafter in accordance with the ordinary laws of nature. For God has established these laws in such a marvellous way that even if we suppose that He creates nothing more than what I have said, and even if He does not impose any order or proportion on it but makes it of the most confused and muddled chaos that any of the poets could describe, the laws of nature are sufficient to cause the parts of this chaos to disentangle themselves and arrange themselves in such a good order that they will have the form of a most perfect world, a world in which one will be able to see

¹⁵ *World*, 25 (AT XI, 37). The idea that "God continues to preserve it in the same way that He created it" is the principle of continuous creation which is dealt with at length in Chapter 5.

¹⁶ Both *Le Monde* and *L'Homme* are written as 'fables' as a cautionary measure on Descartes' part. They deal with, in the first case, a "wholly new world, which I call forth in imaginary spaces before [this world], and in the second with men who are "composed as we are, of a soul and a body." (*World*, 21, 99).

¹⁷ *World*, 22 (AT XI, 32): "...we do not assume this new matter to be infinite, we can assume nevertheless that it fills spaces much greater than those we have imagined." Descartes also explains, in the *Principia*, that he uses the term 'indefinite' rather than 'infinite' "so as to reserve the term 'infinite' for God alone." (*PP* in CSM I, 202 (AT IXB, 15).

¹⁸ *World*, 22 (AT XI, 33).

not only light, but all the other things as well, both general and particular, that appear in the actual world.¹⁹

Because there is no void, the particles of matter "all touch one another on all sides" and "from this it follows necessarily that from the time they begin to move, they also begin to change and diversify their motions by colliding with one another."²⁰ Thus all change is motion and it comes about by God, who preserves matter in the same way but not in the same state, because He "always acts in the same way and consequently always produces substantially the same effect, many differences in this effect occur, as if by accident."²¹ That God always acts in the same way is a result of the fact that He is immutable and it is from the fact of God's immutability that Descartes is able to deduce the laws of nature, the first of which states "that each particular part of matter always continues in the same state unless collision with others forces it to change its state..." Included in this law of nature is the very new idea that rest is a form of motion as well and not simply a privation of motion as thought by "the Philosophers":

In addition, the Philosophers attribute to the least of these motions a being much more solid and real than they do to rest, which they say is merely a privation of motion. For my part, I conceive of rest as a quality also, which should be attributed to matter while it remains in one place, just as motion is a quality attributed to matter while it is changing place.²²

This is Descartes' articulation of what has become known as the principle of inertia. The second law of nature, for Descartes, holds that when one body pushes another,

it cannot give the other any motion except by losing as much of its own motion at the same time; nor can it take away any of the other's motion unless its own is increased by the same amount.²³

¹⁹ *World*, 23 (AT XI, 34).

²⁰ *World*, 25 (AT XI, 36).

²¹ *World*, 25 (AT XI, 37).

²² *World*, 27 (AT XI, 40).

²³ *World*, 27 (AT XI, 41).

The first two rules deal with the conservation and distribution of motion; the third deals with its direction and is the principle of rectilinear motion:

...when a body is moving, even if its motion most often takes place along a curved line...nevertheless each of its parts individually tends always to continue moving along a straight line.²⁴

While there may be other rules of motion dealing with different aspects of motion and collision, these are the three basic laws of nature upon which Descartes will base both his description of the world and his description of the human body. The object and the result of these laws is to explain all change within the universe in terms which are quantifiable and measurable, devoid of any occult qualities within matter or anything over and above matter, such as soul or spirit. Speaking of the errors of the philosophers, Descartes explains:

...the whole difficulty they face with their matter derives only from their wanting to distinguish it from its own proper quantity and from its outward extension, that is, from the property it has of occupying space...And they should not find it strange that the quantity of the matter that I have described does not differ from its substance any more than number differs from the things numbered. Nor should they find it strange if I conceive of its extension, or the property it has of occupying space, not as an accident, but as its true form and essences...²⁵

In *L'Homme*, Descartes sets about to describe the human body as a machine that follows the laws of nature that he has set out in *Le Monde*. Thus, he supposes "the body to be just a statue or a machine made of earth, which God forms with the explicit intention of making it as much as possible like us."²⁶ Like machines that function solely based on the disposition of their parts, the functions of the body depend solely on the disposition of its organs:

²⁴ *World*, 29 (AT XI, 44).

²⁵ *World*, 24 (AT XI, 35).

²⁶ *World*, 99 (AT XI, 120).

We see clocks, artificial fountains, mills, and other similar machines which, even though they are only made by men, have the power to move of their own accord in various ways. And, as I am supposing that this machine is made by God, I think you will agree that it is capable of a greater variety of movements than I could possibly imagine in it, and that it exhibits a greater ingenuity than I could possibly ascribe to it.²⁷

In Descartes' description of the body, machine is not simply a metaphor. For him, the body of his fable, which is 'like ours', *is* a machine:

And the nerves of *the machine* that I am describing can indeed be compared to the pipes in the mechanical parts of these fountains, its muscles and tendons to various other engines and springs which serve to work these mechanical parts, its animal spirits to the water that drives them, the heart with the source of the water and the brain's cavities with the apertures. Moreover, respiration and similar actions which are normal and *natural to this machine*, and which depend on the flow of spirits, are like the movements of a clock or mill, which the normal flow of water can make continuous. External objects, which by their mere presence act on the organs of sense and thereby cause them to move in many different ways, depending on the arrangement of the parts of the brain, are like strangers who on entering the grottoes of these fountains unwittingly cause the movements that take place before their eyes... And finally, when a rational soul is *present in this machine* it will have its principal seat in the brain and will reside there like the fountaineer, who must be stationed at the tanks to which the fountain's pipes return if he wants to initiate, impede, or in some way alter their movements.²⁸

Descartes provides a description of the body-machine and its functions such as movement, vision, memory, and these will be discussed in detail in Chapter 4. As will be shown there, the explanations of the various functions are made in terms of the size, speed and direction of particles, using the same principles that Descartes had outlined in his physics. For example, when he discusses the circulation of the blood, he explains that the most energetic, strongest and finest parts of the blood go directly from the heart to the brain, "inasmuch as the arteries bearing them there are in the *most direct line from the heart; and as you know, all moving bodies tend as much as they are able to continue their*

²⁷ *World*, 99 (AT XI, 120).

²⁸ *World*, 107 (AT XI, 131), emphasis added.

motion in a straight line."²⁹ At the end of his description he addresses the reader regarding the functions of this machine such as digestion, the beating of the heart, respiration, sensation, etc.:

...I desire, I say, that you should consider that these functions follow in this machine simply from the disposition of the organs as wholly naturally as the movements of a clock or other automaton follow from the disposition of its counterweights and wheels.

1.3 Machines without souls; machines with souls

In order to conform to the principles of mechanism, as well as to his dualistic metaphysics whereby only humans have souls, is important that Descartes' description of the body be made solely on the basis of physical principles, except where conscious human action is involved. Thus, the greater part of his description applies to both animals and humans and what is different for humans is the result of God's placing a soul into the machine. This can be seen clearly at the end of *L'Homme* as he addresses the reader:

...I want you once again to reflect a little on all that I have just said about this machine; and to consider, first, that I have postulated in it only such organs and working parts as can readily persuade you that they are the same as those in us, as well as various animals lacking reason... To explain these functions, then, it is not necessary to conceive of any vegetative or sensitive soul, or any other principle of movement or life, other than its blood and its spirits which are agitated by the heat of the fire that burns continuously in its heart, and which is of the same nature as those fires that occur in inanimate bodies.³⁰

This is a point that returns often when Descartes refers to the functioning of the body.

For example, he repeats it several times in the first pages of the *Description*:

...so long as one has studied sufficiently to know the nature of our body, not attributing to the soul functions which depend only on the body and on the disposition of its organs.

²⁹ *World*, 104 (AT XI, 128), emphasis added.

³⁰ *World*, 168, 169 (AT XI, 200, 202).

...we can see that our soul, in so far as it is a substance distinct from body, is known to us solely from the fact that it thinks, that is to say, understands, wills, imagines, remembers, and senses, because all these functions are kinds of thoughts...

...I shall try to...explain the entire machine of our body in such a way that we will have no more reason to think that it is our soul that excites in us those movements that we do not experience as being directed by our will than we have to judge that there is a soul in a clock that makes it tell the time.³¹

Similarly, in the *Passions*, Descartes refers to the error that is made in thinking it is the soul that moves the body:

The error consists in supposing that since dead bodies are devoid of heat and movement, it is the absence of the soul which causes this cessation of movement and heat.³²

It is not the absence of soul, according to Descartes, that causes death to occur; rather the soul leaves the body once the body heat ceases and "the organs which bring about bodily movement decay." Descartes compares the difference between a living human and a dead one to the difference between a working watch and a broken one:

And let us recognize that the difference between the body of a living man and that of a dead man is just like the difference between, on the one hand, a watch or other automaton (that is, a self-moving machine) when it is wound up and contains in itself the corporeal principle of the movements for which it is designed, together with everything else required for its operation; and, on the other hand, the same watch or machine when it is broken and the principle of its movement ceases to be active.³³

Thus, the description of the machine is generic and then certain modifications are described to account for the machines with souls. For example, in one example dealing with sensation, Descartes' description of the physical reaction of the body to a hot object contains no reference to pain:

³¹ *World*, 170, 171 (AT XI, 224, 225).

³² CSM I, 329 (AT XI, 330).

³³ CSM I, 329 (AT XI, 331).

Thus, for example, if fire A [in the accompanying diagram] is near foot B, the tiny parts of this fire—which as you know move very rapidly—have sufficient force to move with them the area of skin that they touch, and in this way they pull the tiny fibre *cc* which you see attached to it, and simultaneously open the entrance to the pore *de*, located opposite the point where this fibre terminates: just as when you pull on one end of a cord you cause a bell hanging at the other end to ring at the same time.

Now when the entrance to the pore or small tube *de* is opened this way, the animal spirits from cavity F enter and are carried through it, some to the muscles that serve to pull the foot away from the fire, and some to the muscles that make the hands move and the whole body turn in order to protect itself.³⁴

After his full description of this reflex action, Descartes explains what happens "when God unites a rational soul to this machine":

He will place its principal seat in the brain and will make its nature such that the soul will have different sensations depending on the different ways in which the nerves open the entrances to the pores in the internal surface of the brain.

Suppose, for example that the tiny fibres that make up the marrow of the nerves are pulled with such a force that they are broken and separated from that part of the body to which they were attached, with the result that the structure of the machine is in some way less intact. The movement that they will then cause in the brain, whose location must remain the same, will cause the soul to have the sensation of pain.³⁵

Similarly, with the sensation of hunger, certain fluids in the stomach agitate tiny fibres that move certain parts of the brain which "will cause the soul, when it is united to this machine, to conceive the general idea of hunger."³⁶

Chapter 4 will deal with certain aspects of perception and sensation in relation to humans and animals and with some of the ambiguities present in Descartes' account.

1.4 The Principle of Life

³⁴ *World*, 117 (AT XI, 142). The diagram is on page 118. Cavity F is one of the cerebral ventricles.

³⁵ *World* 119 (AT XI, 143).

³⁶ *World*, 139 (AT XI, 163).

In Descartes' conception of the body, the principle of life is the heat of the heart which he also refers to as the fire without light. The importance of the heat of the heart to mechanism and to the circulation of the blood has already been discussed in the Introduction and is dealt with in Chapter 4. In Descartes' description, the heat of the heart is a purely physical phenomenon. It does not come from soul or from any cosmic fire, although he does refer to it as fire:

And note that the flesh of the heart contains in its pores one of those fires without light which I have spoken about earlier and which makes it so fiery and hot that, to the extent that the blood enters either of its two chambers or cavities, it is promptly inflated and expanded... And the fire in the heart of this machine that I am describing to you has as its sole purpose to expand, warm, and refine the blood that falls continually a drop at a time through the passage from the vena cava into the cavity on its right side, from where it is exhaled into the lung, and from the vein of the lung which anatomists have called the 'venous artery' into its other cavity, from where it is distributed throughout the body.³⁷

That this fire is not of any strange or occult nature is underlined again in the *Description*:

It is beyond doubt that there is heat in the heart, for one can even feel it with one's hand when one opens up the body of a living animal. And we should not imagine that this heat is of a different nature from that which is caused by the addition of some fluid, or yeast, which causes the body with which it is mixed to expand.³⁸

It is the fire of the heart that allows Descartes to explain the functions of the body without recourse to any idea of soul, be it rational, animal or vegetative. The fire of the heart is the same in animals and in humans (or in machines without souls and machines with souls). This is clearly set out in the *Discours*:

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. And when I looked to see what functions would occur in such a body I found precisely those which may occur in

³⁷ *World*, 101 (AT XI, 123).

³⁸ *World*, 172 (AT XI, 228).

us without our thinking of them, and hence without any contribution from our soul (that is, from that part of us, distinct from the body, whose nature, as I have said previously, is simply to think). These functions are just the ones in which animals without reason may be said to resemble us. But I could find none of the functions which, depending on thought, are the only ones that belong to us as men; though I found all these later on, once I had supposed that God created a rational soul and joined it to this body in a particular way which I described.³⁹

In the *Passions*, Descartes underlines the importance of the heat of the heart by making explicit its foundational nature in relation to both blood and animal spirits. In effect it is responsible for all functions of the body. He deals with it in section 8 which is sub-titled, *The principle underlying all these functions*:

But it is not commonly known how these animal spirits and nerves help to produce movements and sensations, or what corporeal principle makes them act. That is why, although I have already touched upon this question in other writings, I intend to speak briefly about it here. While we are alive there is a continual heat in our hearts, which is a kind of fire that the blood of the veins maintains there. This fire is the corporeal principle underlying all the movements of the limbs.⁴⁰

In the *Description*, Descartes states that "the heat that it has in its heart is like the great spring or principle of all the movements occurring in the machine."⁴¹ It is the heat of the heart that Descartes uses to counter Harvey's theory about the circulation of the blood since with Descartes' theory,

we need suppose no unknown or extraneous faculties.

For what better and swifter arrangement can we imagine than that which is brought about by fire, which is the most powerful agent we know in nature.⁴²

1.5 The Formation of the Foetus

Descartes did not deal with the origin of the body either in *L'Homme* or in Part V of the *Discours*. As he says in the *Description*:

³⁹ CSM I, 134 (AT VI, 46).

⁴⁰ CSM I, 331 (AT XI, 333). Animal spirits are dealt with in Chapters 4 and 5 of this thesis.

⁴¹ *World*, 172 (AT XI, 226).

Until now, I have been unwilling to put my views on this topic into writing, because I have not yet been able to make enough observations to test all the thoughts I have had on the matter.⁴³

He does address the question, however, in that work and his description begins right at the moment of copulation between a man and a woman at which point

an unorganised mixture of two liquids, which act on each other like a kind of yeast, heating one another so that some of the particles acquire the same degree of agitation as fire, expanding and pressing on the others, and in this way putting them gradually into the state required for the formation of parts of the body.⁴⁴

Again, Descartes makes the point that there is nothing strange or occult about what happens and it is not even necessary that the two liquids referred to be very different from each other:

For, just as we can observe how old dough can make new dough swell, and how the scum formed on beer is able to serve as yeast for making more beer, so we can easily agree that the seeds of the two sexes, when mixed together, serve as yeast to one another.⁴⁵

The process of the formation of the foetus as a result of this coupling is explained by the same principle of heat and according to the principles of mechanism:

Now I believe that the first thing that happens in this mixture of seed, and which makes all the drops cease to resemble one another, is that the heat generated there—which acts in the same way as does new wine when it ferments, or as hay which is stored before it is dry—causes some of the particles to collect in a part of the space containing them, and then makes them expand, pressing against the others. This is how the heart begins to be formed.

Then, because these tiny parts, which have been thus expanded, tend to continue in their movements in a straight line, and the heart, which has now begun to form, resists them, they slowly move away and make their way to the area where the brain stem will later be formed, in the process displacing others which move around in a circle to occupy the place vacated by them in the heart. After the brief time needed for them to collect in the heart, these in turn expand and move away, following the same path as the former. This results in some of the former group

⁴² *World* 182 (AT XI, 244).

⁴³ *World*, 186 (AT XI, 252).

⁴⁴ *World*, 187 (AT XI, 253).

⁴⁵ *World*, 187 (AT XI, 253).

which are still in the same position—together with others that have moved in from elsewhere to take the place of those that have left in the meantime—moving the heart. And it is this expansion, which occurs thus in a repeated way, that the beating of the heart, or the pulse, consists.⁴⁶

The formation and growth of the rest of the foetus follows the same principles whereby rarefied blood leaves the heart and "takes its course in a straight line in the direction in which it is freest to move" encounters resistance, attempts to get back to the heart but cannot "because it is blocked by the new blood that the heart is producing". It thus takes another path, and then a circular path which brings it back to the heart and it is this circular path that then forms the vena cava.⁴⁷ It is this circulation of blood in various directions, aided in some cases by the animal spirits (formed by the rarefaction of the blood) and working on various aspects of the seed, that ultimately accounts for the formation of all the parts of the body, including the organs and the sense organs.

Following is a description of part of the role of the animal spirits in the formation of the foetus:

... the spirits that flowed outside the head found pores on both sides of the length of the spinal column, and by these means they distinguished its joints, and became widely distributed all around the mass of the seed, now no longer round but oblong, because the force of the blood and spirits that have passed through the heart to the head have of necessity stretched it more in that direction than in the other. And it remains here only to note that the last place in the seed at which the spirits can arrive in following their course in this way is that where the navel must be...⁴⁸

In all, Descartes deals with the formation of blood, heart, lungs, and nerves, as well as the formation of veins and arteries. His research on the foetus was based on his own extensive examinations of chicken embryos, "opening thirty eggs at various stages after

⁴⁶ *World*, 187 (AT XI, 254).

⁴⁷ *World*, 189 (AT XI, 257).

⁴⁸ *World*, 194 (AT XI, 266).

incubation and noting the stage of development."⁴⁹ The work was abandoned, according to Gaukroger, because he felt "overwhelmed by the amount of research he would have to do if he was to present an account of foetal development that had any claim to being comprehensive."⁵⁰

In addition to the works cited above, a number of unedited fragments exist: the *Primae Cogitationes circa Generationem Animalium*, published in Amsterdam in a 1701 edition of Descartes' posthumous works; and the *Excerpta Anatomica*, published in 1859-60 by Foucher de Careil as part of his *Oeuvres inédites de Descartes*. The latter publication is based on notes transcribed by Leibniz and found in the Bibliothèque Royale de Hanovre.⁵¹ These fragments have different dates (from 1631 to 1648) and appear to be notes and commentaries by Descartes on his dissections of animals.

Descartes' work on the body began around 1630, as his letter to Mersenne of April 15 of that year demonstrates:

I am now studying chemistry and anatomy simultaneously; every day I learn something that I cannot find in any book.⁵²

The last comment presumably refers to what he was learning from his dissections of animal carcasses that he got from Amsterdam butchers, and this is confirmed in several other letters to Mersenne. In November of 1632, he wrote:

I have already written of the vital functions, such as the digestion of food, the heart beat, the distribution of nourishment, etc., and the five senses. I am now dissecting the heads of various animals, so that I can explain what imagination, memory, etc., consist in.⁵³

⁴⁹ Gaukroger, *Descartes*, 406.

⁵⁰ *Ibid.*, p. 406.

⁵¹ AT XI, 546ff.

⁵² CMSK, 21 (AT I, 137).

⁵³ CMSK, 40 (AT I, 263).

Further, a letter to Mersenne of February 1639 helps to date the beginnings of Descartes' practice of dissecting animals to at least 1628:

I have spent much time on dissection during the last eleven years, and I doubt whether there is any doctor who has made such detailed observations as I.⁵⁴

Finally, certain aspects of Descartes' biology are covered in his correspondence. In this respect, his correspondence with Plempius regarding the heat of the heart and the circulation of the blood, discussed in the Introduction to this thesis, is an important addition to Descartes' biological corpus. Similarly, several letters to Regius and to Voetius elaborate on his conception of animal spirits and his refutation of the multi-level soul.⁵⁵ And, lastly, his extensive correspondence with the Princess Elisabeth, which dates from 1643 to 1649, serves as supplementary material to his biological writings, particularly with respect to mind-body union.

Thus, it can be seen that, while very little of this work was published in his lifetime, Descartes was pre-occupied with biological and physiological matters over a span of twenty years, during which time he read, wrote and conducted his observations and his dissections.

[A number of the citations set out in this chapter are repeated, as necessary, elsewhere in the text.]

⁵⁴ CSMK, 134 (AT II, 525).

⁵⁵ See for example, letters to Regius in CSMK, 181-183 (AT III, 369-375) and to Voetius in CSMK, 224 (AT III, 686).

CHAPTER 2

Mirabilis scientiae fundamenta

The unity of science, which was the banner raised in the Cartesian revolution against the philosophy of the Schools, depended, in his own words, on 'the continuous application of a single and identical method to all the various sciences, for the possibility and practicability of its application in common would imply that the sciences together are nought else but the very unity of human reason.' This was Descartes' unfailing contention: it was also his constant practice.

J.L. Beck, *The Method of Descartes* ¹

The above statement elicits several aspects of the unity of science which will form the basis of this chapter and of my thesis in general: that this notion represented a rupture with past thought; that it entails certain epistemological, metaphysical and anthropological choices that were fundamentally *a priori* and present from the beginnings of Descartes' own thought; and that it governed his approach to all science, including, ultimately, his science of the human body. As this thesis will demonstrate, I am generally in accord with Beck's contention that this was both Descartes' unfailing contention and his constant practice.² The banner of the unity of science was raised very early in Descartes' life and work. In Rule One of the *Regulae* Descartes states:

For the sciences as a whole are nothing other than human wisdom, which always remains one and the same, however different the subjects to which it is applied, it

¹ J.L. Beck, *The Method of Descartes* (Oxford: Clarendon Press, 1952), p. 307.

² The unity that is of interest for this thesis is the unity of science and only peripherally the idea of the unity of reason, although, as the quotation from Beck shows, the two are fundamentally and intimately related. In the subject-object dualism of Descartes, the unity of reason pertains to the subject while the unity of science pertains to the objects of science. Throughout this thesis, my main concern is with the object and, more particularly, with the human body as an object of a unified science (and of the method pertaining to a unified reason).

being no more altered by them than sunlight is by the variety of the things it shines on.³

This simple statement of a radically new idea belies the importance that the notion had in Descartes' work and the fact that it "contains within itself the germ of the whole Cartesian revolution".⁴ While the idea did not find public expression until the *Discours* was published in 1637, it was present in Descartes' writings and letters as early as 1619.⁵ In March of that year, he wrote to Beeckman:

What I want to produce is not something like Lull's *Ars Brevis*, but rather a completely new science, which would provide a general solution of all possible equations involving any sort of quantity, whether continuous or discrete, each according to its nature.⁶

Further, according to Baillet, on the night of November 10, 1619, the night of Descartes' three famous dreams⁷, Descartes was "*tout rempli de son enthousiasme, et tout occupé de la pensée d'avoir trouvé ce jour-là les fondements de la science admirable.*"⁸ These words appear at the opening of *Olympica*, a section of a small notebook of early writings seen by Baillet himself but never published (and now lost). In the third of the dreams appeared a dictionary and a book of poetry containing a poem by Ausonius with the words: *Quod vitae sectabor iter?* Descartes interpreted the dictionary to mean the unity

³ *Reg. I* in CSM I, 9 (AT X, 360).

⁴ Beck, *op. cit.*, p. 21

⁵ There is much debate about the dating of the *Regulae* and Gaukroger states that while they "were originally thought to have been composed in 1628...there is now good reason to suppose that the *Regulae* were in fact composed between 1619-20 and 1626-8, and that a number of stages of composition are evident..." Gaukroger, *Descartes*, p. 111.

⁶ CSMK, 2 (AT X, 156).

⁷ Our source for the content of the dreams is Adrien Baillet whose account is based on pages of Descartes' early writings now lost. There is no extant account of the dreams by Descartes himself. The content of these dreams, which has been well analysed by many commentators, is less important to my purposes than the fact that it is generally acknowledged that Descartes' idea of the foundations of a marvellous science came out of, or was at least confirmed by, his interpretation of the third of the dreams. For a detailed account of the dreams and Descartes' interpretation of them, see Henry Gouhier, *Les premières pensées de Descartes* (Paris: Librairie philosophique J. Vrin, 1979), ch. II. For a more concise summary, see Gaukroger, *Descartes*, p. 106-111.

⁸ Adrien Baillet, *La vie de Monsieur Descartes*, (La Table Ronde, 1946), p. 38.

of all the sciences and the book of poetry, the union of philosophy and wisdom.⁹ In the question, *quod vitae sectabor iter?* Descartes saw a message from God and the answer, for him, was to follow the path of establishing the foundations of the marvellous science: the unity of all knowledge. It is also of interest that, according to Baillet, Descartes interpreted the poets in the Anthology to mean Revelation and Enthusiasm, indicating his being ‘favoured’ in his vocation.¹⁰ Thus the unity of science would appear to be as much a mission as an idea.¹¹ That Descartes’ commitment to this idea was unfailing and constant is confirmed by his elaboration of his method in the *Discours* almost 20 years later (1637) as well as by the Preface to the French version of the *Principia* published almost 30 years later and only 4 years before his death. In the latter work he sets out “the principles which enable us to deduce the knowledge of all the other things to be found in the world” and states that the “whole of philosophy is like a tree”, the roots being metaphysics, the trunk physics and the branches emerging from the trunk all the other sciences.”¹²

This chapter will look at Descartes’ idea of the unity of all knowledge and will address the questions: Where did the idea come from and what were the implications of this idea which “contains within itself the germ of the whole Cartesian revolution?” It will also look at the question of the relationship between Descartes’ science and his metaphysics and attempt to show that while Descartes did not elaborate his full-fledged

⁹ Baillet tells us that Descartes “jugea que le *Dictionnaire* ne voulait dire autre chose que toutes les Sciences ramassées ensemble; et que le *Recueil de Poésies*, intitulés *Corpus Poetarum*, marquait en particulier, d’une manière plus distincte, la Philosophie et la Sagesse jointes ensemble.” (AT X, 184) quoted in Jean-Luc Marion, *op. cit.*, p. 32.

¹⁰ AT X, 184.

¹¹ See also Jacques Maritain, *Le songe de Descartes* (Paris: Buchet/Chastel, 1965), p. 21: “Voilà la mission grande et singulière qu’il n’aurait sans doute pas osé assumer de lui-même, mais pour laquelle il lui est révélé que l’Esprit de Vérité l’a élu.”

¹² *PP* in CSM I, 184, 186. (AT IXB, II, 14).

metaphysics until the publication of the *Meditationes* in 1641, certain elements of that metaphysics were present from his earliest writings. Further, the idea of the unity of science, promulgated in the *Regulae* rests on the metaphysical separation of mind and body and results in the transformation of the idea of both, resulting in a rupture with past thought.

One of the main objectives of this thesis will be to question Descartes' primary assumption about the unity of science, the 'possibility and practicability' of the application of Cartesian method to all science and, in particular, the science of the body.

2.1 The origins Descartes' 'unified science'¹³

Given the importance of the idea of a unified science to both Descartes' method and his philosophy in general, it is not superfluous to ask where, in fact, this idea came from. Did this all-important 'discovery' come from a dream? In fact, to a large extent, the answer appears to be that it did, at least in Descartes' own mind. Adam tells us, in his short biography of Descartes that "dans la nuit mémorable du 11 novembre 1619 [in fact, it was the night of November 10], il a trois songes, qui décident de toute sa vie. Il arrête les règles de sa méthode et sa réforme de l'algèbre."¹⁴ Baillet is somewhat more circumspect. With respect to the three dreams he tells us that Descartes

crut apercevoir à travers de leurs ombres les vestiges du chemin que Dieu lui traçait pour suivre sa volonté dans son choix de vie, et dans la recherche de cette vérité qui faisait le sujet de ses inquiétudes. Mais l'air spirituel et divin qu'il affecta de donner aux explications qu'il fit de ses songes tenait si fort de cet enthousiasme dont il se croyait échauffé, que l'on aurait été porté à croire qu'il

¹³ 'Science' here is the Latin *scientia*, which is translated by 'knowledge'. For Descartes 'science' included all certain knowledge, a much broader application than that used today. It would include philosophy of nature as well as the physical and biological sciences.

¹⁴ Ch. Adam, *Descartes, sa vie et son oeuvre* (Paris: Boivin & Cie, Éditeurs, 1937), p. 19.

aurait eu le cerveau affaibli, ou qu'il aurait bu le soir avant que de se coucher.¹⁵

In fact, Descartes was, by his own admission, already “tout rempli de son enthousiasme” about the foundations of a marvellous science during his reflections of the day before the dreams; whatever interpretation he subsequently put on the them, they “would seem not to have constituted his discovery, but rather to have confirmed it, and perhaps expanded its implications.”¹⁶ This comment by Keefer reinforces the *a priori* nature of Descartes’ ‘discovery’ and reflects Gouhier’s position that “l’enthousiasme est à la fois cause et effet de l’invention” and that in analysing Descartes’ interpretation of his dreams it is best not to confuse “une expérience religieuse” with “l’explication religieuse d’une expérience”.¹⁷ Gaukroger takes a more extreme position, suggesting “that the events of the days surrounding 10 November probably constituted a mental collapse of some kind, and that the thoughts on method that Descartes had been pursuing at the time came to symbolize his recovery from this.”¹⁸

Before going further into the question of the source of the idea of the unity of science, it will be helpful to glance briefly at what was motivating Descartes to think so deeply on this question that it came to be imbued with revelatory and religious connotations. According to Gaukroger, even though Descartes’ approach to it was new, the question of method was “the most discussed philosophical problem of the day.”¹⁹ Method was part of the larger question of the nature of knowledge as well as of the

¹⁵Baillet, *op. cit.*, p. 38. Maritain reminds us, however, that Descartes had noted that he had not drunk wine for three months; he concludes that “l’enthousiasme solitaire qui l’anime a une origine divine, l’ivresse de la nuit du 10 novembre 1619 est une ivresse sainte, elle est en sa personne comme une pentecôte de la Raison.” *Op. cit.* p. 27.

¹⁶Michael H. Keefer, “The Dreamer’s Path: Descartes and the Sixteenth Century”, in *Renaissance Quarterly*, 49 (1996), p. 41.

¹⁷Henri Gouhier, *op. cit.*, p. 52, 53.

¹⁸Gaukroger, *op. cit.*, p. 111.

knowledge of nature. As all seventeenth century philosophers, Descartes inherited from the Renaissance a dual approach to method: the humanistic approach to the classification and presentation of different disciplines, including all the material proper to each subject (*Ordo*), exemplified by the writings of Petrus Ramus; and the logical approach emphasizing techniques for discovering principles and generating syllogisms (*Methodus*), as represented in the works of Jacopo Zabarella.²⁰ The encyclopaedic approach was intimately tied to essentialism: the classification of natural objects based on essences or qualities; the second was intimately linked to syllogistic reasoning. Descartes rejected the notion of essences or qualities in natural objects (limiting the essence of matter to extension); further, his method of linking one idea to another will not be based on classes or by subject, but on how one thing can be known from another, regardless of category. Descartes also rejected the syllogism's claim to true method on the basis that while it may explain what is already known it does not lead to new knowledge:

... we should realize that, on the basis of their method, dialecticians are unable to formulate a syllogism with a true conclusion unless they are already in possession of the substance of the conclusion, i.e. unless they have previous knowledge of the very truth deduced in the syllogism.²¹

But Descartes appears to go even further, rejecting the idea that external rules can teach us how to use our reason:

The method cannot go so far as to teach us how to perform the actual operations

¹⁹ Gaukroger, *op. cit.*, p. 112.

²⁰ See Peter Dear, "Method and the Study of Nature", in *The Cambridge History of Seventeenth Century Philosophy* (Cambridge University Press, 1998) pp. 147-177.

²¹ *Reg. 10* in CSM 1, 37 (AT X, 406). Descartes here reflects Bacon's criticisms of syllogism in *The New Organon* (published in 1620): Aphorism XII: "The logic now in use serves rather to fix and give stability to the errors which have their foundation in commonly received notions than to help the search after truth. So it does more harm than good." Aphorism XIV: "The syllogism consists of propositions, propositions consist of words, words are symbols of notions. Therefore, if the notions themselves (which is the root of the matter) are confused and overhastily abstracted from the facts, there can be no firmness in the superstructure. Our only hope therefore lies in a true induction." F.H. Anderson (transl.) *Bacon, The New Organon* (Indianapolis: The Bobbs-Merrill Company, Inc., 1960), p. 41.

of intuition and deduction, since these are the simplest of all and quite basic. If our intellect were not already able to perform them, it would not comprehend any of the rules of the method, however easy they might be.²²

Thus Descartes' approach to method is fundamentally different; he is looking for a new solution based purely on intellectual intuition or clear and distinct ideas²³ and how one idea can be deduced from another without any recourse to qualities or essences.²⁴ The radicalness of his attempt may go a long way to explaining the messianic nature of his approach to his 'discovery' as reflected in the dream experience.²⁵

To return to the night of November 10, the position that Descartes' dreams confirmed rather than constituted his intuition of the unity of science is reinforced by the reference in a letter to Beeckman several months earlier (quoted above) to a "completely new science". This would suggest that Descartes was already on this track long before

²² Reg. 4 in CSM I, 16 (AT X, 372).

²³ Beck states that "Descartes's use of the word 'idea' is peculiar to himself in that previously the term was used to describe the Ideas of Plato and had no current usage in the terminology of the Schools." *The Metaphysics of Descartes, op. cit.*, p. 151. In addition, Descartes' use of the term is ambiguous, and the ambiguity was recognized by him as can be seen in his Preface to the Reader in the *Meditations*: "Idea can be taken materially, as an operation of the intellect... Alternatively, it can be taken objectively, as the thing represented by that operation." CSM II, 7 (AT VII, 8). For a contrary view regarding the usage of the term in the seventeenth century, see Roger Ariew, *Descartes and the Last Scholastics* (Ithaca and London: Cornell University Press, 1999), Ch. 3, "Ideas in and before Descartes" (with Marjorie Grene). Ariew and Grene argue that there were different connotations of the term in both the literature and philosophy of Descartes' time and that, while Descartes use of the term was new, "he shaped this new conception by using readily available meanings of the term and at the same time purifying them of much of their habitual connotation." (p. 76).

²⁴ Dear concludes, however, that "Descartes's lattice-work image of knowledge is itself clearly related to the 'methodical' ordering and presentation of disciplines conventional in contemporary logic texts—*ordo* rather than *methodus*" and that his idea of the unity of science "mimicked in the large part the branching tables of Ramus and the humanist dialecticians..." *Op. cit.*, p. 158.

²⁵ Both André Robinet and Nelly Robinet-Bruyère would question the radical nature of Descartes' approach to method, the latter holding that many elements of the *Regulae* "offrent un étonnant écho à la dialectique de La Ramée" and the former confirming the influence of La Ramée as well as that of Adrianus Ramus, one of a number of sixteenth-century mathematicians interested in *mathesis universalis*, and whose search for a universal science as "le principe des autres sciences" (which he termed *methodus*) is reflected in the Cartesian quest for the unity of science and method. See Emmanuel Faye (ed) *Descartes et la Renaissance* (Paris: Honoré Champion Éditeur, 1999), p. 58, p. 70. Descartes also appears to have been influenced by the work of the Rosicrucian, Johannes Faulhaber, who also had a vision of a universal mathematics. Whatever his influences, however, Gaukroger points out that Descartes filled out his vision "in terms of an amalgam of elements drawn from virtually the whole range of his studies, from those in grammar, and rhetoric to those in mechanics and algebra." *Descartes*, p. 105.

the famous dream sequence of November 10, 1619. Further, when he recalls the experience of November 10, 1619 in the *Discours*, he does not discuss the dreams but states simply that “I stayed all day shut up alone in a stove-heated room, where I was completely free to converse with myself about my own thoughts.”²⁶ In this text, rather than being a revelation from on high, the idea of the unity of science is said to have come out of these thoughts, the first of which “was the thought that there is not usually so much perfection in works composed of several parts and produced by various different craftsmen as in the works of one man,”²⁷ a thought that eventually led him to his method and to the idea that since “all the things which can fall under human knowledge are interconnected in the same way”, if one follows his method for deducing one thing from another, “there can be nothing too remote to be reached in the end or too well hidden to be discovered.”²⁸

The fact that Descartes recounted the dreams in detail in his *Olympica*, and connected them explicitly with his ideas about the foundations of a marvellous science, but left them out of his later account of the same day in the *Discours* suggests that later reflection caused him to play down the apparent esoteric nature of his original discovery. It also could be evidence of another influence on Descartes and his idea of a unified science: the Hermetic writings which were very current in his youth and with which many commentators believe he was quite familiar.²⁹ In this respect, Michael Keefer

²⁶ *DM* in CSM I, 116 (AT VI, 11).

²⁷ *DM* in CSM I, 116 (AT VI, 11).

²⁸ *DM* in CSM I, 120 (AT VI 19). The interconnectedness that Descartes admits here, it should be emphasized, is epistemological. It is far from the ontological interconnectedness of the Stoics, for example, where things in themselves and not just things as we know them are interconnected.

²⁹ See, among others, Gouhier, *op. cit.*, Ch. VII and Frances Yates, *op. cit.*, Ch. VIII, both of which discuss Descartes' presumed acquaintance with the Rose Croix, a sect which falls within the hermetic tradition. See also Maritain, *op. cit.*, p. 11: “Nous savons pourtant que Descartes entretint pendant tout l'hiver 1619-1620 un étroit commerce scientifique avec le mathématicien Faulhaber qui...était Rose-Croix

points out that there

are strong grounds for claiming that Descartes's meditations and dream revelation in November 1619 followed the Hermetic paradigm established in these texts [*Corpus Hermeticum*]. The dualist ascesis undertaken in the hope of a visionary illumination, the separation of mind from body, the pervasive 'enthusiasm,' and the resulting sense of empowerment and certainty: all these suggest that Descartes' reading had led him to the writings of Hermes.³⁰

Keefer goes even further in linking Descartes' early writings with knowledge of hermetic texts by suggesting a link between the title *Olympica* and a work by Agrippa (*De magia seu pneumatica veterum*) in which "[s]even of the forty-nine aphorisms that constitute this short text are concerned with Olympic spirits or the spirits of Olympus."³¹ He goes on to say that the Agrippa text, in spite of its naïveté, "reflects a mind-set not far removed from that of the dreams recorded by Descartes in his *Olympica*, in which the assault of an evil spirit and an incitement to remorse over his past sins was followed by a kind of revelation. His dreams seem to have authenticated, rather than transmitted, the *mirabilis scientiae fundamenta*."³² In case this seems far-fetched, it is worth noting that the Rosicrucians, with whose writings Descartes was familiar, espoused a belief in universal knowledge and that it is to them that Descartes is apparently referring in one of his early fragments when he refers to "certain people who promise to show us miraculous

authentiquée—et exalté—et il est légitime de supposer, en dépit des dénégations de Baillet, que Descartes a rencontré en lui l'homme qu'il cherchait, et s'est trouvé par lui en contact direct avec l'atmosphère intellectuelle des Rose-Croix." About Faulhaber Gaukroger says that "we cannot discount the significance for Descartes of meeting with someone who not only shared his range of scientific and mathematical interests...but who was also a good mathematician" and also admits that "Descartes may not have been unresponsive to Rosicrucian ideas at this time..." (*op. cit.*, p. 105). Cf. Césaire Vasoli, "Le rapport entre les *Olympica* et la culture de la Renaissance" in Faye, *op. cit.*, p. 190. Vasoli suggests that Descartes interpreted his dreams by consulting contemporary texts on dream interpretation, texts which were "encore très connus dans ce temps là, et qui étaient liées à une conception néoplatonicienne du rêve que Marsile Ficin... avait enrichie de nouvelles significations métaphysiques."

³⁰ Keefer, *op. cit.*, p. 58.

³¹ *Ibid.*, p. 53.

³² *Ibid.*, p. 53.

discoveries in all the sciences..."³³ Wishing to downplay any Rosicrucian influence on Descartes, Gouhier states:

On a reconnu la résolution prise le 10 novembre de remettre en question toutes les connaissances acquises et il est facile de comprendre pourquoi la réputation des Rose-Croix a intrigué Descartes: il vient de découvrir "les fondements d'une science admirable" où tout le connaissable sera connu avec certitude, réalisant l'unité de *scientia* et *sapientia*; or voici que des savants allemands auraient promis quelque chose de ce genre; ne convient-il pas d'examiner "les fondements" de leur science que l'on dit si admirable?³⁴

I do not want to contribute to the speculation surrounding Descartes' dreams which, given the paucity of reliable information from his own hand, seem to be already seriously over-interpreted. However, the possible influence of certain esoteric sources both on Descartes' idea of the unity of science and on the defining event out of which that idea grew is certainly as interesting as it is disturbing. The unity of science is one of most important suppositions behind Descartes' method³⁵ and, as pointed out earlier, it "contains within itself the germ of the whole Cartesian revolution."³⁶ Descartes holds to this fundamental principle from the beginning to the end of his philosophy and makes of it one of the driving forces of his life. And yet he never elaborates on the origins of this principle nor does he justify or defend it and all we have to go on is an account of a series of dreams written by an early biographer who sometimes got his facts wrong.³⁷ Given the lack of evidence in general on the life of Descartes around the time of his early

³³ *Preambula*, CSM I, 2 (AT X, 213).

³⁴ Gouhier, *op. cit.*, p. 120. Vasoli refers to the reluctance of Cartesian commentators in general and Gouhier in particular to read Renaissance influences into the fragments of the *Olympica* which he attributes in part to a "préoccupation de ne pas briser l'abstraite perfection de l'esprit cartésien." *Op. cit.*, p. 192 and 190, note 8.

³⁵ Beck, *op. cit.*, p. 21.

³⁶ See note 4.

³⁷ For example, referring to accounts of the period of Descartes' life after La Flèche, Gaukroger states: "...Baillet gets so many details from around this time wrong that we must be wary about the reliability of the account." *Op. cit.*, p. 62. In another context, speaking of Descartes' definition of science and *habitus*, Marion refers to the interpretation of Baillet, "qui a pu filtrer la pensée cartésienne, pour lui donner,

writings, the fact that certain writings have been lost, as well as the fact that the first serious statement of the principle comes in an unfinished work that went unpublished during his lifetime, the philosophical foundations of this very foundational principle are shaky to say the least. If, in fact, Descartes was influenced by hermetic and other occult teachings in his youth (given their general availability and at least partial acceptability even among the elite), it is entirely possible that this founding principle of his method comes out of sources that he later rejected, all the while never rejecting the cherished principle. Even if the suggestion concerning hermetic influence is purely speculative, at the very least this founding principle of Descartes' philosophy appears to have its source (or its confirmation) in a dream experience which had a profound effect upon him at the time but which he chose to 'forget' when it came to finally publishing it eighteen years later.³⁸

2.2 The implications of the unity of science and knowledge

Descartes' clear statement of the principle of the unity of knowledge at the beginning of the *Regulae* sets the tone and determines the content of the rules that will follow and, as already pointed out, the direction of his entire philosophy.³⁹ It

involontairement sans doute, une conformité inattendue aux concepts traditionnels." (Marion, *op. cit.*, p. 26).

³⁸ My amazement at the fact that the beginnings of the great Rationalist's philosophy resulted from a series of hastily interpreted dreams is shared by Keefer who refers to "[t]he very improbability, the extravagance of a path that beginning in religious enthusiasm and dreams appears to lead without detour to the method of Cartesian rationalism..." (*op. cit.*, p. 43). It is the very improbability of such a path that incites Keefer to look for a more probable explanation in the influence of hermetic sources as outlined above. See also Jacques Maritain, *op. cit.*, p. 8: "Il est incontestablement très fâcheux de trouver à l'origine de la philosophie moderne un 'épisode cérébral'...qui appellerait de la part de nos savants, s'ils le rencontreraient dans la vie de quelque dévot personnage, les diagnostics neuropathologiques les moins rassurants...". He later refers to Descartes' 'angélisme' pointing out that "la Science est toujours restée pour Descartes la science admirable du 10 novembre 1619, et que son songe a été vraiment pour lui la révélation de la Science." (p. 30).

³⁹ See André Robinet (*op. cit.*, p. 74) who states that the "dialectique théorique et appliquée des *Regulae* n'a

accomplishes, in several lines, what Jean-Luc Marion describes as “une tâche considérable: inverser le centre de gravité de la relation du savoir à ce qu’il sait—la chose même.”⁴⁰ The *res*, or thing in itself will be replaced by the *object*, which is, in fact, a controlled construct by and for a *subject*. This represents the end of both scholastic and naturalistic epistemology (with their idea of the active predominance of the object) and the beginning of modern epistemology (with the centrality of the knowing subject).

Thus, says Beck,

we must reject the distinction accepted in Thomistic philosophy between the various kinds of knowledge based on the essential diversity of knowable objects, this diversity leading by discursive reasoning to different orders of abstraction, entailing different levels of intelligibility and different degrees of certainty.⁴¹

Henceforth, there will be “a single kind of knowledge, an identical order of abstraction, one level of intelligibility, one kind of certainty, and one single method to obtain this certainty...”⁴²

In order to arrive at the certainty of his principle, however, Descartes takes a major leap in reasoning about what knowledge is and how it is acquired. He distinguishes between art and science in Rule 1, the former entailing physical skills that are not transferable and thus limited to one domain, the latter being universal in its scope. Hence, he tells us in Rule 1, “there is no need to impose any restrictions on our mental powers; for the knowledge of one truth does not, like skill in one art, hinder us from

jamais cessé d'activer la pensée cartésienne jusque dans le détail" and who analyzes the link between the *Regulae* and the *Meditationes*, in particular Meditations V and VI. . Beyssade says of the *Regulae* that it is not "une oeuvre comme les autres. Sans exception (mais aussi sans l'ombre d'une preuve), tous les spécialistes s'accordent pour y voir la plus ancienne formulation du projet cartésien en son ensemble." Beyssade suggests that Descartes, who carried this manuscript with him all his life, himself used it as a kind of blueprint for his other works, "comme si, pour lui Descartes, l'esprit cartésien avait été déposé là..." See "Ordre et mesure, Descartes aux limites de la raison" in *Actes de l'ASPLF*, *op. cit.* Vol. I, p. 62.

⁴⁰ Jean-Luc Marion, *op. cit.*, p.25.

⁴¹ Beck, *op. cit.*, p. 16.

⁴² *Ibid.*, p. 16.

discovering another; on the contrary it helps us.”⁴³ This exclusion of the arts from what Descartes will henceforth consider ‘knowledge’ is reinforced by the first line of Rule 2: “All knowledge is certain and evident cognition.”⁴⁴ It also underscores another implication of his first principle: knowledge is an activity of the mind alone; the power of knowing is “absolutely distinct from, and in no way directly dependent upon, the body or anything bodily...”⁴⁵ Here Descartes is doing more than going against the Scholastic and Aristotelian idea of *habitus* whereby the arts are a form of knowledge developed through a particular form of bodily learning based on habit (a form of understanding that can also be applied to science as the multitude of things known and the different ways of knowing them help to form the *habitus intellectus*), he is falling back on Platonic dualism with its suspicion of knowledge gained through the senses. But Descartes’ dualism will be a dualism with a difference. Unlike Plato, Descartes will attribute no life-sustaining function to the soul, nor will he attribute any rationality to the universe. The essence of the Cartesian soul—as mind—is pure thought⁴⁶; and the human soul, rather than the universe, is the seat of reason. Mind, reason and method become a Cartesian trinity for the establishment of knowledge. In fact, says Beck, “method is itself the mind at work,

⁴³ *Reg. I*, CSM I, 9 (AT X, 360).

⁴⁴ *Reg. I*, CSM I, 10 (AT X, 362).

⁴⁵ Beck, *op. cit.*, p. 15.

⁴⁶ See for example CSM II, 10, footnote 3 where it is pointed out that Descartes added to the French version of his Preface to the Reader in the *Meditationes*, in reference to the mind, “or the soul of man, for I make no distinction between them.” See also Descartes reply to the Objections of Gassendi where he states that while “primitive man probably did not distinguish between, on the one hand, the principle by which we are nourished and grow and accomplish without any thought all the other operations which we have in common with the brutes, and, on the other hand, the principle in virtue of which we think”, he had cleared up this ambiguity by using the term mind. “For I consider the mind not as a part of the soul but as the thinking soul in its entirety.” CSM II, 246 (AT VII, 356). It would appear that ‘primitive man’ includes most of the Ancient, Scholastic and Renaissance philosophers, most of whom had a multi-partite notion of soul. Considering the importance of Descartes’ revision of the concept of soul, it is remarkable that he spends so little time justifying it, and assumes it from his earliest writings.

the unraveling of the processes of thought.”⁴⁷ Thus, it becomes clear that Descartes’ mind-body dualism is a new kind of dualism and it is already at work in his development of his method. The mind alone is involved in the discovery of knowledge and in the determination of certainty. Order and reason are found in the mind, not in nature, and “once nature may no longer be presumed to conform to reason, the mind’s link with reality becomes thoroughly questionable...”⁴⁸ Already in Rule 1 of Descartes’ first exposition of his method the supremacy of mind over matter (and, as a corollary, of man over nature) is established.⁴⁹ The unity of the cosmos, with man as an integral part of that unity, has given way to the unity of knowledge, with man as a separate consciousness and nature a series of objects in a universal science.

The question of the unity of the cosmos will be discussed in a later chapter. For the moment, it is only necessary to underline the enormity of the epistemological shift that Descartes has taken in Rule 1. In the world of Thomas or Aristotle, because objects were known by their essences, different objects required different ways of knowing. It was more than the sun simply shining on an object (to use Descartes’ own analogy); the essence of the object would, in effect, determine the way the sun would shine. As expressed by Marion:

la manière dont [la chose] se peut connaître dépend finalement de ce qu’elle-même *peut livrer à la connaissance*—de son essence; c’est donc l’essence de chaque chose qui commande la science correspondante, et non l’esprit qui produit une science.⁵⁰

Similarly, in Ficino, for example, there is reciprocity between mind and object

⁴⁷ Beck, *op. cit.*, p. 21.

⁴⁸ Louis Dupré, *Passage to Modernity* (New Haven and London: Yale University Press, 1993), p. 84.

⁴⁹ At the same time, it should be pointed out that Descartes has said very little regarding the separation of mind and body nor on why he is so certain that knowledge is strictly an affair of the mind; nor, for that matter, on why he can be so certain that the ‘natural light of reason’ is, like the sun, unaffected by the

based on his principle of affinity:

The thinking subject being considered an existing part of the objective order of the universe, the act of thinking is a relationship between the thinking subject (the thing that thinks) and the thought object (the thing that is thought). All thinking is therefore the result of an original affinity between the mind and its objects.⁵¹

Since Descartes rejects any essence in objects other than extension,⁵² the idea of different essences 'delivering' something different to knowledge is superfluous and the relationship between mind and object is anything but reciprocal. This shift will ultimately result in a gain in the power of knowledge but an attendant loss of immediacy in relation to the world of nature. As Louis Dupré puts it:

The distance that separates immediate experience from reflective knowledge [which] has always elicited the philosophers' concern...took on a new urgency after the conveyance of meaning had become the exclusive task of the knowing subject, for it required the subject to transfer the thing experienced to a representational mode of being.

Thus, Descartes' quest for (and apparent achievement of) certainty drove "a wedge between immediate evidence and the rational foundation of evidence."⁵³ Henceforth, the object in itself, as opposed to how it is known by the rational mind, becomes problematic. And the conformity of that object as thing in itself to the 'object' in the rational mind must be assured in some way—in Descartes' case through the veracity of God. More importantly, however, another idea of the past—that there are different levels of knowing and that, in the hierarchy of beings, proximity to God entails more perfect knowledge—is also done away with by Descartes. For Descartes' not only is there only one way of knowing, one method, but the method relies on the immediate apprehension of truth

objects upon which it shines.

⁵⁰ Marion, *op. cit.*, p. 28.

⁵¹ P.O. Kristeller, *The Philosophy of Marsilio Ficino* (N.Y.: Columbia University Press, 1943), p. 109.

⁵² Descartes does not clarify that the essence of matter is extension until Rules 12 and 14 (which are now presumed to have been written much later—see note 5) but it is implicit in the epistemological homogeneity of objects.

through clear and distinct ideas. In Scholastic philosophy, only God could have immediate knowledge of essences; man's lesser faculties allowed him only knowledge mediated by matter. But in Descartes, matter is secondary in the knowledge of truth, and "l'*ego* se substitue à l'*ousia* comme terme ultime de référence et de constitution du corps des sciences" as human wisdom approaches the divine.⁵⁴

Thus it can be seen that the extremely important principle underlying Descartes' entire philosophy, i.e. the unity of science, represents an enormous shift in thinking about the relation of subject and object, knower and known and that Descartes' way of arriving at this principle and the conclusions he draws from it are not based on any established science. They are strictly *a priori* and, as we have seen in the first section, bolstered by a mystical dream experience. However, while they are based on a metaphysical dualism of mind and body, there appears to be a lack of consensus on whether or not metaphysics has a role to play in Descartes' earliest writings.

2.3 Metaphysics or Science?

The relation between Descartes' science and his metaphysics is a matter of debate among Cartesian scholars. This issue is relevant to my thesis since I will be maintaining that Descartes' mechanistic physiology is based on a notion of matter (and the body) which is fundamentally *a priori* and rooted in his dualistic metaphysics which is implicit in his earliest writings. Descartes' description of the human body in Part V of the *Discours* is a demonstration of his method and, as already discussed, his method is rooted

⁵³ Dupré, *op. cit.*, p. 79, 84.

⁵⁴ Marion, *op. cit.*, p. 31. See also p. 28 where Marion asks, concerning Descartes' epistemological shift: "l'homme est-il doué d'intellect angélique? En un sens, Descartes l'affirme." For a full discussion of the unity of science and the ancient concept of *habitus*, see Ch. 1, sections 1 and 2.

in a separation of knowing subject and known object. In this section I will show that while Descartes was not *doing* metaphysics when he wrote the *Regulae* or even *L'homme*, he was *assuming* a metaphysical dualism of mind and matter, soul and body.

According to Alquié, it is necessary to make a distinction between Descartes' metaphysical ideas and his scientific ideas and, in his view, the true richness of his philosophy can only be appreciated if we separate the physical plane from the metaphysical.⁵⁵ Further, he believes that "la découverte, par Descartes, de la dimension métaphysique et la découverte de l'homme ne sont qu'une seule et même découverte" and that one must recognize that there is "une évolution de la pensée de Descartes, et cette évolution met en lumière une découverte progressive, et proprement métaphysique, de l'homme."⁵⁶ It would appear that, for Alquié, the metaphysical discovery of 'l'homme' is not to be found in the *Regulae*, or in *Le Monde* or *L'Homme*. In fact, in his view it arises with the *cogito* and thus not before the *Discours* can Descartes be said to be on the metaphysical path that Alquié is constructing.⁵⁷ The machine-man that Descartes describes in *L'Homme* is not the whole man but only 'man' as an object of science:

[Descartes] ne méconnaît pas la réalité de cet homme concret, qu'il ne prétend plus connaître mais continue à être, et qui demeure le sujet véritable de la science elle-même...Mais...[il] découvre que le monde du mécanisme ne peut lui-même être pensé que par rapport à un être transcendant se trouvant, vis-à-vis de lui, en une situation sans rapport avec celle de l'homme.⁵⁸

For Alquié, both the method of the *Regulae* and the science of *Le Monde* and *L'Homme*

⁵⁵ Ferdinand Alquié, *La découverte métaphysique de l'homme chez Descartes* (Paris: Presses universitaires de France, 1966), p. 7: "Mais la vraie fécondité de la philosophie de Descartes est ailleurs, et nous ne l'apercevrons qu'en nous mettant à son école, en distinguant le plan de la physique et le plan de la métaphysique, le domaine de l'Être et celui de la représentation."

⁵⁶ *Ibid.*, p. 10.

⁵⁷ Alquié, *op. cit.*, p. 135: "Et, en effet, le *Discours*, qui prolonge, en un sens, le rêve cartésien d'un système total du Monde, traduit aussi les échecs que ce rêve a rencontrés, et manifeste l'apparition de la dimension métaphysique..."

⁵⁸ Alquié, *op. cit.*, p. 343.

are pre-metaphysical although he does admit that the metaphysics implicit in these works might be unconscious: “Descartes ne semble donc pas avoir échappé à la règle commune des savants, inconscients de la métaphysique que leur science présuppose.”⁵⁹ He would, however, have us believe that Descartes was first doing science and only science and that later he brought in metaphysics because of the limitations of the science that he had outlined and the need to ground it in firm metaphysical foundations. In fact, he insists that Descartes’ method in the *Regulae* is not *a priori*, “mais bien plutôt tirée de l’observation des démarches effectives de la pensée” and even that in the *Regulae*, “[c]’est donc bien l’homme total et concret, et non une raison épurée, qui, chez Descartes, se porte vers la connaissance du Monde.”⁶⁰ Further, he maintains that in the *Regulae* the knower (and thus the knowing) must submit to the object, reason being the possibility “d’observer, de constater, de se soumettre.”⁶¹ All of these positions are difficult to reconcile with even the very first assumptions of Descartes as set out in Rule 1, concerning the relation of science and the mind or the natural light of reason and would appear to be far from the positions of Marion and Beck referred to earlier regarding the relation of subject and object. In particular, the suggestion that the knower must submit to the object goes against Descartes’ own vivid analogy of the sun cited earlier. Alquié’s statements are also difficult to reconcile with Descartes’ own impression of the radical nature of his method and his science. For Alquié, in the *Regulae*, the Cartesian subject is not yet born. However, I will maintain the opposite view, that the Cartesian subject/object dualism (including the detached subject) forms a major and unchanging part of Cartesian metaphysics and that it is implicit and directly at work in Descartes

⁵⁹ Alquié, *op. cit.*, p. 71.

⁶⁰ Alquié, *op. cit.*, p. 59, 60.

early writings on method and science.

This idea of a separation of metaphysical and scientific ideas in Descartes is not shared by Annie Bitbol-Hespériès, whose work on Descartes and the body is recent but whose scholarship is of the highest quality. For her, in Descartes, “la métaphysique fonde les sciences sans jamais se confondre avec elles...” and while there is a progression in Descartes’ metaphysical ideas, the role of metaphysics does not change: “en 1630, comme après dans le *Discours*, puis dans les *Principia*... la science trouve ses ‘fondements’, ou ses ‘principes’ dans la métaphysique.”⁶² Further, if one agrees with Beck that the separation of mind and body is a fundamental supposition of Descartes’ method from Rule 1 of the *Regulae*, then it becomes obvious that Descartes’ metaphysical dualism is present from the beginning and is fundamental to his science, even if it is not explicated as a metaphysical principle. It is part of what Marion calls Descartes’ ‘grey ontology’: “Ontologie grise parce qu’elle ne se déclare point, et se dissimule dans un discours épistémologique.”⁶³

Part of the reason for the difference of opinion on this question is related to a concern as to whether or not Descartes’ metaphysics was developed in order to justify his physics, in particular as a result of the trial and condemnation of Galileo, an event which had a serious dampening effect on Descartes’ enthusiasm for publishing his physics.⁶⁴ This position is espoused by Gaukroger for whom the *Meditationes* “establishes the legitimacy of mechanism at a metaphysical level and in a more detailed way than is done

⁶¹ Alquié, *op. cit.*, p. 58.

⁶² Annie Bitbol-Hespériès and Jean-Pierre Verdet (ed.), *Descartes: Le Monde, L'Homme* (Paris: Éditions de Seuil, 1996), p. XI, X. (Introduction by Bitbol-Hespériès). This book will be referred to as *L'Homme*.

⁶³ Marion, *op. cit.*, p. 186.

⁶⁴ It is important to point out that Descartes’ physics includes his physiology which, for him, was a physics of the body. In fact, *Le Monde* and *L'Homme* were not originally meant to be two separate publications: *L'Homme* was to be chapter XVIII of *Le Monde*. For more on this see the Introduction to *L'Homme*, *op.*

in the *Discours...*,”⁶⁵ while the opposite position is taken by Alquié for whom “[l]a lecture de l’oeuvre de Descartes, dans l’ordre où elle fut écrite, nous semble pourtant suffire à rendre totalement invraisemblable l’hypothèse selon laquelle Descartes aurait conçu sa métaphysique ‘pour’ sa physique...”⁶⁶

Is this question important? It is important to this thesis and, in my view, to an understanding of Descartes’ philosophy of the body whether or not his metaphysics grounds his science, justifies his science, or is indifferent to his science. I will be arguing that Descartes made certain epistemological and metaphysical choices which were fundamentally *a priori* and which served to establish and justify a new anthropology. These choices, I will maintain, were in direct opposition to certain positions held by the Renaissance naturalists regarding the relation of man to the cosmos, his knowledge of himself, his body and nature, and the nature of God and his relation to the universe. From this point of view, it is important to understand on what basis Descartes makes certain of his claims about the unity of science and the disunity of mind and body, for example. Here it is clear that his earliest writings (i.e. the *Regulae*) are grounded in metaphysical

cit.

⁶⁵ Gaukroger, *Descartes*, p. 352.

⁶⁶ Alquié, *op. cit.*, p. 9. This argument is taken up in a recent article by Blake D. Dutton (in the *Journal of the History of Philosophy*, 37: 1, January 1999) entitled “Physics and Metaphysics in Descartes and Galileo”. He argues (p. 49) against Charles Adam (who holds “that the metaphysics was developed to deflect attention from the heart of the Cartesian system—its mechanistic physics”) and Gaukroger (who takes a line “arguing that it was Galileo’s failure to convince his opponents through arguments drawn from natural philosophy that prompted Descartes to seek acceptance of his own natural philosophy through metaphysical legitimation”). According to Dutton, “it is only by taking Descartes’ metaphysical commitments as integral to his science that we can make sense of the divergent ways in which he and Galileo resolved the question of the relation of science to theology.” (p. 50). Dutton’s analysis shows how Descartes’ laws of nature are grounded in his metaphysics “particularly in his doctrine of God” (p. 58) and also how Descartes’ criticisms of Galileo were often based on the latter’s inability to ground his ideas in proper metaphysical foundations: “From Descartes’ perspective, Galileo was misled (sic) precisely because he had not undertaken the requisite metaphysical analysis of matter so as to see that it is pure extension.” In general, he thinks that “Descartes’ own remarks concerning the lack of proper order in Galileo’s work... can plausibly be read as a criticism of Galileo’s disregard for metaphysical foundations.” (p. 60).

positions that are implicit but not stated. This is surprising in a philosopher who is setting out to establish a new method and in a work that is the first statement of that method.

Part of the disagreement about the relation between Descartes' science and his metaphysics may arise from a different understanding of metaphysics as an explicit system rather than as an implicit set of principles.⁶⁷ In this respect, it is not difficult to see that Descartes was not *doing* metaphysics in either the *Regulae* or in *Le Monde* or *L'Homme*. But this is not to say that there was no metaphysics implicit in these works. It may well be that Descartes did not elaborate his complete metaphysics until the *Meditationes* in 1641 but certain elements of it were present from his earliest works. As already pointed out, the separation of mind and body is both implicit and explicit in the *Regulae*, as is the doctrine of matter as extension. And these doctrines, which were not yet grounded in any explicit metaphysics in the early writings, did not change over the years but gradually assumed their place in a later, more ordered and structured metaphysics. The issue would appear to be a question of metaphysics as a foundation for Descartes' system and metaphysics as a starting point for the early parts of it. What is important for this thesis is that those starting points did not change and when they were finally grounded in the idea of a non-deceiving God and what Gaukroger calls "metaphysically guaranteed clear and distinct ideas"⁶⁸ they may have received stronger metaphysical legitimization, but they did not, in themselves, become more

⁶⁷ For example, in his recent book *Descartes and Augustine*, Stephen Menn draws a distinction between "metaphysics in the strict sense, as the science of immaterial things or of God and the soul" and "loosely 'metaphysical' doctrines belonging either to Christian faith or to natural philosophy". This distinction could be useful in a discussion of Descartes' metaphysics and his science; however the main point that I am making here is that Descartes' physics is based on several doctrines that appear to me to be more than 'loosely' metaphysical and that are implicit or, if explicit, are simply stated without argument or justification. See Stephen Menn *Descartes and Augustine* (Cambridge: Cambridge University Press, 1998), p. 5.

⁶⁸ Gaukroger, *op. cit.*, p. 352.

metaphysical.⁶⁹ They were metaphysical to begin with and later took their place among other metaphysical principles in a system that was then used to support the physical principles that Descartes had established long before. From this point of view, Gaukroger's point that the *Meditationes* "establishes the legitimacy of mechanism at a metaphysical level and in a more detailed way than is done in the *Discours...*" seems valid. But Descartes is here establishing the legitimacy of a mechanism that was already developed using metaphysical principles about the separation of mind and body, God and nature, which were not arrived at empirically.

2.4 Metaphysics in *Le Monde* and *L'Homme*

If some are reluctant to admit that at least part of Descartes' metaphysics is implicit in the *Regulae*, it is difficult to deny it for *Le Monde* and *L'Homme* since Descartes himself admits the inclusion of metaphysical topics there:

However, in my treatise on physics I shall discuss a number of metaphysical topics and especially the following. The mathematical truths which you call eternal have been laid down by God and depend on him entirely no less than the rest of his creatures...Please do not hesitate to assert and proclaim everywhere that it is God who has laid down these laws in nature just as a king lays down laws in his kingdom. There is no single one that we cannot grasp if our mind turns to consider it. They are all inborn in our minds just as a king would imprint his laws on the hearts of all his subjects if he had enough power to do so.

Descartes wrote this to Mersenne in a letter dated April 15, 1630 and, after a discussion of God's free will, he added, "I hope to put this in writing...in my treatise on physics."⁷⁰

⁶⁹ Gaukroger states: "By starting from those ideas of the corporeal world which are genuinely clear and distinct, Descartes arrives at a mechanistic picture of how the world is to be described at a most fundamental level, and he arrives at this not by natural-philosophical or empirical means, as he had done in earlier writings such as *Le Monde*, but by purely metaphysical ones." I disagree with the distinction because I cannot see how the fundamental ideas about the unity of science, the disunity of mind and body or of extension as the essence of matter are arrived at either naturalistically or empirically in the *Regulae* or in *Le Monde*.

⁷⁰ CSMK, 23 (AT I, 146). Descartes was also undertaking the writing of a treatise metaphysics at this time. See Chapter 4, in particular, footnote 35.

Years later, at the time of completing the *Meditationes*, he wrote to Mersenne about that work: "...for I must tell you that the little book on metaphysics which I sent you contains all the principles of my physics."⁷¹

The laws of nature that Descartes sets out in *Le Monde* (the conservation of motion; the redistribution of motion among bodies in collision; and rectilinear motion)—all of which he will apply to his 'physics of the body'⁷²—are based on the separation of mind and body, soul and nature, and, most importantly, on the idea of continuous creation by God, all of these being among the metaphysical topics that find their way into his physics. The first two laws of motion (conservation and redistribution) Descartes tells us

follow manifestly from the sole fact that God is immutable and that, acting always in the same way, He always produces the same effect. For, on the assumption that He placed a certain amount of motion in matter in general at the first instant He created it, we must admit either that he preserves the same amount of motion in it, or not believe that He always acts in the same way.⁷³

As for the third law, the tendency to rectilinear motion, Descartes tells us that

this rule...depends solely on God's conserving everything by a continuous action, and consequently on His conserving it not as it may have been some time earlier

⁷¹ CSMK, 156 (AT III, 233).

⁷² One of the clearest statements of the application of the laws of nature to the body occurs in the *Conversation with Burman* when Descartes (speaking about illness and the soul and in answer to the question why God did not give the soul awareness of the errors of the senses) states: "God made our body like a machine, and he wanted it to function like a universal instrument which would always operate in the same manner in accordance with its own laws... If the body did not induce this misleading state it would not behave uniformly and in accordance with its universal laws; and then there would be a defect in God's constancy, since he would not be permitting the body to behave uniformly, despite the existence of uniform laws and modes of behaviour." John Cottingham ed., (Oxford: Clarendon Press, 1976), p. 29.

⁷³ *World*, 28 (AT XI, 43). See Garber, *op. cit.*, p. 266: "...when worried about deriving the laws of motion it was not important for Descartes to specify *how* God sustains the world: what will be important is *that* he does, and that he, the sustainer, is immutable and constant in his operation and in that way preserves motion and certain of its features." The metaphysical—even theological—basis of these 'laws of nature' for Descartes' 'marvellous science' is somewhat surprising. Maritain remarks that Descartes "semble si souvent concevoir la Philosophie sur le patron de la Théologie" and points out, among other examples, that "l'ordre suivi par Descartes en Physique, où il prétend déduire des attributs de Dieu les premières lois du mouvement n'est que l'ordre théologique, qui va de Dieu à la créature, indûment transposé dans la science." *Op. cit.*, p. 28.

but precisely as it is at the very instant that He conserves it. So, of all motions, only motion in a straight line is entirely simple and has a nature which may be wholly grasped in an instant.⁷⁴

The principle of continuous creation which “implies that no created thing can exist unless it is sustained by a creative force, and that every force that inheres in a thing is nothing other than that by which God puts it in existence at each instant,”⁷⁵ can in no way be seen as an empirical or naturalistic principle; it is pure metaphysics. As with his dualism which falls back on the ancient dualism of Plato but is radically different from it, so Descartes’ idea of continuous creation falls back on a Scholastic idea while departing radically from it.⁷⁶ And, as with the metaphysical principles already referred to, Descartes provides no explanation or justification for the divine aspect of his laws of nature. Gaukroger points out that in relation to God’s causal activity in the laws of motion, “it is difficult to say whether causation is something physical, or whether it has both a divine manifestation and a physical manifestation in the form of force of motion, or whether force of motion is a physical expression of something that is non-physical” and adds that “Descartes provides no elaboration of this question either in *Le Monde* or in other writings of this period...”⁷⁷

For Bitbol-Hespériès, *Le Monde* and *L’Homme* contain themes “d’une importance décisive pour la suite de son oeuvre”, and this remark “ne vaut pas seulement pour

⁷⁴ *World*, 30 (AT XI, 44).

⁷⁵ Martial Gueroult, “The Metaphysics and Physics of Force in Descartes” in Stephen Gaukroger (ed.) *Descartes: Philosophy, Mathematics and Physics* (Sussex: The Harvester Press, 1980), p. 197. There is a difference of opinion among commentators as to whether God’s continuous creation is discontinuous or continuous in relation to duration. According to Garber, Gueroult espouses the former view, holding that creation takes place in “a world of durationless instants” while others, notably Beyssade, see continual creation taking place in ‘moments’ *in* duration, the instants being boundaries within the continuous duration and not discrete parts. This controversy between ‘temporal atomism’ and ‘continual creation’ (discussed at length in Garber, pp. 266-280) is not relevant to my thesis. Like Descartes, I am not concerned with the *how* of continuous creation; only that it is there in his early writings as a metaphysical principle.

l'aspect scientifique du *Monde* et de *L'Homme*, elle vise également la métaphysique qui y est contenue.”⁷⁸ For this reason, she adds in a footnote, “il est d'autant plus surprenant de constater que de nombreux commentateurs n'ont pas prêté attention à la métaphysique du *Monde*.”

2.4.1 Metaphysics and the Body: the 'body-machine'

The implications of the above discussion for Descartes' philosophy of the body are extremely important. Descartes was convinced of the unity of science at least as early as 1619 and his fundamental metaphysical principles, if not systematised, are at least present in varying degrees in the *Regulae* and in *Le Monde* and *L'Homme*. In principle this means that Descartes assumes that the same method can be used to study the body as any other object in physics. In practice this is what he attempted to do. *L'Homme* was an integral part of *Le Monde*. In fact there was to be a third section—on the rational soul—which was never completed.⁷⁹ *Le Monde* went unpublished, at least in part because of Descartes' fears after the condemnation of Galileo⁸⁰ but much of the material

⁷⁶ This is discussed in detail in Chapter 5.

⁷⁷ Gaukroger, *Descartes*, p. 245 and footnote p. 449.

⁷⁸ *L'Homme*, p. XL V.

⁷⁹ There is some discussion among commentators as to whether this section was never written or was written and subsequently lost. Bitbol-Hespériès discusses this question in her Introduction to *Le Monde*, *L'Homme* and concludes that the work “est un traité inachevé”. (See *L'Homme*, pp. XL - XLII for details of her argument). See also G. Rodis-Lewis who reflects a similar view in “La conception de ‘l'homme’ dans le Cartésianisme” in her *L'anthropologie cartésienne* (Paris: Presses universitaires de France, 1990), p. 22.

⁸⁰ See Descartes' letter to Mersenne of November 1633: “I was told [Galileo's *World System*] had indeed been published but that all the copies had immediately been burnt at Rome, and that Galileo had been convicted and fined. I was so astonished at this that I almost decided to burn all my papers or at least to let no one see them...I must admit that if [Galileo's] view is false, so too are the entire foundations of my philosophy, for it can be demonstrated from them quite clearly.” CSMK, 40. Also in a letter to Mersenne in May 1637, Descartes refers to his *Physics* saying: “I do not anywhere promise never to publish it during my lifetime. I merely say that in the past I planned to publish it, but that more recently, for the reasons which I gave, I have decided not to do so during my lifetime....I spoke of my *Physics* as I did solely in order to urge those who want to see it to put an end to the causes which prevent me from publishing it.” CSMK, 57. See also Part V of the *Discours* where Descartes refers to “a treatise which certain considerations prevent me from publishing...” CSM I, 132. (It is difficult to reconcile these statements of Descartes with the position of Alquié who says: “Nous croyons que cette nouvelle eut sur Descartes l'effet

was revised and included in the *Discours* of 1637. There Descartes states:

...I have noticed certain laws which God has so established in nature, and of which he has implanted such notions in our minds, that after adequate reflection we cannot doubt that they are exactly observed *in everything which exists or occurs in the world*.⁸¹

He refers to his earlier treatise (*Le Monde*) and, after a very brief summary of its contents states that “from the description of inanimate bodies and plants, I went on to describe animals, and in particular man.”⁸² He then goes on to show how he dealt with the subject by giving an explanation of the movement of the heart and arteries. Thus, the body is treated as a chapter in his book on method, which includes in annex his essay on optics. The presentation of Descartes' work on the body demonstrates his belief in the unity of science and method and, implicitly, the idea that the human body is an object among all the other objects of physics. Descartes has, along with his metaphysics and his epistemology, ushered in a new anthropology.

This new anthropology is the direct result of Descartes' distinction of soul and body and the fact that for him the essence of soul is pure thought (with the essence of body being extension). Descartes sees the operations of the body as purely mechanical, following the laws of nature (i.e. of physics) and, like the rest of the world of natural bodies it does not need the soul to act as the principle of change or movement (except in situations involving human will). This constitutes a dramatic change in the nature of man and in the nature of life which, up to that point, was considered to be a function of soul. According to Descartes the functions of the body “follow in this machine simply from the

le plus heureux, et fut l'occasion d'une prise de conscience encore plus lucide des rapports de la science et de l'Être... La condamnation de Galilée ne causa donc nulle peur à Descartes...” Alquié, *op. cit.*, p. 117, 118).

⁸¹ *DM*, CSM I, 131 (AT VI, 41). Emphasis added.

⁸² *DM*, CSM I, 134 (AT VI, 45).

disposition of the organs as wholly naturally as the movements of a clock or other automaton follow from the disposition of its counterweights and wheels.”⁸³ According to Bitbol-Hespériès, this body-machine “qui fonctionne sans âme conçue comme ‘principe de vie’ témoigne de l’opposition de Descartes à la tradition médicale,” while the reduction of soul to pure thought “introduit une rupture dans le champ du savoir, rupture qui sera prolongée par la Méditation seconde.”⁸⁴ This radical change in the view of the body is similar to (and flows from) the radical view in epistemology whereby objects do not affect the knowing mind that studies them any more than objects affect the sun that shines on them.⁸⁵ It is a necessary adjunct to Descartes’ epistemology that the human body be seen as any other body in the science of physics and that the laws of movement, as set out in *Le Monde* apply to it in a fundamentally similar fashion. The application of Descartes’ mechanism to the human body and the subsequent reduction of body to ‘body-machine’, will be dealt with at length in a Chapter 4, but it is important here to underline that Descartes’ anthropology flows out of his idea of a unified science, that it is a direct result of his metaphysical and epistemological principles and that it represents a rupture with past thought.

2.4.2 Metaphysics and the body: the body as leftover

A further, and equally, dramatic anthropological shift pertains to man’s relation to the cosmos. As the separation of mind from body and soul from nature resulted in a distancing of the knowing subject from the subject matter being known, so the same separation results in an idea of man separated from nature. In order to apply mechanical

⁸³ *World*, 169 (AT XI, 202).

⁸⁴ *L’Homme*, p. XIX.

⁸⁵ Descartes admits body-soul interaction at the level of the passions, for example, but this can only be known through the mind-body union which, as will be discussed in Chapter 6, is knowledge of a different

principles to the matter of nature, Descartes must evacuate any idea of soul from natural things, even living things. Soul cannot be the principle of life that makes things move, nor can it be the principle that connects man to the hierarchy of living things around him. Since the essence of matter is extension, and since living bodies are also conceived as extension, there can be no hierarchy. Things are things. Human beings are no longer true *participants* in the natural life of the universe; we are over and above it, as mind, and will learn to “make ourselves, as it were, the lords and masters of nature” through science.⁸⁶ This represents a clear departure from Neoplatonic cosmology and the traditional way of man’s seeing himself as part of the universe around him. Both the organic unity of life and the hierarchy of reality have been broken as man assumes a place over and above nature.

The evacuation of ‘life’ from the notion of the soul was not an unintended result of Descartes’ metaphysics of mind and body. Nothing could be clearer in his metaphysics, or in his physiology⁸⁷ that the soul and mind are identical, that the mind and body are separate and distinct substances and that the functions of the body are mechanical and explainable by strictly physical causes.⁸⁸ It is a direct result of the unity

order which can never be scientific.

⁸⁶ *DM*, CSM I, 142 (AT VI, 62). Descartes here echoes another Baconian position from *The New Organon*: Aphorism III: “Human knowledge and human power meet in one... Nature to be commanded must be obeyed.” Aphorism CXXIX: “Only let the human race recover that right over nature which belongs to it by divine bequest and let power be given it; the exercise thereof will be governed by sound reason and true religion.” *Op. cit.*, p. 39, p. 119.

⁸⁷ As pointed out in the Introduction, using the term ‘physiology’ is an anachronism. Physiology for Descartes was part of physics. See Gary Hatfield, “Descartes’ physiology and its relation to his psychology” in *The Cambridge Companion to Descartes*, ed. John Cottingham (Cambridge University Press, 1991), p. 335: “Descartes understood the subject matter of physics to encompass the whole of nature, including living things. It therefore comprised not only nonvital phenomena...it also extended to the world of plants and animals, including the human animal (with the exception of those aspects of human psychology that Descartes assigned solely to thinking substance.”

⁸⁸ CSMK, 134 (AT II, 525). In a letter to Mersenne, Descartes writes about his experience of anatomy and dissection: “I have spent much time on dissection during the last eleven years, and I doubt whether there is any doctor who has made such detailed observations as I. But I have found nothing whose formation seems

of science that all things can be studied in the same way and Descartes will hold to this principle all through his life.

2.5 The Unfinished Metaphysics of the Body

Creating a new anthropology to fit his new vision of a unified ‘marvellous’ science was not an especially simple task and it is interesting to note that Descartes was never able to complete any of the works in which he set out to deal with the totality of world and man (including body and soul). The *Regulae*, for example, was originally conceived to have three sections of twelve rules each; but, as Murdoch points out, the second set of twelve rules is incomplete and the “final set of twelve rules is entirely missing; it appears that Descartes left this project unfinished.”⁸⁹ This is particularly revealing because, while the first two sets deal with more easily quantifiable problems, the third set of rules “would have dealt with ‘imperfectly understood problems’, i.e. problems which, owing to the multiplicity of the data involved, resist expression in the form of equation” but which Descartes hoped to reduce to perfectly understood problems.⁹⁰ These could be the types of problems one finds in a science of the body and Descartes abandoned the *Regulae* before incorporating these sections.

Similarly, *Le Monde* and *L'Homme*, as already pointed out, was conceived as a unitary work and was to have three parts: the world, the body, and the soul. The first two parts were completed; the third part was never finished. As for the *Principia* which, according to Gaukroger, “provides a systematic statement of Descartes’ metaphysics and

inexplicable by natural causes. I can explain it all in detail, just as in my *Meteorology* I explained the origin of a grain of salt or a crystal of snow.”

⁸⁹ CSM I, 7. (Introduction by Dugald Murdoch).

⁹⁰ CSM I, 7.

natural philosophy,"⁹¹ this work too went unfinished. Aside from the four parts dealing with metaphysics, physics, the nature of the universe and the earth, two other sections (one on plants and animals and one on man) were to be included but were never completed.

When one adds to this the less-than-satisfying explanation of mind-body connection in the *Sixth Meditation* and in the letters to Elisabeth, it is difficult not to remain sceptical regarding the Cartesian project for the foundations of a marvellous science, in particular with respect to anthropology.⁹² While Descartes dealt with different aspects of his unified science in different works and in a piecemeal fashion, he did not complete any work in which he had proposed to consolidate them into a total system. This would appear to point to serious limitations in the idea of unified science itself, limitations that will be discussed in the following chapters.

It is also interesting, and perhaps not coincidental, to note that Descartes' first attempt to treat the human body in mechanical terms was conceived as a fable:

I suppose the body to be just a statue or machine made of earth, which God forms with the explicit intention of making it as much as possible like us. Thus He not only gives its exterior the colours and shapes of all the parts of our body, but also places inside it all the parts needed to make it walk, eat, breathe, and imitate all those functions which can be imagined to proceed from matter and to depend solely on the disposition of our organs.⁹³

⁹¹ Gaukroger, *Descartes*, p. 364.

⁹² Much of Cartesian physics and physiology was rejected in the ensuing years, but it is important to note that Descartes' mind-body dualism has pervaded medicine (as well as psychology) until very recently and that the image of the body-machine still haunts Western bio-medical science, as can be seen by organ transplants and xenotransplants. H. Floris Cohen refers to Descartes' "search for an all-encompassing doctrine of the world and man, largely misconceived in his imagined, corpuscularian mechanisms, yet somehow indispensable in providing the new scientific currents with a suitable, metaphysical substructure." *The Scientific Revolution, A Historiographical Inquiry* (Chicago and London: University of Chicago Press, 1994), p. 498. Georges Chapoutier writes of the influence of Descartes on Claude Bernard and the whole of modern biology. "Quoique personnellement spiritualiste, C. Bernard fonde donc la biologie comme une discipline matérialiste en prenant appui sur la dichotomie cartésienne du corps-animal et de l'âme. À quelque nuances près, toute la biologie moderne repose sur ces fondations matérialistes et constitue pour la pensée cartésienne un triomphe." *Actes de l'ASPLF, op. cit., Vol. II*, p. 743.

⁹³ *World*, 99, (AT XI, 120)

Descartes' point is to tell the 'story' of the body of 'these men' and then if we "compare the imaginary constructs with the real thing we will find in both cases that they are indistinguishable..."⁹⁴ While this type of hypothetical creative writing might have been intended to lessen the risk of criticism of religious authorities, it also had the advantage of allowing Descartes to deal with bodies of "men who resemble us" without having to cope either with the question of the soul, which he intends to treat separately (having already determined its separateness) or with the question of generation and growth (as the fictional statue-men appear whole out of nowhere).^{95 96}

Like the fable of *Le Monde* and *L'Homme*, Descartes' unified science is a construction appearing whole out of nowhere in the form of a dream (possibly coloured by hermetic influences) and driven by an almost messianic conviction that "il faut qu'il reconstruise la connaissance humaine."⁹⁷ As the above analysis has shown, it was an epistemological, metaphysical and anthropological construction and, as I hope to show in the remaining chapters of this thesis, it necessitated a rupture in philosophical thought in all three areas.

There were, however, a few obstacles to the Cartesian constructivist project that had to be overcome before the idea of a unified science could be sustained. The first was

⁹⁴ Gaukroger, *op. cit.*, p. 270.

⁹⁵ It is interesting to note that Descartes only dealt with the question of generation near the end of his life in the fragment entitled *Primae Cogitationes circa Generationem Animalium*, written around 1648 (although Adam says that he did think about the question as early as 1629); AT XI 503. For Gassendi, on the other hand, the question of the generation and growth of the foetus was integral to his work on the body. (See F. Bernier, *Abrégé de la philosophie de Gassendi, Tome V* (Paris: Fayard, 1992).

⁹⁶ Alquié (*op. cit.*) would not agree with my interpretation here. For him, the fabular nature of *L'Homme* is not an accident, but is a direct result of Descartes' mechanism and his idea of God: "La déréalisation de l'objet, fruit du mécanisme et de la théorie corrélatrice de la création des vérités éternelles, explique assez la croyance de Descartes au Monde feint." (p.114). This is not a shortcoming for Alquié since he believes that at this point "Descartes n'est prisonnier d'aucune ontologie scientifique" (p.116), a position contrary to what I will be arguing in this thesis.

⁹⁷ Maritain, *op. cit.*, p. 21.

the idea of a living nature and, especially, the notion of a world soul; the second was the question of final causes. The former was anathema to Descartes' mind-body dualism. To admit that soul was immanent in nature (as did the naturalists of the Renaissance) or to account for soul-body unity through the notion of the scholastic substantial forms was to deny that the essence of matter was pure extension (as well as the notion that the essence of soul was pure thought). The latter was rejected because Descartes rejected all notions of teleology or Aristotelian multiple causality and recognised only efficient causes: all change can be explained by local motion of particles, even God acts only as an efficient cause⁹⁸ and there is no other notion needed to account for change of any kind.⁹⁹

The abolition of these two notions was a condition of possibility for the implantation of the new science, both in relation to physics and to Descartes' physics of the body. Descartes was not alone in the rejection of these notions and there were many influences, both direct and indirect, moving philosophers and scientists in this direction. In fact, with respect to the philosophy of the human body, Descartes can be seen as being at the epicentre of the development of an epistemology of the body which comes from two directions: the new science of nature, arising out of the Copernican revolution (macrocosm), and the new science of body, arising out of the anatomical work of Vesalius and the practice of dissection (microcosm). Ironically, these two pioneers of the Scientific Revolution, Copernicus and Vesalius, published their major works in the same

⁹⁸ CSM I, 202 (AT VIIIA, 16). "When dealing with natural things we will, then, never derive any explanations from the purposes which God or nature may have had in view when creating them and we shall entirely banish from our philosophy the search for final causes...we should consider [God] as the efficient cause of all things..."

⁹⁹ See Garber, *op. cit.*, p. 195: "...Descartes objects to the very conception of motion that gives rise to the general Aristotelian definition of motion, the idea that motion is a notion that embraces all sorts of change, of which local motion is but one. For Descartes...all change is explicable in terms of local motion alone....The rejection of all varieties of motion but local motion is one of Descartes' basic commitments; it is, indeed, closely linked to his entire mechanist program for physics."

year—1543—almost a full century before the mechanistic theories and experiments of Galileo and Descartes gave them their full expression and legitimisation.¹⁰⁰ The work of each of these scientific trailblazers played its part in the eventual marginalisation of the concept of life, in the case of Copernicus from the Universe, in the case of Vesalius, from the human body. As expressed by Jonas, “not before the Copernican revolution widened this horizon [the horizon of the soul’s earthly home] into the vastness of cosmic space was the proportional place of life in the scheme of things sufficiently dwarfed so that it became possible to disregard it for most of what henceforth was to be the content of the term ‘nature’.”¹⁰¹ Similarly, as the dissection theatre of Vesalius overturned more and more of the ideas of Galen, the link between body and soul as well as that between body and nature became ever more tenuous and the body became just another one of the mechanical objects of nature. As LeBreton puts it:

Réduit à la condition d’écorché et de squelette, l’homme donne symboliquement congé au cosmos. La signification du corps ne renvoie à rien d’autre. Le microcosme devient pour Vésale une hypothèse inutile: le corps n’est pas autre chose que le corps.¹⁰²

The next chapter will explore this double *désacralisation*—that of the cosmos and that of the body—by examining the idea of a living nature and world soul, and the notion of final causes, the rejection of which will be posited as conditions of possibility for the new mechanistic science and for the anthropology of modern man.

¹⁰⁰ Copernicus’ *De Revolutionis orbium...* and Vesalius’ *De Fabrica* were both published in 1543. The trial of Galileo was in 1633 and Descartes’ *Discours* was published in 1637.

¹⁰¹ Jonas, *op. cit.*, p. 8.

¹⁰² D. LeBreton, *Anthropologie du corps et modernité*, (Paris:Presses universitaires de France, 1990), p. 56.

CHAPTER 3

Epistemological Obstacles, Metaphysical and Anthropological Choices

It is one of the more profound ironies of the history of thought that the growth of mechanical science, through which arose the idea of mechanism as a possible philosophy of nature, was itself an outcome of the Renaissance magical tradition. Mechanism divested of magic became the philosophy which was to oust Renaissance animism and to replace the 'conjuror' by the mechanical philosopher.

Frances Yates, *The Rosicrucian Enlightenment*¹

Chapter 2 brought out how Descartes' early philosophy was rooted in his belief in the unity of science and method as well as the fact that his metaphysical dualism underlies and supports his earliest writings. From the beginning, and throughout his entire work, Descartes makes it clear that he is setting out on a new path in philosophy and rejecting much, if not all, of what went by the name of philosophy in the past. His injunction in Rule Two of the *Regulae* that "it is better never to study at all than to occupy ourselves with objects which are so difficult that we are unable to distinguish what is true from what is false" and his commitment to reject "merely probable cognition and resolve to believe only what is perfectly known and incapable of being doubted"² represent the foundations on which he will reject the past and build the philosophy of the future:

The main reason why we can find nothing in ordinary philosophy which is so evident and certain as to be beyond dispute is that students of the subject first of all are not content to acknowledge what is clear and certain, but on the basis of merely probable conjectures venture to make assertions on obscure matters about

¹ *Op. cit.*, p. 113.

² Rule 2, CSM I, 10 (AT X, 362).

which nothing is known.³

In order to evacuate the merely probable and open the way for the clear and certain, Descartes will follow a path which can be described as one of reduction over inclusion, of disengagement and objectification over connection, and of transcendence over immanence. These are the key words of the new philosophy and science of Descartes' time: reduction, objectification, transcendence and, as has been seen in the previous chapter, they take their place in a new arrangement of subject and object, knower and known, mind and world.⁴ As will be seen in the next two chapters, Descartes played an important role in the Scientific Revolution, not so much because of his scientific achievements (which some consider to have had limited long-term importance), but because his metaphysics both framed and justified the mechanism that was being developed by him and around him.⁵

In this chapter I will be discussing the move to mechanism and the rejection of two notions that had, up to that time, been of considerable importance in explaining the connection of soul and body and of man and the universe: the idea of a world soul and the idea of final cause.⁶ I will be demonstrating that these two concepts were considered an

³ Rule 3, CSM I, 14 (AT X, 367).

⁴ In fact, these key words are inter-related and the most important is objectification since both reduction and transcendence (of the knowing subject) are preconditions of objectification. In the discourse of later modernity, this set of dichotomies will become the opposition between Reason and Nature.

⁵ The statement that Descartes science was of limited long term importance does not hold true for his physiology. As Gaukroger points out, in physiology, "where mechanism was almost exclusively associated with Descartes, it took the form of the mechanical modeling of biological entities and processes. Here Cartesianism, which in this area effectively became a type of materialist reductionism, was an immense success throughout the eighteenth and nineteenth centuries." Gaukroger, *Descartes*, p. 5. (See also Ch. 2, footnote 92).

⁶ The notion of 'world soul' is multi-faceted and it is difficult to be precise in its definition and, at the same time, as general in its use as I need to be in this thesis. The idea of a 'world soul' originates in Plato, and is set out in detail in the *Timaeus*. This is the soul that was fashioned by the creator-god and diffused through the corporeal world in such a way that "it was woven right through from the centre to the outermost heaven, which it enveloped from the outside and, revolving on itself, provided a divine source of unending and rational life for all time." *Timaeus*, 37 in Desmond Lee (ed.) *Timaeus and Critias*, (London: Penguin

obstacle to mechanistic science and to Cartesian method: a part that is integrated with, and causally affected by, the whole cannot be divided up, even conceptually, into discrete parts; and a mind, which is truly part of the life of nature and thus amenable to change and to the influences of the whole, cannot be the determining subject of a passive object—the subject and object must be in mutual relation, knowledge of the object must always be shifting and certainty always elusive. These two notions formed an integral part of the conception of man and the universe before the Scientific Revolution and were generally rejected after it.⁷ I will maintain that, with respect to the human body, they represent the key elements in the scientific and philosophical rupture between naturalism and mechanism.

My analysis will make use of Gaston Bachelard's theory of epistemological rupture and epistemological obstacle⁸ in order to arrive at an understanding, firstly, of

Books, 1971), p. 50. It is invisible and endowed with reason and harmony. It is also the same substance, although in less pure form, that is fashioned into the human soul—the human soul being the world soul with mortal elements. In the Middle Ages the world soul or *anima mundi* was interpreted in three ways: 1) as the Holy Spirit; 2) as a natural power introduced by God into sensible reality and 3) as an incorporeal substance present in all corporeal beings. (See Gerard Verbeke, *The Presence of Stoicism in Medieval Thought*, Washington, Catholic University of America Press, 1983, p. 33). In Plato, and in other Platonists such as Ficino, the world soul represents Reason, Life and Divinity, but it is *not* God. For the Stoics and for Bruno, however, the world soul is Reason, Life *and* God. For other Renaissance naturalists it might be fire or air or some combination representing Reason, Life, Soul or God. In all cases the world soul represents an immanent animistic principle; it is what makes the cosmos a living being and what links body and soul, and man to the whole. In general, I avoid using the term 'animism' because of its negative and pantheistic connotations. (Aristotle rejected the Platonic world soul; however, his fourfold cause and his prime mover play a similar metaphysical role).

For the purposes of this chapter and the thesis as a whole, I will be using 'naturalism' to cover those loosely Platonic and Neoplatonic philosophies of the Renaissance that brought the world soul back into the centre of their cosmological and anthropological thinking and which contrast with—and presented an obstacle to—the mechanistic philosophies that followed.

⁷ While this is not generally recognized, not all mechanists rejected final causes. Mechanists such as Gassendi, Leibniz and More took issue with Cartesian dualism and with the idea of inert matter and re-introduced, in different ways, the notion of final causes into their mechanistic philosophies.

⁸ There are different theories about the rupture in scientific thinking from one period for another, for example the paradigm shifts of Kuhn, the epistemic break of Foucault, or the intellectual mutation of Koyré. These are all interesting with respect to the shift from the Renaissance to the seventeenth century, but they are also very general. Bachelard's analysis is both more specific and more precisely related to the question of the separation of consciousness and nature that I will be analysing in this chapter. However, Bachelard is not dealing with the shift from the sixteenth to the seventeenth centuries but rather with the

what Descartes was trying to overcome and, secondly, how his method and his unflagging promotion of the unity of science are integral to his mechanistic conception of human life. At the same time I will be asking whether the rejection of these concepts and the adoption of a mechanistic view of the body was an unavoidable result of the scientific developments of the time or whether it was simply what Hans Jonas refers to in relation to teleology: an *a priori* prohibition.⁹ In a later chapter I will suggest that the rejection of these notions was at the root of inconsistencies and ambiguities in Descartes' mechanistic physiology and that they reappeared, transformed, in his writings on the body.

3.1 The epistemological rupture and its obstacles

There is a certain amount of overlap in scientific and philosophical notions at the beginning of the seventeenth century which is reflected in this chapter. This is not unrelated to the fact that most, if not all, the major philosophers at that time were doing science as well as philosophy. Descartes himself knew the difficulty of separating the two; he wrote to Mersenne in 1634 (after he had finished what he calls his physics but before the publication of the *Discours* or the *Meditationes*) that he could not "possibly solve any question in physics absolutely without first setting out all my principles."¹⁰ At the same time, it is difficult to separate ontological from epistemological questions and

shift to scientific reasoning and he does not see Cartesian science as falling into his definition of 'scientific'. Descartes is still looking for foundations whereas for Bachelard "not only are there no starting points, no epistemological foundations for natural science, there are no already fully objective views, right or wrong about how the world is." See Mary Tiles, *Bachelard, Science and Objectivity* (Cambridge University Press, 1984), p. 40. Nevertheless, I believe that Bachelard's concept of epistemological obstacle is relevant to my analysis since notions of world soul and final causes were, as I hope to demonstrate, perceived as obstacles to the mechanistic paradigm that had to be dispensed with in the move to mechanistic explanation of the universe and of the body.

⁹ Hans Jonas, *op. cit.*, p. 33.

to know which is more fundamental, the metaphysics or the method.¹¹ I hope to show that there was a rupture in both scientific and philosophical thinking and, while reserving judgment on the former (as being beyond the scope of this thesis), will question the necessity of the latter, in particular in relation to human life and the body.

In looking at the above questions, the Bachelardian concept of *epistemological obstacle* provides a clue to their analysis. For Bachelard, scientific progress consists of a series of *epistemological ruptures*¹² with past thought. Science represents a rational construction of reality and progress in science is made not by building on past notions but by continually reconstructing them.

The key words that describe science and the scientific spirit are: construction, , abstraction, ordering; and Bachelard emphasizes that what is lived or experienced as such is, ultimately, an impediment to scientific knowledge. “Nous insisterons”, he states, “sur ce fait qu’on ne peut se prévaloir d’un esprit scientifique tant qu’on n’est pas assuré, à tous les moments de la vie pensive, de reconstruire tout son savoir.” For him, “la pensée scientifique est alors entraînée vers des ‘constructions’...vers des ‘espaces de configuration’,” and what does not fit the configuration—even, or rather especially, real, concrete experience—is not part of scientific truth; is disorder, error. In fact, he states further, “une expérience *scientifique* est alors une expérience qui *contredit* l’expérience *commune*.”¹³

In the development of scientific reasoning, certain problems which arise because

¹⁰ To Mersenne, August 14, 1634, CMSK, 45 (AT I, 305).

¹¹ As pointed out in chapter 2, for example, Descartes principle of mind-body separation is implicit in his earliest writings, even though he does not formulate it in metaphysical terms until the *Meditationes* more than twenty years later and appears, in the *Regulae*, for example, to be concerned only with methodological questions.

¹² See Mary Tiles, *op. cit.*, p. 12.

¹³ Gaston Bachelard, *La formation de l’esprit scientifique* (Paris: Librairie philosophique J. Vrin, 1947), p.

of common belief or concrete experience are perceived, after the fact, as obstacles that had to be overcome in order that the true scientific knowledge could be constructed. They are, in Bachelard's words, "des causes de stagnation et même de regression...des causes d'inertie que nous appellerons des obstacles épistémologiques."¹⁴ They represent, in retrospect, the errors of the past and they necessitate "un véritable repentir intellectuel"¹⁵ once scientific truth has been arrived at. Such epistemological obstacles can be found at all levels of scientific endeavour; for example, the scientific discoveries of one generation can become the epistemological obstacles of another. But, in his book, Bachelard is dealing with what he perceives as the most important epistemological obstacles to the development of science from the sixteenth to the eighteenth centuries¹⁶ and two of them are of particular interest here: 1) unity in nature¹⁷ and 2) animism in the physical sciences. With respect to the first, in which class final causes can be included, Bachelard states:

"...le progrès scientifique marque ses plus nettes étapes en abandonnant les facteurs philosophiques d'unification facile tels que l'unité d'action du Créateur, l'unité de plan de la Nature, l'unité logique."

Such unifying factors are no longer called upon in science: "On trouverait bien prétentieux le savant contemporain qui voudrait réunir la cosmologie et la théologie."¹⁸

7; p. 6; p. 10.

¹⁴ Bachelard, *op. cit.*, p. 13.

¹⁵ Bachelard, *op. cit.*, p. 14.

¹⁶ Bachelard distinguishes 3 periods in the development of the scientific mind: the 'pre-scientific' which extends from the antiquity into the 18th century; the 'scientific' which extends from the 18th century into the beginning of the 20th century; and the 'new scientific mind' beginning with Einstein's relativity.

¹⁷ Unity in nature should not be confused with the unified science of Descartes. The first applies to a unifying force or principle *in* nature (which is objective); the latter to a unified method of studying nature (which is subjective).

¹⁸ Bachelard, *op. cit.*, p. 16. Like the 17th-century mechanists, Bachelard is interpreting any principle of unity or final causality as theological, a position that I will reject later in this chapter. His position is also somewhat disingenuous given the often expressed contemporary view that science itself has become a religion. Lenoble is much more realistic when he remarks, concerning the scientist: "...même s'il entend se retirer du monde pour étudier, à côté de son 'laboratoire' il a toujours son 'oratoire'." See Robert Lenoble,

For Bachelard, the prescientific mind tends to see the vast diversity of natural activity as a manifestation of a single metaphysical Nature, a search for harmony that leads to acceptance of such false beliefs as astrology and magic and impedes the development of science. Lenoble captures the essence of this obstacle best when he states:

On est bien incapable de donner de la nature une définition qui soit naturelle quand on commence par admettre qu'elle possède une conscience. De plus, par un choc en retour inévitable, une fois ce postulat posé, on ne peut plus élever l'homme à la dignité de roseau pensant: son âme est une partie de la conscience universelle, comme les choses en sont l'autre partie; il reste donc soumis aux forces occultes du *Cosmos*, au prestige des astres et des éléments.¹⁹

The scientific mind must be outside of the nature that it is studying and cannot be part of a whole that might have its own direction or purpose. Scientific knowledge does not recognize epistemological categories such as 'resonance', 'sympathy', 'immersion', 'fusion', etc., notions that serve to explain relations between parts of the same underlying reality. The scientific mind abstracts itself from, and then ultimately ignores and forgets, such forms of knowing which it then perceives as being pre-scientific and even primitive.

With respect to the obstacle of animism, Bachelard sees this as the result of a mistaken analogy: the application of principles of life to the physical realm. Such misplaced analogical thinking is 'pre-scientific', in Bachelard's view in that it is an obstacle to the objectivity of physical phenomena; it puts greater value on the animal and vegetable realms and is always prejudicial to the mineral realm. Further, in his words, "dans le passage d'un règne à l'autre, c'est le but et non la cause qui est le thème

Esquisse d'une histoire de l'idée de nature (Paris: Éditions Albin Michel, 1969), p. 30.

¹⁹ Lenoble, *Mersenne*, *op. cit.*, p. 7. Lenoble also underlines the rupture that separates naturalism and mechanism: "Et voici qu'à partir des années 1620, savants et philosophes, quelle que soit leur tournure d'esprit... d'un bout à l'autre de l'Europe... tous, en dépit de toutes les divergences d'Écoles et des polémiques souvent passionnées, se trouvent d'accord pour affirmer que la Nature est une machine et que la science est la technique d'exploitation de cette machine."

directeur, en suivant, par conséquent, une intuition valorisante.”²⁰ Thus do the two obstacles that I will be dealing with unite as one: the ‘end’ being the unifying factor which serves as a causal framework (final cause as opposed to efficient cause) for an animistic (or naturalistic) explanation.²¹

3.2 The Obstacle of Naturalism

The terms ‘nature’ and ‘naturalism’ have many different meanings, depending on both the context and the historical period. For the purposes of this thesis, *naturalism* refers to philosophies of the Renaissance which, by reviving certain Platonic and Neoplatonic and even Hermetic views of nature, relied on explanations of the cosmos that were, principally, monistic and, to varying degrees, animistic. While it is difficult to encompass all Renaissance philosophers within one definition, the following definition by Schmitt and Copenhaver captures the essence of the naturalism that I am referring to in this thesis:

The universe of most of the philosophers of nature, like that of the Neoplatonists, was an enchanted world of ensouled objects linked together and joined to a higher realm of spirit and absolute being. A universal world-soul pervades all creation and makes all creatures, even rocks and stones, alive and sentient in some degree.²²

Renaissance naturalism represented what Louis Dupré refers to as the ‘retheologising’ of nature. It was a reaction to the weakened link between the Creator and the world order in

²⁰ Bachelard, *op. cit.*, p. 150.

²¹ I am using Bachelard’s notion of epistemological obstacle but not fully within his context. In Bachelard’s analysis, the epistemological obstacle of animism endures into the eighteenth century and the period of the so-called Scientific Revolution is, in his theory, pre-scientific; I will be limiting my own analysis to Cartesian mechanism where the obstacle of animism was considered to be overcome, at least in theory. Secondly, in discussing the notion of animism, Bachelard is excluding its use in the biological sciences whereas for Descartes, the elimination of the obstacle of animism is attempted even in relation to human biology.

²² Charles B Schmitt and Brian Copenhaver, *Renaissance Philosophy* (Oxford University Press, 1992), p.

Scholastic philosophy and it attempted to re-affirm that link through an emphasis on immanence as opposed to transcendence.²³

Naturalism represents a philosophy of nature that embraces cosmology and metaphysics. But it also has its anthropological dimension in which the human person is part of nature, often at a given level of the hierarchy of being (for example, in Ficino or Pico della Mirandola). Thus the cosmological and metaphysical transformations that mark the move from naturalism to mechanism have an anthropological counterpart that will be played out in the Cartesian approach to the human body (which will be examined in Chapter 4). The body, as part of the living nature of naturalism is conceived differently from the body as part of the inert nature of mechanism. The result of the move from naturalism to mechanism is a transformed anthropology.

In his analysis of the transition from the sixteenth to the seventeenth centuries in *Mersenne ou la naissance du mécanisme*, Robert Lenoble asks what he considers the fundamental question: “faut-il distinguer Nature et Conscience?”²⁴ Lenoble is asking this question about nature in general; it is, however, also the fundamental question in relation to the body as it was conceived in the 16th and then in the 17th centuries. The fate of nature and the fate of the human body are linked in the metaphysical transformation that Lenoble's question addresses. In answering this question, Lenoble sees three possibilities: that of Scholasticism which, combining a qualitative physics with a transcendent metaphysics (which allows inherent qualities or forces *in* nature but keeps

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²³ Louis Dupré, *op. cit.*, p. 58. See also Stephen Menn's discussion of naturalism in *The Cambridge History of Seventeenth Century Philosophy* (Cambridge University Press, 1998), p. 63ff. Menn thinks Lenoble, for example, includes too many philosophers under the label 'naturalism', although he does admit that there was "a real tendency of thought which understood God's nature and relation to the world in a way incompatible with Christianity, and we call this 'naturalism' rather than 'atheism'."

²⁴ Robert Lenoble, *Mersenne, op. cit.*, p. 8.

the ultimate cause outside of nature), is forced to answer equivocally, both 'yes' and 'no'; that of naturalism, which unequivocally answers 'no'; and that of mechanism which equally unequivocally answers 'yes'. In his view, the move to mechanism cannot be explained (as it most often is) as a simple reaction to Scholastic philosophy. While the mechanists were preoccupied with eliminating the qualitative physics and substantial forms of the Scholastics, Lenoble maintains that it is more accurate to interpret mechanism as a reaction to naturalism, and his study of Mersenne's life-long effort both to eradicate the naturalistic ideas of the Renaissance and to promote any philosopher who promoted mechanism provides strong support for his thesis.

Historians of both philosophy and science have differing opinions on the origins and causes of the Scientific Revolution²⁵ and this thesis will not attempt to resolve this particular problem. In addition, there are, in both history of science and history of philosophy, differing opinions as to whether the transition to mechanistic science represented a gradual shift (the 'continuist' thesis) or a sudden rupture (the 'discontinuist' thesis). Part of the difference turns on questions about which aspects of the Scientific Revolution were the most important or most radical (e.g. mathematisation, method, mechanism, the principle of inertia, etc.). It is also relevant, in my view, how much importance is given to Renaissance Philosophy as true philosophy. In this regard, many historians of philosophy leap from Aquinas to Descartes without so much as a sideways glance at Renaissance philosophers such as Ficino, Campanella or Bruno. And yet Mersenne's preoccupation with the naturalists is intense enough to suggest that they were

²⁵ For a comprehensive account see Cohen, *op. cit.* Cohen's book addresses, among others, questions relating to the continuist/discontinuist argument and questions regarding the 'key' to the Scientific Revolution (e.g. mathematisation, mechanisation, experimentation); it also addresses difficulties "in assigning a proper role to Descartes in particular, and in finding a fitting place for contemporary

of considerable philosophical importance at the beginning of the seventeenth century (and even Descartes, if the slight existing evidence is to be believed, was attracted to the Rosicrucians²⁶). In fact, according to Lenoble, the move to mechanism can only be understood as a reaction to naturalism. Part of the problem with the naturalists (and, in particular those who were referred to as the 'libertines') was that at one and the same time they posed a threat and offered an alternative to Scholastic Aristotelianism. While the Renaissance revival of original works of Aristotle raised certain problems regarding the accepted Scholastic interpretation, the revival of Platonic, Neoplatonic and Hermetic works posed a clear threat and "a sharper breach with medieval philosophy."²⁷ The Aristotelian paradigm was crumbling and there was an expectation of a 'new philosophy'; Mersenne, for one, saw the danger. In Lenoble's words:

Au début [Mersenne] ne sait pas encore ce que sera la "Philosophie nouvelle", mais tout de suite il sait très bien ce qu'elle ne sera pas: elle n'aura rien de commun avec le Naturalisme. Il le repousse de toutes ses forces, à la fois parce qu'il ruine la religion et la doctrine de la liberté, et parce qu'il ne propose aux savants que des rêveries. C'est contre lui qu'il écrit ses premiers ouvrages, et il le dénonce comme 'l'ennemi public n° 1'. Toute sa vie il cherchera contre lui les armes les plus efficaces et les meilleurs alliés."²⁸

Lenoble's view receives support from Koyré who divides Medieval and Renaissance science into three periods: the Aristotelian; the impetus; and the Archimedean (the impetus would cover Renaissance naturalism and the Archimedean covers Galileo and the mechanists). For him, "the one doctrine that did more than any other to usher in the destruction of the Greek Cosmos" was the principle of inertia. He also held that while Galileo prepared the conversion of the empirical to the mathematical

developments in chemistry, the life sciences and medicine." (p. 15).

²⁶ See chapter 2 and Gouhier, *op. cit.*, p. 135.

²⁷ Copenhaver and Schmitt, *op. cit.*, p. 127.

²⁸ Lenoble, *Mersenne, op. cit.*, p. 9.

world, it was Descartes who supplied its foundations:

The person to execute the full conversion was Descartes, who was the first to think up, in a systematic and thorough fashion, a world consisting of nothing but bodies moving through infinite space in accordance with the principle of inertia."²⁹

According to Gaukroger,

[t]he inertness of matter is the one characteristic feature of mechanism that will be generally adhered to in the seventeenth century. Other features of seventeenth-century mechanism that have been identified are considerably less fundamental than the inertness of matter.³⁰

And to understand its importance it is necessary to take a look at some of the elements of naturalistic philosophy and how they presented an obstacle to the new mechanistic science and, not incidentally, a threat to the old religion.³¹

Returning to Lenoble's question: "Faut-il distinguer Nature et Conscience?", we can recall that the answer of naturalism is unequivocally negative. This means that in naturalistic philosophies all of nature is in some way alive and, to some extent conscious.³² And all parts of nature are inter-linked through different degrees of being: humanity is part of the cosmos and the cosmos is part of humanity. The importance of

²⁹ Cohen, *op. cit.*, p. 77. With respect to the continuist/discontinuist issue, it is interesting to note that Koyré, for whom the principle of inertia is paramount in bringing about the intellectual mutation that the Scientific Revolution represented, can be ranked among the discontinuists. Dijksterhuis, on the other hand, for whom mathematisation was the key issue of the Scientific Revolution, was emphatically continuist. It is possible that the question of continuity and discontinuity is answered differently depending on whether one approaches it from the perspective of science (where the transition can appear to be more gradual) or from the perspective of philosophy (where the rupture is more apparent—at least if Renaissance philosophy is taken into account). In this thesis I am assuming a discontinuist interpretation, in particular in relation to the metaphysics and epistemology of the human body.

³⁰ Gaukroger, *Descartes*, p. 150.

³¹ Because the focus of this thesis is on the body, I will be looking at aspects of naturalism principally from that point of view.

³² Here it is important to emphasise that 'conscious' does not mean 'self-conscious'. [This distinction may become superfluous in the new cosmology where every level of being is seen as being not only conscious but self-conscious: "L'univers n'est fait que de formes conscientes d'elles-mêmes et d'interactions de ces formes par information mutuelle... L'univers est, dans son ensemble et son unité, conscient de lui-même... Ses informations ne sont pas aveugles." See Raymond Ruyer, *La gnose de Princeton* (Paris: Fayard, 1974), p. 58.]

this point is underlined by Hélène Védérine in *La conception de la nature chez Giordano*

Bruno:

On commettrait un contresens si l'on prêtait aux hommes de la Renaissance une séparation entre l'anthropologie et la cosmologie qui n'est devenue possible qu'avec la distinction cartésienne de la *res extensa* et la *res cogitans*. Le XVe et le XVIe siècles ne vivent aucunement l'opposition entre la nature et la liberté comme celle de deux types irréductibles de connaissance, mais plutôt comme celle qui caractérise les degrés de l'être.³³

In relation to the body, this means that there are direct links with the cosmos which were demonstrated through astrology and magic and other occult theories. It also means, in relation to the soul, that there is a closer link between God and his creation than Christian theology could comfortably accept—which, given the close links between theology and philosophy at this time, makes the syncretism of the Renaissance an interesting phenomenon. It is also what makes Lenoble's thesis about the relation between Scholasticism, naturalism and mechanism, so plausible. As Védérine points out, during the Renaissance,

la triple hiérarchie, Monde-Homme-Dieu, subsiste en général, mais on l'interprétera dans le sens d'un immanentisme et d'un naturalisme que le Moyen Age n'a connus qu'en germe et chez des hérétiques déclarés."³⁴

Perhaps it is less surprising that Bruno went to the stake in 1600 than that others before him did not!

3.2.1 The Naturalistic Body: Marsilio Ficino (1433-1499)

Naturalism had a correlative thesis that Gaukroger refers to as 'mortalism', "whereby the soul is not a separate substance but simply the 'organizing principle' of the

³³ Hélène Védérine, *La conception de la nature chez Giordano Bruno* (Paris: Librairie philosophique J. Vrin, 1967), p. 80.

³⁴ Védérine, *op. cit.*, p. 79.

body, that is, something wholly immanent in the matter of the body.”³⁵ Such a position raises the problem of personal immortality, something that was denied in the case of certain naturalists such as Pomponazzi for whom the world and the soul are one.³⁶ Others account for the immortality of the soul by positing gradations of being such that the soul is an intermediary between the world and God. Such is the case with Pico della Mirandola and Ficino, for example. In general, however, the Renaissance sees man as being integrally linked to the cosmos, no matter how many levels of being are posited:

Il y a des créatures qui représentent une valeur supérieure à la sienne; il y en a d'autres, par contre, vis-à-vis desquelles il prend conscience de sa supériorité. Mais [l'homme] n'est jamais qu'une des créatures de ce monde, douée de certaines qualités qui la caractérisent comme telle, et qui doivent être définies d'après leur rapport de valeur avec celles des autres créatures de ce monde, supérieures ou inférieures à elle.³⁷

Even if the soul partakes in the higher levels and is thus freed from the overall fate of the world of matter, in the case of Ficino at least, the body is still linked to the world of matter and is affected by both the heavens and earth, subject to the same fate. Thus Ficino, who was one of the few philosophers who wrote specifically about the body and medicine, provides a good example of the interaction of body and nature in Renaissance anthropology.

Ficino was a priest, a doctor, and a philosopher who translated the works of both Plato and Plotinus,³⁸ as well as the *Corpus Hermeticum*. Like Pico della Mirandola, Ficino's approach to philosophy was syncretic: his cosmology is partly Platonic, partly Neoplatonic (particularly in relation to his gradations of being), partly Stoic (he integrates

³⁵ Gaukroger, *op. cit.*, p. 149.

³⁶ Bernard Groethuysen, *Anthropologie philosophique* (Paris: Gallimard, 1952), p. 165-166: “Pour Pomponazzi...la nature de l'homme est ce qui est donné une fois pour toutes....L'homme aspire à l'immortalité, mais son désir, sa nostalgie ne décident pas de la question....Être homme signifie donc, dès d'abord, être relié à ce monde par les liens de l'esprit et de l'âme....le monde et l'âme ne font qu'un.”

the notion of seminal reasons and a *pneuma*-like world soul), partly hermetic (as a result of his translation of the *Corpus Hermeticum*) and, of course, partly Christian (strongly influenced by Augustine). As Védérine puts it:

Les thèmes néo-platoniciens y côtoient l'enseignement des mages de l'Orient, des gymnosophes, d'Hermès dans un aimable syncrétisme où anges et démons, Dieu et demi-dieux, âmes des sphères et âmes humaines se répondent en une vivante harmonie.³⁹

This syncretism is fundamental to Renaissance epistemology and cosmology. In it is expressed the idea that truth is one and that diverse notions and beliefs reflect this unitary truth:

Il n'y a que l'Un. Le multiple, c'est l'Un pluralisé. Dans la multiplicité apparente des thèses divergentes, on va, sans le savoir, du même au même.⁴⁰

It reflects, as well, the Neoplatonic metaphysical unity whereby the one and the many are ultimately the same reality and each level of being reflects every other. The most obvious, for the Renaissance, was the notion of the microcosm participating in and reflecting the macrocosm.

Thus, the multiplicity of Ficino's angels, demons, and souls, so foreign to

³⁷ Groethuysen, *op. cit.*, p. 143.

³⁸ Copenhaver and Schmitt refer to Ficino as "the moving spirit of the Platonic revival." *op. cit.*, p. 127.

³⁹ Hélène Védérine, *Philosophie et magie à la Renaissance* (Librairie générale française, 1996), p. 22. In their Introduction to *Three Books on Life*, Kaske and Clark explain Ficino's syncretism thus: "...he believed in a continuous secular tradition of truth, the 'ancient theology', parallel to Christian truth. His approach...is therefore to accept all texts at face value without considering qualifying historical circumstances such as genre, cultural context, or polemical purpose..." The result is a "crowded universe" which included "several sets of divinities: the Christian, embracing the Trinity, angels, the Virgin Mary, and the saints; the Neoplatonic, embracing the three hypostases generally known as the One, the Mind, and the World-soul, the supramundane or supercelestial gods, the mundane or celestial gods including the movers, souls, or Intelligences of the spheres plus an undefined number of other star-souls, heroes living a semi-divine posthumous existence on the stars, and daemons good, bad, and indifferent, both celestial and sublunary; and astronomical entities lumped under the term 'celestials' which are alive and sometimes personal" and embracing "in one form or another the Olympian gods." Marsilio Ficino, *Three Books on Life*, (trans. C. V. Kaske & John R. Clark; Binghamton, N. Y., The Renaissance Society of America, 1989) p. 39. I will refer to both the work in general and Kaske and Clark's English translation as *De vita*.

⁴⁰ Danièle Letocha, "Le principe occulte de la vérité selon Jean Pic de la Mirandole". Paper presented to the Sixteenth Century Studies Conference, Nov. 2-5, 2000, Cleveland.

modernity, is, in fact, the expression of this Renaissance Neoplatonic unity. Since everything reflects the one underlying unity, the role of the philosopher, the doctor or the priest (and Ficino was all three!) is too find the similarities in the various levels of being (in particular between macrocosm and microcosm), to decode the signs and make the links which allow for an understanding of the place of man in the cosmic hierarchy and, particularly in the case of the doctor, to know how to invoke the forces of the different levels to cure the sick and to maintain the healthy.

Eugenio Garin, writing about Ficino's efforts to define the structures of his planes of reality and their correspondences, states:

... all the difficulties of his thought are diminished if one grasps the point of the union: what he in fact calls the 'concord of the world' (*concordia mundi*), and which is expressed as the refraction, slowly moving on different planes, of that living unity which is the cosmos, in which each individualisation in turn is the synthesis of all the others... And all are 'formal' manifestations of the one living heart of the universe, different signs of that unique living reality which, in its turn, is the same infinite refraction of life.⁴¹

Like the world of the Stoics, Ficino's world is a monist universe with the equivalent of the *pneuma* which he calls the World-soul. The World-soul contains all things and, in Ficino's words "she is equally connected with everything, even with those things which are at a distance from one another, because they are not at a distance from her".⁴² Thus, as Ficino says in *De vita*, the universe is a continuum and it is alive:

That the cosmos is animate just like any animate thing, and more effectively so, not only Platonic arguments but also the testimony of Arabic astrologers thoroughly proves. In the same works, the Arabic writers also prove that by an application of our spirit to the spirit of the cosmos, achieved by physical science

⁴¹ Eugenio Garin, *Astrology in the Renaissance* (London: Routledge & Kegan Paul, 1988), p. 73.

⁴² *De vita*, p. 243. Naturalism did not shy away from the idea of action at a distance as did the mechanism which followed it. That one level of being can act on another is implicit in the idea of a continuum but also, and more importantly, in the idea of the macrocosm and microcosm. Sympathy, resonance, analogy are causal categories that will be banned from the mechanistic view of the world where only efficient causes operated and where causal activity necessitates physical proximity.

and our affect, celestial goods pass to our soul and body.”⁴³

For Ficino reality is comprised of five levels: bodies (which are extended matter, passive and infinitely divisible); qualities (which are powers or material forms which cannot exist apart from matter and which can transmit motion without initiating it); souls (which give life to bodies); angels (or Reason, or the agent intellect, which guide souls); and God (which is pure unity). The five levels represent a living hierarchy, with each degree influencing the one next to it in an ascending or descending manner. Ficino insists on the harmony of all levels of the cosmos and on the presence of one animating principle.⁴⁴

As a doctor and the son of a doctor, Ficino grew up with astrology and practised it as part of his medical training and practice.⁴⁵ The revival of Platonic and Neoplatonic cosmology during the Renaissance provided a framework for astrological beliefs at the same time as the rising humanist philosophy, which attempted to give more room to human freedom, resisted its inherent determinism. As a result, ways were sought of explaining astrology more in terms of escaping fate than in submitting to its dictates. The heavens came to be seen less as causes and more as signs⁴⁶ to be interpreted at critical moments in order to allow choices as to what actions to take. Magic becomes what is

⁴³ *De vita*, p. 255.

⁴⁴ Védrine, *Bruno, op. cit.*, p. 85. “Ainsi, dans cette hiérarchie vivante, chaque degré d’être se lie au degré supérieur ou au degré inférieur dans un même système de stimulations ascendantes ou descendantes. Tous ces mouvements renvoient à Dieu qui seul leur donne un sens.”

⁴⁵ As Anthony Parel points out in his book on Machiavelli, in pre-modern medical thought, “changes in one’s bodily humours are linked to changes in the motions of the heavens. As such, there is a theoretical connection between the ancient science of medicine and ancient physics and cosmology.” Anthony Parel, *The Machiavellian Cosmos* (New Haven and London: Yale University Press, 1992), p. 1.

⁴⁶ This shift can be seen as the beginning of the end of astrology as a mainstream medical practice. Anthony Parel points out that Pico delivered a decisive blow to astrology by insisting that signs cannot be causes. In Parel’s words: “No sign can causally effect physical change in physical entities; physical changes require physical causes. The heavens can indicate that they are causing something only if they are its actual physical cause, otherwise they indicate nothing real. In other words, signs cannot be causes.” Parel, *op. cit.*, p. 20.

used to counteract fate. The Universe is no longer an impersonal system of causes and effects. Human personality intervenes in the causal chain and the heavens develop a personality as well. As Garin says: "The celestial powers, in fact, come to be caught, and placated or used, by imprisoning them in fictitious material representations, talismans and amulets, capable of absorbing and concentrating astral forces."⁴⁷ Thus magic, in accommodating free will, becomes opposed to astrology. Védérine points out that "un partisan de l'astrologie peut se révéler opposé à la magie et vice-versa"⁴⁸, as was the case with Pico who opposed astrology but defended natural magic and even tried to make it scientific through the unifying method of the Cabbala⁴⁹.

Ficino practised both astrology and magic and one of his medical works, *De vita* (1489), is devoted to demonstrating how the human body is connected with the heavens and can be influenced and cured by heavenly forces. The third book of *De vita* is entitled: *On Obtaining Life from the Heavens* and is subtitled: *In What, According to Plotinus, the Power of Attracting Favor from the Heavens Consists, Namely, That Well-adapted Physical Forms Can Easily Allure the World-soul and the Souls of the Stars and*

⁴⁷ Garin, *op. cit.*, p. 46. Garin discusses the ambiguity and continual tension that surrounds the two approaches to astrology: "...one of which... is conceptual and mathematical and reduces the heavenly intelligences and the souls of things to necessary principles of rationality inherent in the picture of an absolute, completely predetermined. The other instead accentuates the personality of the divine and underlines the free individuality of souls... and is expressed in terms which are fantastic and emotive, imaginative and poetic. In the first case one risks losing human initiative and freedom; in the second the trap is the destruction of rationality and a nature which is regulated by laws... A continual tension emerges... an ambiguity which is so deep that it is useless to think it can be resolved by the commonplace of the oppositions between astrology and magic." (p. 61).

⁴⁸ Védérine subsumes astrology under magic; Garin opposes the two concepts while admitting (as is shown above) that the line is often difficult to draw. For the purposes of this chapter, I am contrasting astrology (as the impersonal determiner of fate) with magic (as the means of 'escaping' fate). I realize, however, that Ficino uses both magic and astrology, thus confirming Garin's view that it is difficult to draw the line. The determinist astrology of Pompanazzi (or the Stoics), on the other hand, would confirm the opposition of the two concepts.

⁴⁹ Garin, Eugenio, *op. cit.*, p. 43.

the Daemons.⁵⁰ While this long title has a magical air, the magic in which Ficino is interested is natural magic, "ways of using plants, stones, musical sounds, and other natural objects as sources of unusual power without any appeal to personal, supernatural agents such as demons or angels."⁵¹

The concept of world soul is central to Ficino; it is also called spirit or medical spirit⁵² and is an intermediary in Ficino's world hierarchy:

You will bend your efforts to insinuate into yourself this spirit of the world above all, for by this as an intermediary you will gain certain natural benefits not only from the world's body but from its soul, and even from the stars and the daemons. For this spirit is an intermediary between the gross body of the world and its soul; and the stars and daemons exist in it and by means of it.⁵³

This spirit is available to us through all the things in the universe; we can, according to Ficino,

by way of certain preparations, lay claim to celestial things. For these lower things were made by the heavens, are ruled continually by them, and were prepared from up there for celestial things in the first place.⁵⁴

⁵⁰ *De vita* is not the best-known of Ficino's works and it is the rather massive three-volume *Theologica Platonica* for which he is renowned. However, the editors of the recent translation in English point out that *De Vita* "represents a cultural milestone" and is one of two medical works of Ficino (the other being his *Consiglio contro la pestilenza*) both of which were immensely popular in the Renaissance. *De Vita* was reprinted 30 times and the last edition was in 1647, 148 years after his death, and only 3 years before the death of Descartes. It was "the first treatise on how to be an intellectual and still keep you health", the intellectual being more subject than most to the influence of Saturn and "the melancholic humor black bile" which is "the physical basis for that madness which is genius." (see Introduction, p. 3-4). Since Ficino was both a doctor and a philosopher, the book offers an insight as to how the human body was perceived in the interconnected world of Renaissance naturalism. As the editors point out, Book 3 is both "more philosophical and more occult" and in it "Ficino eloquently defends the naturalness of his magic by appeal to his cherished belief that the heavenly bodies are animated with an impersonal spirit which in turn pervades all men." (p. 4). Further, the work is important, according to the editors, because it was the first "to give the Platonic notion of the four noble *furores*—itself restored to the West almost singlehandedly by Ficino—a medical basis in the melancholic humor or black bile" and it helped to extend and popularize humoral psychology in the Renaissance. (p. 23).

⁵¹ Copenhaver and Schmitt, *op. cit.*, p. 160.

⁵² "The most important mediator in the entire work is the medical spirit...In medical writers the philosophical function of the medical spirit was as a *tertium quid* to bridge the gap between man's body and soul—the function now filled in modern science by electro-chemical nervous transmission...Ficino greatly extended the importance of the medical spirits by attributing them (or rather it) also to the cosmos, envisioning a *spiritus mundanus* or world spirit between the world's soul and its body." Introduction to *De vita*, p. 43.

⁵³ *De vita*, p. 259.

⁵⁴ *De vita*, p. 249.

Certain things are governed by certain planets. For example,

One obtains things from Venus through....sapphire, lapis lazuli, brass, coral, and all pretty, multicolored or green colors and flowers, musical harmony and pleasant odors and tastes,

while one obtains favours from the Moon through

things that are white, moist, and green and through silver and crystal and pearls and silver marcasite....To get something from Saturn we use any materials that are somewhat earthy, dusky and leaden; we use smoky jasper, lodestone, cameo, and chalcedony; gold and golden marcasite are partly useful for this. From Mars, materials which are fiery or red, red brass, all sulphurous things, iron, and bloodstone...etc."⁵⁵

These materials, whose qualities are related to their respective celestial body, can draw desired effects from them.

A doctor had to bear a number of things in mind before treating a patient, including the patient's astral chart and how it related to his own, the relation between the infected parts of the body and their governing planet and the position of the stars and planets at the moment of medication!

Accordingly you must remember that Aries has power over the head and face; Taurus over the neck; Gemini, the forearms and shoulders; Cancer the breast, lungs, stomach and upper arms."⁵⁶

Depending on your ascendant sign, it could be harmful to take medicine when the Moon is in Capricorn (but acceptable when it is in Pisces) or to induce vomiting when the Moon is in Libra; purgatives should only be taken when the Moon is in Cancer, Pisces, or Scorpio. The doctor plays the role of mediator between the stars and the patient. Ficino agrees with Galen that "astrology is necessary for the physician",⁵⁷ and his book is a veritable font of information on how to use it.

⁵⁵ *De vita*, p. 253.

⁵⁶ *De vita*, p. 287.

De Vita provides an epistemological model that includes and links several concepts which are pivotal in Ficino's astrology and medicine. The first is analogy or sympathy: that there are qualities—such as colour, texture or shape—in the microcosm which are analogous to the qualities in the macrocosm (for example the analogy between the moon and things that are white, moist and green). “Argument from analogy crowds out argument from those material causes and effects which are the staple of modern science.” Moreover, analogy is “the very energy that holds the Neoplatonic cosmos together and hence the basis of those sympathies by which sympathetic magic operates.”⁵⁸ The ultimate analogous structure is cosmic sympathy manifested in the *musica mundana* and representing the overall harmony of the universe.⁵⁹

The second pivotal concept is mediation—a hierarchy of being where there are no gaps and which allows for the interconnectedness of all things. The World-soul is a mediator, as are the seminal reasons, “the agents of the World-soul's generative activity in matter...”⁶⁰ and the medical spirits. The heavenly bodies are alive and act as “a mezzanine between the planes of material and immaterial, man and God.”⁶¹ Translated into anthropological terms, the Renaissance theorists held that “the two basic components of man's nature, 'corpus' and 'anima', were connected by a third element described as the 'medium', the 'vinculum', or the 'copula', between the other two...the division of human nature into body, soul and 'spiritus humanus' corresponded to a similar division of the

⁵⁷ *De vita*, p. 289.

⁵⁸ *De vita*, p. 40 (Introduction).

⁵⁹ See Garin, *op. cit.*, p. 76: “Music, the harmony of the world, the universal harmony, the eternal poem, the theatre of the world: these are all dominant themes from the fifteenth century onwards, and scientists and philosophers were to write and speak about them from Galileo to Kepler, from Descartes to Mersenne.”

⁶⁰ *De vita*, p. 43.

⁶¹ *De vita*, p. 43.

universe into universal matter, universal mind and 'spiritus mundanus'.⁶² In Ficino, as with most Renaissance naturalists, everything is more or less alive and Ficino could not accept the view of "those who see life in the most despised creature and lowest plant but refuse to recognize it in the sky and in the cosmos" which he refers to as a "living being".⁶³

Both sympathy and mediation are founded on the belief that from form to matter, from thought to sensible beings, there is a continuum. Thus, an intelligible cause can produce a sensible effect or a sensible cause can produce an intelligible effect. At the same time it must be emphasized that in Ficino, the human mind escapes the determinism of the stars and can actually will the influence of one star rather than another. "Man as an active and thinking being was fundamentally free, and could even, thanks to this freedom, harness the forces of the stars by consciously and willingly exposing himself to the influence of a certain star; he could call such an influence down upon himself not only by employing the manifold outward means, but also (more effectually) by a sort of psychological autotherapy, a deliberate ordering of his own reason and imagination."⁶⁴

Thus can Ficino be seen as a vivid example of the kind of naturalism that Bachelard would classify under the epistemological obstacle of animism.⁶⁵ In addition, his emphasis on astrology, magic, talismans, etc., makes him an easy target for criticism and even ridicule from the point of view of seventeenth-century rationalism and modern science. At the same time, he expressed a view of the unity of the cosmos that had been

⁶² Raymond Klibansky, Erwin Panofsky and Fritz Saxl, *Saturn and Melancholy* (London: Nelson, 1964), p. 265.

⁶³ *Ibid.*, p. 264.

⁶⁴ *Ibid.*, p. 270.

⁶⁵ Ficino fits Copenhaver and Schmitt's definition of naturalism (see footnote 22). Menn might object to my including Ficino under the naturalists since he defines the term more narrowly and more or less in a theological context. For the purpose of the development of mechanistic science and within the context of

prevalent for at least two millennia and the question that will be addressed in further chapters will be: in rejecting astrology, magic, talismans, demons and other paraphernalia of the Ficinian cosmology, was it necessary to reject all notions of cosmic unity, of gradations of being and of life or intelligence at every level? Does the rejection of magic necessarily mean that all mind is separated from all matter? Or, once again, in the words of Lenoble: *faut-il distinguer Nature et Conscience?*

Lenoble's question is central to my thesis and serves as a guiding theme. For Lenoble, the separation of nature and consciousness represented the fundamental aspect of the shift from naturalism to mechanism. I will be trying to show that it also represents a fundamental shift in thinking about the human body and that it is essential to Descartes' conception of the body in mechanistic terms. Ficino's living hierarchy in which everything is alive to different degrees and the body is linked to the cosmos and both affects and is affected by the whole can have no role to play in the Cartesian dualistic universe of inert matter on one side and pure thought on the other side. As will be demonstrated in Chapter 4, it also represents a fundamental shift in the notion of soul as the principle of life.

While Cartesian physics and metaphysics are founded upon a radical mutual exclusion of consciousness and nature, we are forced to ask, with Lenoble: was this separation necessary?

3.3 The Obstacle of Finalism

The second epistemological obstacle that I want to look at is the notion of final causes or teleology: the idea that there is some end or purpose to the world as a whole or

Bachelard's notion of epistemological obstacle, Ficino can be considered a naturalist in the larger sense.

to human life in particular (or to Being in general and beings in particular). The notion of final cause pervades philosophy and science up to the seventeenth century, after which it is excluded from science, although it remained problematical in philosophy⁶⁶. To the 17th Century mind, looking for a new philosophy and a new science, final causes were to be rejected because they were considered both anthropomorphic and anthropocentric: anthropomorphic because the idea is presumed to be based on an analogy with human production or artistry (man makes his creations for a purpose, therefore, God made his creation, the world, for a purpose); anthropocentric because it is assumed that the purpose for which God made the world is *man* (and thus the natural world exists for man's use). I want to look at the question of final causes from two perspectives: the immanent finality of a monistic metaphysics and the transcendent finality of a dualistic metaphysics⁶⁷. At the same time I want to underline another dichotomy, not unrelated to the first, within the concept of finality itself: that between direction and purpose, while, at the same time, examining another aspect of teleological explanation: the relationship of part to whole. The purpose of this analysis is to demonstrate that in rejecting the notion of final causes, seventeenth century mechanism was rejecting the notion of 'purpose' and in particular God's purpose for the world as something unknowable (and as a question of theology) but at the same time it was ignoring or setting aside the ancient notion of final cause as

⁶⁶ It is particularly problematical in relation to a philosophy of the body and many recent philosophers, including Jonas, have recognized the need to return to some idea of finality in relation to the body and human life. See the Conclusion for a discussion of recent authors whose view of body calls for a return to the notion of finality.

⁶⁷ This dichotomy is being used with a certain hesitation since the line cannot be so neatly drawn. Henry More, for example, insisted on immanent finality within a dualistic metaphysics and Spinoza rejected it within his monistic metaphysics (although, I believe, Spinoza rejected final causes in the sense of God's purposes and that the argument can be made that his *conatus* implies immanent finality). In addition, those who promoted the retention of the idea of final causes in the Seventeenth Century (e.g. Gassendi, Leibniz, More and others) often did so explicitly within the meaning of God's purposes and even relied on final causes as proof of God's existence.

the relation of part to whole and the unconscious direction of the universe as a whole (a notion which is not necessarily theological in the Judeo-Christian sense⁶⁸). As a result, as I will demonstrate in Chapter 4, an epistemological obstacle was removed but another was created, in particular in relation to the place of man in the universe and the relation of the human body to the natural world.

3.3.1 Purpose vs. Direction

The identification of teleology with 'purpose' is so common in philosophy that one hardly dares question it.⁶⁹ A very recent book by Colas Duflo, *La finalité dans la nature*, in spite of its claim to re-visit the question, makes the same assumption:

Supposer une finalité dans la nature, en tout cas jusqu'au XVIII^e siècle, c'est supposer aussi, inséparablement, un Dieu providentiel, qui est l'auteur de cette nature et qui décide de ces fins, qui sont Ses fins.⁷⁰

This is, of course, the idea of God as the Great Artificer, or the Great Engineer. If nature is a machine (or a clock), God is the machinist (or the clock-maker), par excellence. And his purposes are inscrutable. As Descartes says in *The Principles of Philosophy*:

When dealing with natural things we will, then, never derive any explanations from the purposes which God or nature may have had in view when creating them <and we shall entirely banish from our philosophy the search for final causes>. For we should not be so arrogant as to suppose that we can share in God's plans.⁷¹

⁶⁸ Gilson takes a strong position regarding what is for him the 'philosophical inevitability' of final causality and differentiates the question of teleology from questions of theology. In his view, theologians can draw conclusions about it if they wish, but "l'existence de la finalité dans l'univers sera l'objet d'une réflexion philosophique propre, qui n'aura aucun autre but que d'en confirmer ou infirmer la réalité." Etienne Gilson, *D'Aristote à Darwin et retour* (Paris: Vrin, 1971), p. 9. Similarly, Balme points out that while some teleologists have inferred that a supernatural cause guides events towards goals, such an inference relates to the nature of the *efficient* cause. "This is a possible inference, but not a necessary one. It was not Aristotle's." See D.M. Balme, *Aristotle's Use of the Teleological Explanation*, Inaugural Lecture at Queen Mary College, University of London, June 1, 1965, p. 3.

⁶⁹ For example, *The Cambridge Dictionary of Philosophy*: "Telos: ancient Greek term meaning 'end' or 'purpose'". (p. 792); *The Encyclopaedia of Philosophy*: "Teleology: If we grant that there is such a thing as purposive or goal-directed activity... we may ask the following questions..." (Vol. 8, p. 88); *A Companion to Metaphysics* (Blackwell): "Teleology: Classically, teleology has referred to the appearance of purpose in nature, in particular, purpose not underwritten by conscious human intent." (p. 489).

⁷⁰ Colas Duflo, *La finalité dans la nature* (Paris: Presses universitaires de France, 1996), p. 9

⁷¹ *PP* in CSM I, 202.

And yet, the equation of final cause and God's purpose, so obvious to Descartes, is not evident in the Greek, Stoic or Renaissance philosophers. Aristotle talks about 'directedness' not purpose; Plato talks about a tendency to perfection; the Stoics talk about living in accordance with nature. Only a half-century before Descartes' *Discours*, Giordano Bruno held that spirit, soul, and life are all immanent in nature and the final cause is the perfection of the universe.⁷² According to Balme, teleological explanation "is not applied to intentional behaviour, and perhaps the best way to start considering it is by distinguishing it from purpose."⁷³

It is interesting to compare the Cartesian and modern interpretation of teleology with that of the Greeks which refers neither to God nor to purpose. Liddell & Scott's Greek-English Lexicon gives as the first meaning of *telos*: "the fulfilment or completion of a thing"; followed by "an end, extremity", with *es telos* meaning "to the uttermost". The third meaning given is "the end proposed, chief matter, the end of an action" (in the sense of 'highest good' or 'chief good') which could imply purpose but is, it must be noted, related to action, and more precisely, human action. The fourth meaning given is: "a being complete or perfect, perfection, full age". Liddell and Scott also tell us that the strict sense of *telos* is "not as the ending of a past state but the arrival of a complete and perfect one." The word 'purpose' does not appear among the meanings of the edition consulted.⁷⁴

⁷² Giordano Bruno, *Cause, Principle & Unity*, transl. Jack Lindsay (New York: International Publishers, 1964), p. 89.

⁷³ Balme, *op. cit.*, p. 3.

⁷⁴ H.G. Liddell and Robert Scott, *Greek-English Lexicon* (Oxford, 1901). Another interesting etymological detail: the Stoics differentiated between 'end' and 'purpose', using *telos* for 'end' and *skopos* for 'purpose'. Interestingly, Liddle & Scott include 'aim', 'end' or 'object' among the meanings of *skopos*, but the primary meaning is "one that watches, one that looks after things...a look-out man, stationed in high places to overlook a country..." I do not want to go too far down the etymological road, which I am quite

Teleological explanation, for the Greeks, was used to explain the inherent order and complexity in the universe, as well as change, movement, and an apparent tendency towards goals. It was Aristotle who framed the notion most completely with his idea of the four causes (material, formal, efficient and final, the final cause being the *telos* or that 'for the sake of which' something occurs), as well as with his notion of the unmoved (or prime) mover. The first order of explanation (the fourfold cause) accounts for goal-directedness in things (plants, animals, machines, statues, etc), while the second accounts for the goal-directedness of nature as a whole.

Some explanations of the fourfold causality, either by Aristotle or his commentators, have a clear connotation of purpose. In the case of a statue, for example, the *purpose* of the craftsman is the final cause (and his idea for the shape of the statue is the formal cause, while his work of carving or moulding is the efficient cause). With respect to biological phenomena, the teleological explanation is more complex, but can ultimately be reduced to some kind of functional explanation: horns in animals have a defensive function; birds have long necks or webbed feet so they can either reach down to the ground or forage under water for food. Here there is a tendency towards the best which, in biological terms "means the perfect functioning of the adult animal, which in turn requires the perfect realisation of the form of the species."⁷⁵ There is no connotation of purpose in this kind of explanation. One might say that the purpose of the horns is for defence, but one cannot say that the animal's intent or purpose is to grow horns to defend itself. Nor can one say that God or Nature had a purpose in making the animal grow

unqualified to pursue, but do wish to make the point that 'end' does not necessarily imply 'purpose' and, as I hope to show, only comes to do so in a dualistic framework which includes a Divine Artificer or, perhaps, a look-out man stationed in high places!

⁷⁵ Balme, *op. cit.*, p. 6.

horns. As Lerner explains:

Dire que la nature fait ou recherche en toutes choses le meilleur, ne signifie pas pour Aristote qu'elle s'apparente en quelque façon à un démiurge doué de la faculté de délibération....La nature doit être envisagée comme un principe dynamique et inconscient, à la fois cause finale, efficiente et formelle du devenir, plus généralement, du mouvement.⁷⁶

For Aristotle, teleology is non-intentional; it does not carry the connotation of purpose, nor of God's purpose. There is no trace of the divine Artisan in Aristotle's mature work.⁷⁷ Writing about finality in Aristotle Louis Dupré states:

Nature teleologically *directs* organic processes to their *destined perfection*. It establishes the norms that things developing in time must follow if they are to attain their *projected end*.⁷⁸

However, difficult as it might be for the post-Cartesian mind to conceive, such words as "directs", "destined perfection" and "projected end" do not imply "purpose" in the sense of a purposive agent. "Though the teleology of nature rules all things in the *kosmos*, *only in the human person does this entelechy attain the level of purpose*."⁷⁹

The unconscious direction that causes living things to develop into their complete or perfect form is reflected cosmically where the heavenly bodies "through desire for the unmoved mover...move in the manner nearest to the unchanging, that is, in a circle", and where the unmoved mover as the ultimate cause of motion and goal-directedness "is the sustaining cause of nature's finality."⁸⁰ Through this desire inherent in all things, the prime mover, acting "as a kind of metaphysical magnet" becomes "the source of actualization in every form."⁸¹ Thus the inherent directedness does not stop at the level

⁷⁶ M.P. Lerner, *La notion de finalité chez Aristote* (Paris: Presses universitaires de France, 1969), p. 37.

⁷⁷ R.J. Hankinson, "Philosophy of Science" in Jonathan Barnes (ed.), *The Cambridge Companion to Aristotle* (Cambridge: Cambridge University Press, 1995), p. 127.

⁷⁸ Louis Dupré, *Passage to Modernity* (New Haven: Yale University Press, 1993), p. 17.

⁷⁹ *Ibid.*, p. 26. (Emphasis added).

⁸⁰ Balme, *op. cit.* p. 24.

⁸¹ Charles H. Kahn, "The Place of the Prime Mover in Aristotle's Teleology", in Allan Gotthelf (ed.),

of the organism or the species but permeates all of nature--and includes both animate and inanimate nature. In the Greek tradition "the stuff of the world is living, eternal, powerful, and there is no hard line between it and the divine."⁸² None of this implies a transcendent divinity, nor a transcendent purpose. The goal-directed nature of the universe is accomplished through desire and attraction, not purpose.

3.3.2 Part and Whole

Étienne Gilson remarked that "la notion de finalité n'a pas de chance. L'une des raisons principales de l'hostilité dont elle est l'objet est sa longue association avec la notion d'un Dieu créateur et providence."⁸³ But the Greeks did not have the Christian idea of creation *ex nihilo*. Plato's demiurge brought order out of chaos—not out of nothing. Aristotle rejected both the notion of creation *and* the idea of a conscious designing artificer. While natural processes are, for Aristotle, goal-directed, this must be understood as a tendency toward an end-state, an actualizing of form. As Hankinson points out, these tendencies or strivings do not arise "out of the edicts of some divine dictator", but "[r]ather the form itself is an internal structural principle striving to actualize itself as the fully mature individual."⁸⁴

In his biological writings, Aristotle's teleology is invoked to explain not only the function of parts, as described above, but also to explain the relation of part to whole and the adaptability of animal structures.⁸⁵ For Aristotle "the concept of a part only makes

Aristotle on Nature and Living Things (Pittsburgh and Bristol: Mathesis Publications, Inc., and Bristol Classical Press, 1985), p. 184, 190. Kahn refers to this view of Aristotle's teleology as the 'broader view' which he defends along with other commentators such as Zeller. Other recent commentators hold a 'narrow view' which would limit the teleological influence of the unmoved mover to the heavenly sphere (see notes 1 & 2, p. 203).

⁸² Balme, *op. cit.*, p. 24.

⁸³ Étienne Gilson, *D'Aristote à Darwin et Retour*, *op. cit.*, p. 9.

⁸⁴ Hankinson, *op. cit.*, p. 128.

⁸⁵ *Ibid.*, p. 128.

sense in the context of a completed whole” and thus finality plays a role in the nature of the efficient cause.⁸⁶ And the phenomenon in its totality is cosmic:

Thus the cosmic teleology reaching down from the outer heavens is thought of as including both inanimate nature and the biological world, where it will coincide with the patterns of immanent teleology, including the hierarchical ordering of elements, tissues, and organs within the organism.”⁸⁷

In spite of the cosmic dimension of Aristotle's teleology, many of his examples deal with animal life, i.e., explaining the relation of part to whole in the form and functioning of individual organisms. The teleology of the Stoics, however, is more overtly all-encompassing and is evident in both their physics (with its complex notion of interconnecting causality where every part of the cosmos is related to the whole⁸⁸) and their ethics where ‘the end’ is considered to be “that for the sake of which everything is done, but which is not itself done for the sake of anything.”⁸⁹ What this means for the Stoics is “living in agreement”, or “living in accordance with one concordant reason”.⁹⁰ As Long & Sedley express it: “The nature with which one is to live in agreement is both one’s own rational constitution as a person, and the rationality of universal nature or god. These are related as ‘part’ to ‘whole’.”⁹¹ In principle, the nature of a person and the nature of the universe are in accord and this accord or harmony is knowable—in fact, that is the quest of wisdom: to live well by living in accordance with nature. Happiness is

⁸⁶ *Ibid.*, p. 132.

⁸⁷ Kahn, *op. cit.*, p. 193.

⁸⁸ See S. Sambursky, *The Physics of the Stoics* (Princeton University Press, 1959): “...the law of causality supposes an immanent and pre-established order in the world by which the succession of single events and the interconnection of phenomena, including those related through divination, is determined once and for all” (p. 68). For the Stoics, “every partial system of the cosmos must be regarded as having some relation to the cosmos as a whole, and it is in this sense only that the cosmos in its totality can be denoted as a perfect body... This mutual exchange means mutual dependence: one partial system in the course of the life of the cosmos might gain at the expense of another, and vice versa; the cosmos as a whole, however, being the sum total of all possible partial systems, is perfect in the sense of independence and self-support.” (p. 114).

⁸⁹ A.A. Long & D.N. Sedley, *The Hellenistic Philosophers* (Cambridge University Press, 1987), p. 398.

⁹⁰ *Ibid.*, p. 399.

this state of harmony between the individual and the universe. For the Stoics, reason and nature are one.

This is not teleology expressing human purpose; the finality being expressed is *in nature itself*. This can be seen clearly in the Stoic concept of *oikeiosis*, a term which renders the idea of recognizing something as *belonging* to one (but with a connotation of relationship rather than ownership), a recognition related to the body and what it needs to preserve itself.⁹² The Stoics believed that the first thing appropriate to every animal right from birth is its own constitution and the *consciousness* of this. (As expressed by Cicero: "...a living creature feels an attachment for itself, and an impulse to preserve itself and to feel affection for its own constitution..."⁹³). This concept of an innate *awareness* of the body and its functions served as a grounding for Stoic arguments about the virtuous life being a life lived in accordance with Nature. Man is capable of living in accordance with Nature because he is capable of understanding his own nature, his own natural constitution, his own strengths and weaknesses. Since every nature is different, what is in accordance with Nature for each individual is different and must be learned—and learned over a lifetime—for wisdom comes only after long experience. At the beginning, however, this impulse to self-preservation is innate and conscious and goes beyond instinct. There is a subjective element built into the concept right from the beginning. At a very fundamental, if obscure level, the animal or child is aware and assenting. Seneca says:

"Every one of us understands that there is something which stirs his impulses, but he does not know what it is. He knows that he has a sense of striving, although he

⁹¹ *Ibid.*, p. 400.

⁹² The term *oikeiosis* has different translations. Long & Sedley use *appropriation* for *oikeiosis*; other translations in the literature are: *orientation*, *belonging*, *attachment*, among others.

⁹³ Cicero, *De Finibus Bonorum et Malorum*, H. Rackham, transl. (Loeb Classical Library, 1914), p. 233.

does not know what it is or its source. Thus even children and animals have a consciousness of their primary element, but it is not very clearly outlined or portrayed.”⁹⁴

The link between individual and the whole of nature is not one of individual purpose nor is it the result of a transcendent purpose. In fact, the impulse or striving comes from within nature and within the individual equally, or, more correctly, being within nature, it is also within the individual.

The idea of finality as equilibrium or harmony of the whole is evident to different degrees in many philosophers of the Renaissance but none more so than in the work of Giordano Bruno whose ‘world soul’ is both immanent and intelligent and ‘directs’ the efficient cause. The ‘world soul’ and the ‘Universal Intellect’ are basically the same thing, and it is this intellect which produces all things, “infusing and bringing something of its own into matter, and itself remaining restful and immobile.”⁹⁵ At the same time, the Universal Intellect is also the efficient cause, “the formative and organizing force, which operates from the depths of nature and is unthinkable apart from nature.”⁹⁶ Thus, for Bruno, the efficient cause is already imbued with elements of the final cause, the latter being, for him, the perfection of the universe, “the fullest possible actualisation of all the possible determinations of matter.”⁹⁷ Bruno’s universe is a harmonious whole with all its parts in mutual relation to each other and to the whole. With Bruno one can say that every individual is determined by his place in the overall totality of beings and, much like the Stoics, the primary goal of wisdom is to find the perfect balance in any

⁹⁴ Seneca, 121.13. *Ad Lucilium Epistolae Morales*, (transl. R. M. Gummere, Loeb Classical Library, 1962). See also Pembroke (*op.cit.*, p. 120) who points out that the Stoics differed from other philosophies of antiquity in that “childhood is accorded the status of a fully natural phenomenon and that the child himself is treated as the chief agent in his own education”.

⁹⁵ Giordano Bruno, *Cause, Principle & Unity*, transl. Jack Lindsay (New York: International Publishers, 1962), p. 81 (2nd Dialogue).

⁹⁶ *Ibid.*, p. 24.

given context.

3.3.3 Anthropomorphic? Anthropocentric?

The preceding analysis demonstrates that in a monistic universe, the dynamic principle is internal; the divine, to the extent it is admitted at all, is immanent; and finality goes beyond the notion of purpose (where it does not reject it completely) to encompass the notion of the perfection of a whole and the relation of the parts to that whole. At the same time it is not considered necessary to define the whole other than in terms of harmony, equilibrium or perfection.⁹⁸ The idea of 'end' or 'direction' is the ultimate completion of the whole (be it the single organism in Aristotle or the whole of nature for Bruno and the Stoics) and the idea of efficient cause can only make sense if it is seen as being 'guided' by the final cause or teleological principle.

Teleology, in this sense, is not anthropomorphic, because it does not rest on any idea of conscious purpose. It does not follow the model of the artist making a statue

⁹⁷ *Ibid.*, p. 25.

⁹⁸ Paul Janet points out that the question of ends and the question of an intelligence which designs or plans those ends are two separate questions. One can ask: "If there are ends, is there an intelligence?". But one can also simply ask: "If there are ends, by what are they recognised." *Op. cit.*, p.12. I believe the rejection of final causes is based, in part, on not separating out these two questions and even adding a third: "If there are ends, what are they?" This confusion of questions is evident if one looks at the question of evolution. For Janet, for example, evolution presupposes finality because attributing to nature "a spontaneous property of accommodation and adaptation" is "nothing else than finality itself under another name. For to say that it is a law of organized matter spontaneously to find the best combination for its preservation and growth, is precisely to attribute to it an essential innate instinct, which implies an obscure foresight of the end, and an unconscious yet precise choice of the means." (p. 179). But for a modern evolutionist, presupposing final causes without explicating them is meaningless. Ernst Mayr, for example, who agrees that there are different meanings to 'teleology' and that Descartes et al banished all of them when some of them should have been maintained, will not admit finality in a general sense. He quotes Waddington as saying that natural selection "in itself suffices to determine, to a certain degree, the nature of the end towards which evolution will proceed, it must result in an increase in the efficiency of the biosystem as a whole in finding ways of reproducing itself". But he criticises him because "[h]e refers here to completely generalized processes, rather than to specific goals" and Mayr finds this over-extension of the concept of goal-direction "ludicrous". (The Stoics, I believe, would not agree). See Ernst Mayr, *Toward a New Philosophy of Biology: Observations of an Evolutionist* (Cambridge, Mass.: Harvard University Press, 1988), p. 43. For an interesting discussion of biological causality, including evolution, in terms of finality (which the author refers to as "loi-conséquence" or "force résultante"), see Jean Gayon, "La biologie entre loi et histoire", in *Philosophie* (Paris: Éditions de minuit, 1993, numéro 38), pp. 30-57.

because it does not entail an artist separate from the statue nor does it entail a plan or a design. For the analogy to work, the artist would have to be part of the statue!⁹⁹ In fact, Aristotle himself dealt with this question by pointing out that nature is not imitating art in teleology, but rather it is art trying to imitate nature when the artist establishes a deliberate design. The true artist creates spontaneously in the same manner as nature—and no conscious deliberation or will is needed. In the *Physics*, Aristotle tells us that it is absurd to deny ends because of the absence of deliberation. "Art does not deliberate; and art differs from nature only in that the motive principle is not in the thing moved."¹⁰⁰

Neither is teleology, in this context, anthropocentric. Man has his place in nature but he does not dominate it.¹⁰¹ In Bruno, for example, man is part of nature and nature's process of self-realization. "Talk about man is an incidental subject in cosmology", Blumenberg tells us; and he continues: "If man rises above the other beings, then that is not to be understood as a central and unique position in the world, but rather as raising to a higher power the universal tendency towards transformation of whatever is given, as a translation of the process into 'work'." Seen in this light, the transformation of nature or even going beyond nature becomes a form of participation. "Self-empowerment over

⁹⁹ Cf. Kant: "In considering nature and the ability it displays in organized products, we say far too little if we call this an *analogue of art*, for in that case we think of an artist (as a rational being) apart from nature". *Critique of Judgment*, transl. Werner S. Pluhar (Indianapolis and Cambridge: Hackett Publishing Company, 1987), p. 254. Kant believed that that intrinsic natural perfection is not conceivable or explicable by any causal analogy known to man. See also Gilson, *op. cit.*, p. 23, who states that while we tend to think that Aristotle imagines nature as an artist choosing his ends, in fact "il est encore plus vrai de dire qu'en dernière analyse, Aristote conçoit l'artiste comme un cas particulier de la nature."

¹⁰⁰ W.D. Ross (ed.), *Aristotle Physics* (Oxford: Clarendon Press, 1936), p. 357.

¹⁰¹ This statement could be challenged in relation to the Stoics since Cicero tells us that "Chrysippus excellently remarked that everything else was created for the sake of men and gods" and thus man can make beasts serve his own needs. However, this should be seen in the larger context of everything being made for the sake of other things (e.g. crops and fruits for the sake of animals) and their belief that animals have souls (not to mention the possibility that, if men were made for the sake of gods, perhaps some degree of humility towards the rest of nature would be a wise thing!).

against nature is reinterpreted as empowerment by nature.”¹⁰²

Christianity transforms this picture of universal harmony of parts within a whole with the idea of a dualistic universe consisting of a created world and a transcendent God who created it, keeps it going and has purposes for it which are external to nature. Balme points out how far removed this is from Aristotle because the idea of an omnipotent God and creation *ex nihilo* are two ideas that never occurred to Aristotle and further they transform the idea of teleology such that “the source of motion and form—God—is no longer part of the universe.”¹⁰³ Dupré’s statement that, with respect to creation, “if nature for the Greeks emerged, for Christians it was brought to emerge”¹⁰⁴ can be paraphrased in relation to finality which for the Greeks emerged and for Christians was brought to emerge. The Christian notion of teleology can be called anthropomorphic since, unlike the unmoved mover, the Christian God transcends his creation and, like the artist and the statue, is the formal, efficient and final cause. God and his creation are modelled on man and his creations.

More importantly, the idea of ‘end’ or ‘direction’ in Christian thought is eschatological: the world comes to an end with God’s final judgment, and the ultimate meaning and purpose of the world are outside the world and outside history.¹⁰⁵ Within the context of the Christian preoccupation with both the beginning of the world (creation

¹⁰² Blumenberg, *op. cit.*, p. 590.

¹⁰³ Balme, *op. cit.*, p. 27.

¹⁰⁴ Dupré, *op. cit.*, p. 30.

¹⁰⁵ It is interesting to speculate on how much the notion of ‘purpose’ may be tied to the Christian philosophy of history so clearly set out by Augustine in the *City of God*. Both purpose and progress are implicit in Christianity’s view of time (and history) as linear (in spite of Augustine’s rejection of earthly progress); these terms have little meaning in the Greek cyclical view of time. For Augustine, history has a goal, but that goal is, itself, outside of history. History is the working out of God’s plan and, while God’s purpose may be embodied in man’s actions, divine purpose and activity work outside of history and override it. Providence is not immanent in history. For an elaboration of Christian historiography and its contrast with the Greek, see R.G. Collingwood, *The Idea of History* (London: Oxford University

ex nihilo) and the end of the world (redemption) both of which reflect God's will and purpose, it is not surprising that teleology comes to mean 'God's purpose' for nature rather than unconscious direction in nature itself. In fact, what is surprising is the extent to which the naturalistic philosophies of the Renaissance were accommodated at all.¹⁰⁶

The Christian view of God's purpose also tends to be anthropocentric because of the belief that only humans have souls and thus are superior to all other life on earth as well as the belief in redemption and eternal life in the Heavenly City. Human destiny is thus divorced from that of Nature. In Augustine's words,

God, the wise Creator and just Ordainer of all natures, has made the mortal race of man the loveliest of all lovely things on earth. He has given to men good gifts suited to their existence here below... These good gifts are granted, however, with the perfectly just understanding that whoever uses the goods... as these goods should be used, will receive more abundant and better goods—nothing less than immortal peace and all that goes with it."¹⁰⁷

It could be pointed out, however, that although science rejected final causes because they were anthropomorphic and anthropocentric, what resulted from the Baconian call for unlimited control over nature (based on the belief that nature had no purposes of its own) is anthropocentric to the core.¹⁰⁸

When Descartes banishes final causes from philosophy stating that "we should not be so arrogant as to suppose we can share in God's plans", it is clear that he interprets the

Press, 1956), part I and II.

¹⁰⁶ Considerations of length prevent a discussion of how Christianity adapted itself to Greek ideas for so long. Dupré points out that Christianity succeeded "to a surprising degree in integrating the ancient idea of nature with its doctrine of creation" (p. 30) and that this is true can be seen in many of the philosophers of the Renaissance who revived Greek thinking and were themselves priests or theologians (e.g. Ficino). Some, of course (e.g., Bruno) pushed their syncretism to limits unacceptable to the Church.

¹⁰⁷ Augustine, *The City of God* (New York: Doubleday, 1958), p. 458.

¹⁰⁸ In this regard Blumenberg (*op. cit.*) discusses Nietzsche's rejection of all teleology and his assertion that science has "held fast to the teleological premise... [t]he assumption that if not reality itself, then at least the truth about it must be useful and beneficial to man, appears to Nietzsche as the last, hard-to-recognize remainder of that teleological metaphysics...." (p. 140). He says further that for Nietzsche, "Technique... derives from a teleology that compensates obedience to the laws of nature with mastery over nature..." and is "the epitome of the surrogates for the lost natural teleology benefiting man." (p. 142).

notion of final cause as meaning God's purpose. But it can also be seen that in rejecting final causes as God's purpose he is also rejecting them in the Greek and Renaissance sense of immanent direction or as the relation of the part to the whole. Only efficient causes will be allowed ("We must not examine the final causes of created things, but rather their efficient causes") and God is the efficient cause of all things.¹⁰⁹

Descartes does not deny that there *are* final causes in the sense of God's purposes; he denies that we can know them and he denies that they are immanent in nature. Duflo asserts that Descartes' rejection of final causes is methodological and not ontological.¹¹⁰ This rationalisation of the Cartesian position underestimates the enormity of the rupture that Descartes has brought into thinking about the world. In the first place, the refusal of any immanent finality is an ontological position which reflects Descartes fundamental mind-body dualism and cannot be seen as merely methodological. Secondly, rejecting final causes for methodological reasons ultimately determines their ontological status as objects of science since, as Jonas points out, "representing the only *knowable* aspect of nature they, by a tempting substitution, came to be regarded as its *essential* aspect too...as the only real in reality."¹¹¹ In addition, the rejection of final causes limited the scope of the scientific search for knowledge. As Kant point out in his *Critique of Judgment*,

... if we want to investigate the organized products of nature by continued observation, we find it completely unavoidable to apply to nature the concept of an intention, so that even for our empirical use of reason this concept is an absolutely necessary maxim...we must at least try this maxim of judgment on the whole of nature too, since this maxim may well allow us to discover many further laws of nature that would otherwise remain hidden to us since our insights into the

¹⁰⁹ PP in CSM I, 202 (AT VIIIA, 16) The idea of God as the efficient cause of all things is not without problems; these are discussed in Chapter 4.

¹¹⁰ Duflo, *op. cit.*, p. 34.

¹¹¹ Jonas, *op. cit.*, p. 10. This is clear in Descartes' insistence that the *essence* of matter is extension, for example. It is not a methodological hypothesis.

inner nature of its mechanism is so limited.¹¹²

Surely it is unscientific to claim that something exists but that the search for it is futile! More importantly, even if Descartes accepted final causes in the sense of God's purpose as existing but unknowable, it is certain that he rejected any notion of final cause as an immanent principle in nature. Both the idea that nature is alive and the idea that it has an immanent end or direction were, for him part of the magical baggage of the Renaissance that had to be rejected. This was, at least in its beginnings, a purely Western phenomenon. Only in the West were these epistemological obstacles overcome, and only in the West did mechanistic science evolve.

3.4 Epistemological Obstacles Not Overcome: Science and the East

If naturalism and final causes were really epistemological obstacles to mechanistic science, a corollary to this would be that where such notions, or similar notions, persisted and were not 'overcome', mechanistic science could not have taken root. This question is addressed at length by Cohen in his book, *The Scientific Revolution, A Historiographical Inquiry*. Cohen deals, in particular, with the non-emergence of modern science in both the Arab and Chinese civilizations and he devotes a great deal of space to Joseph Needham's work on Chinese science.¹¹³ With respect to the non-emergence of mechanistic science in China, Needham's analysis raises two aspects of Chinese philosophy and science that are relevant to this thesis: the absence of any conception of 'laws of nature' and the pervasiveness of an organic approach to nature

¹¹² Kant, *op. cit.*, p. 280.

¹¹³ Needham's work is the fifteen-volume *Science and Civilisation in China* (Cambridge University Press, 1956).

which he calls 'organic materialism'.¹¹⁴

According to his analysis, in the West, by the seventeenth century, two distinct concepts of laws of nature had been differentiated: "law as valid for all human beings and laws obeyed by everything in nature that is not human."¹¹⁵ No such differentiation existed in Chinese philosophy where order and pattern in nature are perceived but not explained through any notion of law: "Universal harmony comes about not by the celestial fiat of some King of Kings, but by the spontaneous co-operation of all beings in the universe brought about by their following the internal necessities of their own natures."¹¹⁶ Humanity is a part of this universal harmony and is not subject to a different level of causality than the rest of nature. In addition, there is no idea of a Creator nor of a personal God in Chinese thought; therefore "no idea emerged that man might recognize rational order in nature through the decipherment of a divine code."¹¹⁷

With respect to organic materialism which pervades the Chinese conception of nature, Needham speaks of 'coordinative thinking' or 'associative thinking', an 'intuitive-associative system' which has a logic and causality of its own and which he contrasts with the 'subordinative' thinking of Western science which subjects everything to external causation.¹¹⁸ This way of thinking seeks out causes in Nature but not causes in the sense of Western science since "nothing was un-caused, but nothing was caused mechanically":

¹¹⁴ Both Cohen and Needham raise other reasons as well, some which were economic and sociological, including what Needham calls a 'feudal bureaucracy'. However, these two issues are important for Needham in his analysis and, with respect to organic materialism Cohen states that, in Needham's view, it "is the very element that needs to be fused with the mechanical science of the Scientific Revolution so as to relieve the latter of its one-sided, mathematical reductionism." Cohen, *op. cit.*, p. 463.

¹¹⁵ Cohen, *op. cit.*, p. 454. This reflects Duflo's point above. It is also reinforced by Toulmin who sees one of the aspects of the division of Nature and Humanity as the belief that rationality and causality follow different rules. Stephen Toulmin, *Cosmopolis, The Hidden Agenda of Modernity* (Chicago: University of Chicago Press, 1990), p. 109.

¹¹⁶ *Ibid.*, p. 454.

¹¹⁷ *Ibid.*, p. 455.

The symbolic correlations or correspondences all formed part of one colossal pattern. Things behaved in particular ways not necessarily because of prior actions or impulses of other things, but because their position in the ever-moving cyclical universe was such that they were endowed with intrinsic natures which made that behaviour inevitable for them.¹¹⁹

In this view things are not caused mechanically; it is not law but mutual adaptation, not a chain of events but a web of interdependence. What is interesting about this description is how closely it conforms to the Ficinian universe of mutual interaction and the idea that things in the universe which have the same qualities resonate with or energise each other. The idea of a web of interdependence is also very Stoic and reflects the fact that Eastern and Western thought may once have been much closer than they became after the scientific revolution.¹²⁰ Similarly, Chinese thinking about correspondences between the body of man and the cosmos is reflected in the Renaissance idea of macrocosm and microcosm. In fact, states Needham,

if anything in Europe was analogous to ancient and medieval Chinese thinking in terms of cosmic pattern or organism, it was this doctrine, though it never dominated Western ideas to the same degree.¹²¹

At the same time, Needham resists comparison with Stoicism, which he identifies with pantheism (a position which can be disputed), although he does see some connection between *Chi* and *pneuma* and admits that the *logos spermatikos* of the Stoics "is certainly a conception somewhat parallel to the principle of order, *Li*, in every particular collocation of *Chi*." ¹²² He also rejects any strict comparison between *Chi* (matter) and *Li* (form) and the Aristotelian concepts of matter and form since he believes that "*Li* was not in any strict sense metaphysical, as were Platonic and Aristotelian forms, but rather the

¹¹⁸ Needham, *op. cit.*, Vol. II, p. 280.

¹¹⁹ *Ibid.*, p. 283, 281.

¹²⁰ This point is raised further in Chapter 4 with the discussion of animal spirits, *pneuma* and life-breath.

¹²¹ Needham, *op. cit.*, p. 294.

invisible organising fields or forces existing at all levels within the natural world."¹²³

The similarities and differences between Chinese organic materialism and the various naturalistic philosophies of the Renaissance are subtle and complex and I do not want to forcefit either to the other. What is important is that Chinese science, among other things, did not reject or overcome the 'obstacles' to mechanistic science, either by reducing matter to inertness or by reducing causal explanation to efficient causes. Cohen suggests that it was only in the West that people

adopted a dual attitude which alone made possible the very type of involved detachment toward nature that enables the man or woman of science to turn it into an object. Once taken for an object, nature can be subjected to mathematical analysis of the phenomena it presents to us, and to that characteristically Western determination to bend it to human will.¹²⁴

Thus, in Cohen's assessment, "organic materialism ran into a 'magnificent dead end', whereas somehow out of Aristotelianism and some other, scattered (and meanwhile enriched remnants of the Greek legacy) a kind of science could be forged that went on the conquer the world."¹²⁵

The Iranian historian of science Seyyed Hossein Nasr, a Sufi philosopher and American-trained physicist has a different view which posits a refusal to entertain certain possibilities rather than an inability to overcome certain obstacles:

¹²² *Ibid.*, p. 476.

¹²³ *Ibid.*, p. 475.

¹²⁴ Cohen, *op. cit.*, p. 487.

¹²⁵ Cohen, *op. cit.*, p. 465. In my view this remark of Cohen's shows a prejudice common to many historians of science: the belief that modern science has indeed conquered the world. Perhaps the emergence of super bugs, deadly and uncontrollable viruses and ecological disasters in the late twentieth century should temper this kind of enthusiasm and force a re-evaluation of some aspects of organic materialism. For a different view of Chinese science, as expressed in Chinese medicine, see Leon Hammer, M.D., *Dragon Rises, Red Bird Flies: Psychology & Chinese Medicine*. According to Hammer, an American psychiatrist trained in Chinese medicine, "Chinese medicine is science in its original and most creative form. It has perfected the art of observation, the superb refinement of our senses, blended it with rigorous logic, and enriched it with the intuitive gifts and varied experience and personality of the observer...Chinese medicine is far more faithful to the basic tenets of science, in the primary sense of its meaning, than is modern Western medicine..." (p. 40). But from the Western point of view it is a

The main reason why modern science never arose in China or Islam is precisely because of the presence of metaphysical doctrine and a traditional religious structure which refused to make a profane thing of nature... The most basic reason is that neither in Islam, nor India nor the Far East was the substance and stuff of nature so depleted of a sacramental and spiritual character, nor was the intellectual dimension of these traditions so enfeebled as to enable a purely secular science of nature and a secular philosophy to develop outside the matrix of the traditional intellectual orthodoxy.¹²⁶

Whether one agrees with Cohen that Western science has conquered the world, or with Nasr that it represents an enfeebled intellectual dimension, it would seem clear that where consciousness in any or all of its forms was evacuated from the idea of nature, mechanistic science developed, and where the idea that nature was imbued with consciousness persisted, it did not. One can conclude that both naturalism and final causes represented obstacles to mechanistic science since both represent the presence in nature of consciousness in some form. The question thus becomes : how were these obstacles overcome? Did they simply disappear or become irrelevant? Were the things they dealt with proven to be non-existent? Or were they purposefully and systematically excluded?

3.5 Banishing the Obstacles

So far in this chapter I have been examining the idea of epistemological obstacles to the new science of the seventeenth century following Bachelard's model and seeing how it fits with the rejection of two notions that were important in the sixteenth century but virtually disappeared with the rise of mechanistic science in the seventeenth century. I have been discussing various aspects of naturalism and, in particular, the notion of final

'magnificent dead end'.

¹²⁶ Seyyed Hossein Nasr, *Man and Nature* (Chicago: ABC International Group, Inc. 1997), p.97. This statement is an indictment of Western science that may simply reflect another prejudice. However, it

causes to show how these notions served to link body and soul and man and cosmos in pre-mechanistic natural science. I have also shown that where these notions (or variations on them) persisted, mechanistic science did not evolve.

In this section I want to explore the evolution of mechanism from the point of view of its philosophical implications and to ask whether or not it was as inevitable as Bachelard's notion of epistemological obstacle requires. I will be looking in particular at the influence of Mersenne in the evolution of mechanism and at Lenoble's position that mechanism developed as a reaction to naturalism and I will put into question the necessity of this development from the point of view of philosophy.

In *The Phenomenon of Life*, Hans Jonas states:

In any account of what the scientific attitude, as such, postulates in, and what it excludes from, its objects, foremost among the exclusions will stand that of teleology, i.e. of final causes....the exclusion of teleology is not an inductive result but an *a priori* prohibition of modern science.¹²⁷

The idea of the prohibition of final causes *a priori* appears to contradict Bachelard's idea that epistemological obstacles are recognized after the fact, that they represent a 'repentir intellectuel'. As Jonas further points out, "there is not first a record of persistent failure to detect them in nature...[t]he mere search for them was quite suddenly, with the inauguration of modern science, held to be at variance with the scientific attitude."¹²⁸

We have already seen in Chapter 2 that Descartes could not arrive at the most basic points of his method without already assuming the distinction of mind and body, of knower and known, as well as the absence of any immanent principle of life or direction in the universe. It is fundamental to his dualism that consciousness and nature are

serves as an antidote to the notion expressed by Cohen that Western science conquered the world.

¹²⁷ Hans Jonas, *The Phenomenon of Life* (New York: Harper & Row, 1966), p. 33.

¹²⁸ Jonas, *op. cit.*, p. 33.

radically distinguished. He has already answered Lenoble's question, without ever having clearly posed it. While Descartes did do some experiments and spend years dissecting corpses of animals to further his study of physiology, none of this empirical work affected his first principles. Though he will later state in a letter to Mersenne that "I have spent much time on dissection during the last eleven years...but I have found nothing whose formation seems inexplicable by natural causes,"¹²⁹ this was written twenty years after beginning the *Regulae*, where the basic principles of method and mechanism are already in place.

There was an 'intellectual crisis' at the turn of the Seventeenth Century, one that left the scientific and philosophical world in anticipation of a "new philosophy".¹³⁰ The crisis, which has already been referred to, came about because of the void created by the recognized limitations of Aristotelian philosophy, combined with the threat of the animistic tendencies of Renaissance naturalism. Mersenne has already been mentioned as being aware of the crisis and as opposing the naturalistic philosophies with all of his considerable intellectual and religious force. Mersenne was a close friend, mentor and confidant of Descartes and each influenced, and was influenced by, the other.¹³¹ They were in constant correspondence between 1629 and the death of Mersenne in 1648. Mersenne acted as an intermediary in the circulation and publication of Descartes' writings and argued with him extensively in their correspondence on points of science and metaphysics, raising both his own arguments as well as those of others.¹³²

¹²⁹ CMSK, 134. By 'natural causes' Descartes means the same mechanical causes "as in my Meteorology I explained the origin of a grain of salt or a crystal of snow."

¹³⁰ See Menn, *op. cit.*, for a detailed discussion of the downfall of Aristotelianism and the "expectation of a new philosophy" (p. 39).

¹³¹ This being said, it must be recognized that the two did not meet until 1624, long after Descartes' messianic experience of November 1619, as well as the writing of the early *Regulae*.

¹³² See Lenoble, *Mersenne, op. cit.*, p. 36 on the role of Mersenne as intermediary in the intellectual milieu

Lenoble has pointed out how Mersenne was not a disinterested mediator. While he did not clearly understand, in the early years, what the 'new philosophy' should be, he did understand clearly what it should not be, and he vociferously attacked naturalistic ideas in his early works. His great target in *L'Impiété des Déistes* was Giordano Bruno and his pantheism, but he attacked all those who threatened to replace Aristotle with Neoplatonic and other animistic ideas.¹³³ He was fervently opposed to the idea of a world soul as well as all the other aspects of esoteric or Eastern thought which "venait heurter durement à la porte de l'Occident grec et chrétien."¹³⁴

At this point in his writings, he was on the defensive, resisting and attacking the naturalists at every opportunity. But by 1634, he was on the offensive, replacing his attack on naturalism with a enthusiastic campaign in favour of mechanism. By this date he had published his own ideas on mechanism, contained, among others, in his *Harmonie universelle* and in his essay *Les Mécaniques de Galilée*,¹³⁵ and he knew in what direction he wanted the new philosophy to go. In the words of Lenoble, "Jusqu'à cette date il cherche; en 1634, il a trouvé, et ce qu'il a trouvé, c'est le Mécanisme."¹³⁶ *Les Mécaniques de Galilée*, published after the condemnation of Galileo, offered support for Galileo's theories but also, Mersenne insisted, confirmation of his own. The essay is, in

of the time and, particularly in relation to Descartes, as the single line of communication through which all who wanted to correspond with him had to pass.

¹³³ Marin Mersenne, *L'Impiété des Déistes, Athées et Libertins de ce temps, Vol. I* (Stuttgart-Bad Cannstatt, 1975; reprint of Paris, 1624): Regarding Cardano, Mersenne states: "Ce sont ces brigands desquels il se faut soigneusement garder en ce temps icy, auquel il semble que l'impiété vueille empieter sur la vraye religion, & déraciner la verité Catholique de l'ame des gens de bien." (p. 222). Regarding Bruno, he states that "il a attaqué la verité Chrestienne, [et] il est raisonnable de le décrier comme un des plus méchants hommes que la terre porta jamais." (p. 230). Lenoble states that Mersenne "combattrait sans pitié" all the naturalists: Pomponazzi, Paracelsus, Cardano, Telesio, Bruno, Vanini, Campanella. (Vol. II of *L'Impiété* which is a dedicated attack on Bruno has unfortunately, unlike Vol. I, not been reprinted).

¹³⁴ Lenoble, *Mersenne, op. cit.*, p. 158.

¹³⁵ In fact there were five treatises published in 1634 which, according to Lenoble, form a whole. They were the *Questions inouyées*, *Questions harmoniques*, *Questions théologiques*, *Préludes de l'Harmonie Universelle* and *Les Mécaniques de Galilée*.

Lenoble's words, "une application constante du principe d'inertie..." as well as a homage to Galileo, "cet excellent homme, qui a l'un des plus subtils esprits de ce siècle"¹³⁷, brave words for a man of the cloth to write about one who has recently been condemned by his Church. But they are perhaps an indication of the strength of his conviction about the new philosophy for which he had been searching for so long.

It was the strength of this conviction, as well as his considerable power and influence as 'le secrétaire de l'Europe savante' which also explains his efforts to incite other likeminded thinkers to publish and to share their ideas in a cooperative manner. He asked that "une *méthode* permette de travailler 'd'un bon ordre' pour poursuivre les recherches, et que les savants apprennent en même temps à se spécialiser et à collaborer."¹³⁸ The collaboration was not always forthcoming and Mersenne used his position to force a sharing of ideas that was not always desired by the authors themselves. Thus he was known to share private letters or to show unpublished manuscripts to unintended readers, to stir up controversies and, often, bad feelings between rivals (Gassendi and Descartes, for example) and to generally insist that it was the ideas, and not the personalities, that were at stake.¹³⁹ Mersenne was stirring up and bringing into the world the philosophy that would support the mechanistic science being developed by Galileo. Like a good missionary, he was spreading the Word! And this new mission

¹³⁶ Lenoble, *Mersenne, op. cit.*, p. 38.

¹³⁷ *Ibid.*, p. 39, p. 358. The words of homage to Galileo are cited from a letter from Mersenne to de Reffuge, to whom he dedicated the *Mechaniques*.

¹³⁸ *Ibid.*, p. 342.

¹³⁹ Lenoble recounts several incidents involving Descartes. In one case, Mersenne received two letters from Bourdin, one for his eyes only, the other to be sent on to Descartes; he sent both letters to Descartes. When Descartes sent him the manuscript of the *Meditationes*, in order that he seek the approval of the Sorbonne, Mersenne circulated the manuscript to the young Arnauld, to Gassendi and to Hobbes, much to the chagrin of the author. "Pour Descartes", says Lenoble, "la Philosophie nouvelle est son oeuvre à lui; lors donc qu'il demande des objections, il entend que l'on interroge seulement les gens bien disposés. Maladroit Mersenne, qui ne comprend pas cela! Mersenne, en effet, a compris autre chose: c'est que le

replaced his old mission of attacking naturalism. In his mind, mechanism, with his help, was winning: "Au milieu des querelles qu'il anime avec placidité, peu à peu il se forme une doctrine pour lui-même. Ses vieux ennemis, les Sceptiques et les Naturalistes, sont complètement dépassés. Il ne s'en occupe plus...La jeune science mécaniste dissipe toutes les ombres."¹⁴⁰

The year 1634 as a turning point for mechanism, philosophically speaking, is interesting because by that time Descartes had finished writing *Le Monde* and Mersenne was pushing him to publish it. Descartes was promising it to him in 1632 ("I shall make a fair copy of it later and send it to you, but I dare not say when that will be, for I have failed to keep my promises so often already that it pains me to think of it."¹⁴¹). He asked for a reprieve in 1633 ("...I ask you to be so kind as to allow me a year's grace so that I can revise and polish it"¹⁴²) even though he makes it clear, in the same letter, that he does not want to publish the work ("I have never had an inclination to produce books, and would never have completed it if I had not been bound by a promise to you and some other of my friends."). In February 1634, he expresses fear that Mersenne has cooled towards him because of his failure to send him the promised work but at the same time informs him that he has decided "wholly to suppress the treatise I have written and to forfeit almost all my work of the last four years in order to give my obedience to the Church since it has proscribed the view that the earth moves."¹⁴³ Even when Descartes had decided to publish his *Discours* and to add certain well-edited essays based on his

Mécanisme était plus large que le Cartésianisme, et l'avis de Gassendi et de Hobbes l'intéresse autant que le reste." (*Mersenne*, p. 48).

¹⁴⁰ *Ibid.*, p. 49.

¹⁴¹ Letter to Mersenne, June 1632, CMSK, 39 (AT I, 255).

¹⁴² Letter to Mersenne, November, 1633, CMSK, 41 (AT I, 272).

¹⁴³ Letter to Mersenne, April, 1634, CMSK, 42 (AT I, 281).

unpublished *Physics* (which was how he referred to *Le Monde*), Mersenne was still pushing him to publish the earlier work. This can be seen in Descartes reply to him in February 1637: "I find that you have a very poor opinion of me and consider me very inconstant and irresolute, since you think that because of what you tell me I ought to change my plan, and attach my opening *Discourse* to my *Physics*. You seem to think I should give it to the publisher this very day on seeing your letter."¹⁴⁴ Descartes' rare display of humour did not temper the ardour of his mentor as can be seen in a letter he again sent to him later in the same year: "...it seems you are afraid that the publication of my opening *Discourse* may commit me never afterwards to publish my *Physics*" and he makes it clear that while this is so for the moment, if the reasons for his not doing so are removed he will then revise his decision not to publish. "I spoke of my *Physics* as I did solely in order to urge those who want to see it to put an end to the causes which prevent me from publishing it."¹⁴⁵ It is possible that Descartes was being too cautious and that Mersenne's impatience that his *Physics* see the light of day was justified,¹⁴⁶ but the importance here is to point out how much Mersenne was pressing Descartes to publish the one work in which his mechanism was clearly set out. Mersenne was not satisfied with the *Discours* as a full exposition of the mechanism that he himself was promoting, and when it came to the *Meditationes*, the difference between the two became clearer, since Mersenne was not at all in favour of a metaphysical system. When Descartes added his metaphysics to his unpublished physics, Lenoble tells us that "avec un ensemble touchant, les premiers mécanistes la lui laisseront pour compte, Mersenne tout le

¹⁴⁴ Letter to Mersenne, February, 1637, CMSK, 52 (AT I, 348).

¹⁴⁵ Letter to Mersenne, May, 1637, CMSK, 57 (AT I, 368).

¹⁴⁶ Gaukroger points out that "there was considerable dispute at the time as to the wisdom, legitimacy, and standing of the condemnation [of Galileo], and even about its relevance outside Italy"; and that for some "it

premier."¹⁴⁷ Thus Mersenne was more sympathetic to the mechanism of Hobbes and Gassendi (although he was suspicious of the latter's atomism and though the former was suspected of atheism) because they did not surround it with an overall metaphysics as did Descartes. "Par souci de l'expérience, il a quitté le Stagirite et combattu les Naturalistes; par souci de l'expérience, il refusera de s'engager à fond dans l'atomisme ou dans la métaphysique cartésienne."¹⁴⁸

Lenoble makes a strong case for the role Mersenne played in the birth of mechanism that has not, to my knowledge, been refuted. Lenoble has been criticized for lumping too many varieties of naturalism together, but Mersenne himself did that. The importance of Mersenne in the intellectual climate of the time has been confirmed recently by Peter Dear who refers to him as a "one-man scientific journal," a metaphor which "neatly expresses the social implications of his philosophical thought,"¹⁴⁹ and who writes about Mersenne's "cognitive agenda" whereby he "simply defined what could not be known and advocated the pursuit of whatever was left."¹⁵⁰ What could not be known was, of course, the "false science" of the naturalists; what could be known was Mersenne's particular brand of mechanism, which was both empirical and preserved his voluntarist theology.

The general influence of Mersenne is difficult to refute, as is his campaign against naturalism. His influence on Descartes (although this was mutual) is also generally recognized, so much so that Gaukroger asserts that when "Descartes comes to investigate

was a purely Italian affair." See *Descartes*, p. 291 and footnote 177.

¹⁴⁷ Lenoble, *Mersenne*, *op. cit.*, p. 364.

¹⁴⁸ Lenoble, *Mersenne*, *op. cit.*, p. 413.

¹⁴⁹ Peter Dear, *Mersenne and the Learning of the Schools* (Ithaca, N.Y.: Cornell University Press, 1988), p. 3.

¹⁵⁰ Dear, *op. cit.*, p. 48.

the metaphysical foundations of mechanism in his work of the 1630's and 1640's, his programme will be in many ways a detailed and sophisticated development of Mersenne's," and that this pertains as well to Descartes' mechanism as applied to the body.¹⁵¹ The ideas against which he fought so hard were a real threat: the Libertines were in the salons of Paris (some were even in his entourage); so were the Rosicrucians. Mersenne recruited Gassendi in his campaign against the occultist Robert Fludd who had both notoriety and popularity. Then, when the new philosophy of mechanism seemed assured, he sat back and let the rivals fight out the details.

It is difficult, in light of this background manipulation of ideas, to see the arrival of mechanistic philosophy as an inevitable fact and as a necessary overcoming of the naturalistic *obstacle épistémologique*. This is particularly true in face of the fact that other philosophers of the period, while accepting mechanism as a fundamental principle in science, did not accept it as the fundamental principle of philosophy. Gassendi, More, Leibniz and even Spinoza held that there was a more fundamental principle of the whole governing the laws of mechanism.¹⁵² In fact, the more one sees the arrival of mechanistic philosophy as a reaction to the naturalistic philosophies of the Renaissance, the less credible is the suggestion of its inevitability. Frances Yates has documented the Rosicrucian scare in France in the 1620's and she labels the reaction of Mersenne and his writings aimed at eliminating the influence of the Renaissance as a "reaction of fear":

¹⁵¹ *Descartes*, p. 150. "Given that Mersenne's response to mortalism had been the same as that to naturalism proper, namely to establish the inertness of matter, it follows that many bodily functions that had previously been treated organically would now be dealt with in mechanistic terms, and in this sense Descartes' account is fully in accord with Mersenne's programme."

¹⁵² In relation to Spinoza, for example, Victor Delbos states: "...le mécanisme de Spinoza diffère du mécanisme de Descartes...chez Spinoza, le tout dans l'individu s'impose en quelque mesure aux parties dont il est l'union; il a sa loi propre d'existence et de développement...le mécanisme est seulement la loi des modes qui se conditionnent les uns les autres: il ne se réfère qu'à la causalité externe. La causalité interne, qui part de Dieu pour descendre graduellement jusqu'aux essences des modes finis, fait du mécanisme une

This fact is not yet generally understood, and whilst awaiting its recognition it is important that we should try to discover and understand all the circumstances leading up to this momentous change in man's attitude to nature... The failure of the Rosicrucian movement in Germany, its suppression by force and by savagely adverse propaganda, affected the tone of thought in the early seventeenth century, injecting into it an atmosphere of fear. Mersenne too was afraid. He had to protect his own interest in mathematics and mechanics from any taint of conjuring. This gave an asperity to his anti-Renaissance movement which, in less excited times, might have been conducted more gently and *with less loss of the more valuable aspects of the Renaissance tradition*.¹⁵³

The above quotation is not a comment on the Scientific Revolution as such. It is a comment on the sweeping rejection by philosophers of an entire philosophy of nature.

The work and influence of Galileo and the ramifications of Copernicanism in the development of mechanistic science cannot be ignored. However, the development of mechanistic *philosophy* and of the metaphysics that could support the new science only through a complete rejection of the metaphysics of the past reveal another perspective, one that deserves re-examination. The blurring of science and metaphysics in Descartes' work (and his own role in doing both philosophy and science) raises questions about the role of philosophy in the seventeenth century. If in the sixteenth century philosophy was the handmaiden of theology, it has been argued that it has, since the Scientific Revolution, increasingly become the handmaiden of science. In this light the seventeenth century can be seen as a pivotal period of transition where philosophical and scientific concepts overlapped and occasioned varying levels of philosophical discomfort for a philosopher/scientist such as Descartes.

That mechanism in science brought forth successes and eliminated certain theological problems of the type that sent Bruno to the stake is not what is in question here. What I want to address are the questions it left unanswered in philosophy,

explication subordonnée. See Victor Delbos: *Le Spinozisme* (Paris: Vrin, 1993), p. 89-90.

particularly regarding the nature of life and how human life is linked to the life of nature as a whole. Hiding these questions under the carpet (or throwing them out along with magic, astrology and other occult beliefs and practices) did not answer them: it only sent them underground where they have persisted for over three hundred years, popping up every once in a while, making a nuisance of themselves and embarrassing post-Enlightenment philosophy and philosophers. Descartes succeeded in removing rationality and spirit from the heavens and housing them in the mind of man (where over the centuries their living quarters have been considerably reduced—comprising now only the human brain) but he could then not explain how man was connected to the rest of nature. He answered a resounding yes to the question: *faut-il distinguer Nature et Conscience?* But in so doing he created particular problems relating to the human body and its relation to nature. These will be the subject matter of the next chapter.

¹⁵³ Yates, *op. cit.*, p. 112, 113. (emphasis added).

CHAPTER 4

An Anthropological Problem: Lifeless soul; mindless body

*Avec Vésale et ses successeurs le corps se détache de l'homme pour mener son aventure personnelle, et la médecine fait de son étude le principe de sa démarche. La force et la fragilité de la médecine depuis lors est contenue dans ce dilemme qu'à trop vouloir approcher le corps on oublie l'homme dans la singularité de son visage et de son histoire, et à trop vouloir approcher l'homme on rend plus malaisée l'élaboration d'un savoir méthodique...*¹

David LeBreton, *La chair à vif*

The last chapter examined two notions considered as epistemological obstacles to the development of mechanistic science—the world soul and final causes—as well as the rejection of these notions by the early mechanists, in particular, Mersenne and Descartes. This chapter will examine what I will call an anthropological obstacle arising out of the rejection of those notions; by this I mean the creation of a new problem: the need to explain human life without soul and understand body without mind. This anthropological obstacle originated in Descartes' writings on the body and it is one that has never been overcome in more than 300 years of philosophical work on the mind-body problem. Like the epistemological obstacles that, in effect, impede the solution of certain problems or even the asking of certain questions, the anthropological obstacle in turn has rendered questions relating to links between soul, mind and nature inappropriate within the science of the human body.

According to Bitbol-Hespériès, "[l]a question du principe de vie est indissociable

¹ David LeBreton, *La Chair à vif* (Paris: Éditions A.M. Métailié, 1993), p. 107.

d'une conception générale de l'ordre naturel."² The general conception of the natural order that governed the philosophies of the Renaissance was one of the unity of life in the cosmos—expressed by the idea of a world soul which was both cosmic (macrocosm) and earthly (microcosm). The soul of man was held to be made of the same stuff as the soul of the universe and all levels of being partook of the same life to different degrees. The notion of life was intimately connected with the idea of movement or change and the final cause, as the perfection of the whole, assured the interconnection of all things and explained the relation among the various levels of being.

While the Christian ideas of creation and transcendence meant that life came from God rather than nature itself, this did not break the connection between life and soul, nor did it prevent a conception of nature as alive—as the syncretism of the Renaissance naturalists demonstrates. Even within the more conservative confines of scholasticism, the Aristotelian notions of form and matter combined with the notion of multiple causality, while adapted to Christian theology, still assured the interconnectedness of life and soul, soul and body, body and cosmos.

The mechanisation of the natural order that Descartes helped to bring about created a double schism: between life and soul and between human life and nature.³ In the metaphysical mind-matter dualism of Descartes, the concept of life becomes problematic. As was pointed out in Chapter 3, it no longer belongs to a multileveled soul since there is no longer a multileveled soul. The soul is mind and mind only. Life must

² Bitbol-Hespériès, *op. cit.*, p. 9.

³ In addition, through the *cogito*, Descartes created a schism between the newly discovered 'subject' and its own body. This is, of course, the famous mind-body problem that has absorbed philosophers and, more recently, psychologists, for centuries. The mind-body problem is vast and I have intentionally not made it the subject of this thesis. My main concern is with the body side of the mind-body dualism: what happened when body became conceived under a mechanistic paradigm, separated from nature as a whole, and, for the purposes of scientific understanding, devoid of soul and of reason.

fall on the side of body and, as such, it must be subsumed under the 'laws of nature' which govern all bodies. The connection of human life with cosmic life has been broken and the human body must be explained in isolation from other bodies, devoid of any principle of immanence. All bodily movements will be explained by 'natural causes' which, we have seen, for Descartes means the same mechanical causes by which he "explained the origin of a grain of salt or a crystal of snow."⁴ "Descartes évacue tout principe extérieur au corps pour expliquer son mouvement, et sa vie."⁵ The principle of life for Descartes will be what he calls the fire without light; but it will not be the cosmic fire. It will be the heat of the heart, operating according to the laws of fermentation, which are strictly mechanical. Most importantly, the shrunken concept of soul will have no causal connection with the principle of life either of the body or of nature as a whole. Body and nature are matter; soul is thinking mind. Further, reason or intellect being solely on the side of the human mind, there can no longer be any intelligence or mind in nature. Mind has been abstracted from nature and given to the human 'subject'.

In Part I of this chapter, I will examine the twofold influence of Copernicus and Vesalius that contributed to the evacuation of soul from macrocosm and microcosm and the resultant objectification of both Nature and the human body. In Part II, I will examine Descartes' mind-body dualism arising out of the *cogito*, the reduction of the notion of soul to pure thought and the resulting application of the mechanistic paradigm to the human body.

⁴ Letter to Mersenne, February 20, 1639, CMSK, 134 (AT II, 525).

⁵ Bitbol-Hespériès, *op. cit.*, p. 13. This is not entirely accurate since, as will be seen in Chapter 5, Descartes will call upon God, through continuous creation, as the ultimate sustainer of movement and life.

4.1 Macrocosmic and Microcosmic Influences: Copernicus (1473-1543) and Vesalius (1514-1564)

The year 1543 is pivotal in the history of mechanism. This is the date of the publication of two important works which, while unconnected at the time of their publication, had a double influence on the work of Descartes and, ultimately, on his application of the principles of mechanism to the human body. The first, long recognised for its importance and influence, was Copernicus' *De revolutionibus orbium*. The second, lesser known but, I will maintain, also influential, was Vesalius' *De Fabrica*, the first scientific work of anatomy. The coincidence of the publication date of these two pivotal works is symbolic in the history of the human body: what Copernicus did to prepare the way for the mechanisation of the cosmos, Vesalius did to prepare the way for the mechanisation of the human body, the body-machine of Descartes.

This coincidence has not gone unremarked by those whose concern is the human body. In *La Chair à vif*, David Le Breton states:

La parution de la *Fabrica*, la même année que le *De Revolutionibus* de Copernic, situe une date essentielle de ce processus qui aboutit à l'invention du corps dans la pensée occidentale. Ces deux ouvrages ébranlent deux paradigmes fondateurs de la pensée médiévale: l'autorité de Galien pour l'un et celle de Ptolémée pour l'autre.⁶

Hans Jonas has also remarked that the appearance of these two works in the same year "is symbolic of the two sides of the scientific revolution as it eventually took shape: the macrocosmic and the microcosmic, the abstract and the concrete, the mathematical and the empirical..."⁷

Neither Copernicus nor Vesalius made the link between their revolutionary works and the development of mechanistic science, but each played a role in the withdrawal of

⁶ David Le Breton, *La Chair à vif* (Paris: Éditions A.M. Métailié, 1993), p. 74.

the cosmic soul and the human soul from natural philosophy and in the conception of matter—both natural and human—as inert. With respect to Copernicus, the major implication of the notion of the earth moving around the sun was the rupture of the cosmic hierarchy and the subsequent realisation that the earth was just a planet and the other planets were like the earth. The notion of macrocosm and microcosm, of the sub-lunar world as a reflection of the cosmos had to give way. But it was only with the work of Galileo Galilei (1564-1642), in particular with his *Dialogue Concerning Two World Systems* (1632) that the full impact of this was realised: both heavenly objects and earthly objects must be made of the same substance and be subject to the same natural laws.

4.1.1 Galileo: Sunspots and Inclined Planes

It was the observations and experiments of Galileo that signalled the demise of the ancient cosmology and brought about the real Copernican Revolution. One of the pillars of both naturalism and Aristotelianism was the idea of the macrocosm and the microcosm and, whatever the number of levels posited within the cosmic hierarchy, it was held that what was 'above' (the heavenly realm) was perfect and immutable, while what was 'below' (the earthly realm) was imperfect and always changing. Further, the heavens were believed to be composed of essentially different 'matter' than the earth. While earthly matter was considered to be made up of the four elements—earth, air, fire and water—celestial 'matter' was supposed to be made up of a fifth element, the ether or the quintessence. As expressed by Shapin, the quintessence "was an incorruptible sort of matter, subject to different physical principles. So while earth tends to fall until it reaches the center of the universe, and air and fire tend to rise, the heavens and heavenly bodies naturally tend to move in perfect circles, and the stuff of which they are made is

⁷ Hans Jonas, *Philosophical Essays* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974), p. 52.

itself perfect and immutable."⁸ The notion of a world soul (from Plato to the Renaissance) entails the idea that a spark of the heavenly perfection, the quintessence, permeates the earthly realm and, through the notion of a final cause or *telos*, directs its workings.

Along with proving that the earth revolved around the sun (and not vice versa) and thus was neither the centre of the universe nor, in fact, 'below' the heavens, Galileo's telescope offered evidence against both the presumed perfection and immutability of the heavenly realm and its influence on earthly objects and events.

Evidence of the former came in the form of sunspots, what Galileo referred to as "these importunate spots which have come to disturb the heavens, and worse still, the Peripatetic philosophy."⁹ Galileo's discovery that sunspots were actually *on* the sun (and not revolving around it as had been speculated) showed two things: that the sun was not a perfectly luminous body but contained impurities or imperfections in the form of spots; and, that the apparent movement of the spots was actually due to the movement of the sun on its own axis—a movement similar to the rotation of the earth on its own axis.

Galileo's position called into question the Aristotelian principle of the perfection and immutability of the heavens as well as the essential difference between heavenly and earthly matter, and he was not unaware of the radical nature of his discoveries. However, falling back on the Aristotelian principle of sense experience over argument, he states that "it is better Aristotelian philosophy to say, 'Heaven is alterable because my senses

⁸Steven Shapin, *The Scientific Revolution* (Chicago and London: The University of Chicago Press, 1996), p. 23. Shapin further explains that although this vision of the earth with the cosmos spinning around it was truly anthropocentric, the special place of the earth "did not necessarily connote special virtue. Although human beings, and their earthly environment, were understood to be the unique creations of the Judeo-Christian God, compared with the heavens and a heavenly afterlife the earth and earthly existence were regarded as miserable and corrupt, and the actual center of the cosmos was hell." (p. 24)

⁹Galileo Gallilei, *Dialogue Concerning the Two Chief World Systems*, transl. Stillman Drake (Berkeley and

tell me so', than to say, 'Heaven is inalterable because Aristotle was so persuaded by reasoning'.¹⁰

The result of Galileo's observations in Shapin's words, was both

a new way of thinking about the natural world and about how one ought to secure reliable knowledge of that world. Like many others challenging ancient orthodoxy in the late sixteenth and early seventeenth centuries, Galileo was claiming that there existed not two sorts of natural knowledge, each appropriate to its proper physical domain, but only one universal knowledge. Moreover, by asserting the similarity of heavenly and terrestrial bodies, Galileo implied that studying the properties and motions of ordinary earthly bodies could afford understanding of what nature was like universally.¹¹

This, in effect, turned the macrocosmic/microcosmic paradigm on its head:

instead of the earth being perceived as an imperfect reflection of the celestial world, the heavens came to be perceived as being composed of bodies similar to earthly bodies and subject to the same laws. Descartes' *mirabilis scientiae fundamenta* was confirmed.

Thus Galileo set about studying the properties and motions of ordinary earthly objects in order to obtain an understanding of universal nature. Among the earthly objects he used to describe experiments¹² were stones rolling on inclined planes. These experiments ultimately led him to the theory that there were no forces inherent in objects which caused them to move and that an object would either remain at rest or in motion until some external force causes it either to accelerate or decelerate. This is the principle of the conservation of motion that is fundamental to the principle of inertia. That Galileo

Los Angeles: University of California Press, 1953), p. 53.

¹⁰ *Dialogue, op.cit.*, p. 56.

¹¹ Shapin, *op. cit.*, p. 18.

¹² It is not clear whether or not Galileo actually conducted the experiments about which he writes. Shapin tells us that "historians have long debated whether these experiments were ever actually performed or whether they are best regarded as 'thought experiments,' imaginative rehearsals in Galileo's mind of what *would* happen were certain manipulations to be carried out, given what we already securely know about the physical world." See Shapin, *op. cit.*, p. 82.

did not arrive at a fully elaborated principle of inertia¹³ does not lessen the importance of his work or the radical nature of his contribution to the new mechanistic science. The inferences from his 'experiments' with inclined planes contradicted the Aristotelian position that the state of rest was the 'natural' state for earthly objects and negated the idea of immanent movement caused either by the formal or material qualities of the object or by the existence of a world soul permeating earthly matter. The idea of matter as inert was born, and movement was now open to explanation solely by efficient causes, the other three Aristotelian 'causes' having been rendered unnecessary.¹⁴ Thus, through Copernicus and then Galileo, the way to the mechanisation of the world picture had begun.¹⁵

4.1.2 Vesalius and the Culture of Dissection

The move to the mechanisation of the body picture comes from another direction, one on the surface unrelated to the Copernican or Galilean project. It is the anatomical work of Vesalius that initiated the practice of dissection as an acceptable scientific enterprise for the study of the body. Until that time, the writings of Galen had guided medical study and practice, even though Galen's anatomical investigations never included the dissection of humans. Galen was the recognised authority on the functioning of the

¹³ It was only with the work of Beeckman and Descartes that this important principle found its full elaboration. See Wallace Hooper, "Intertial Problems in Galileo's Preinertial Framework" in Peter Machamer (ed.), *The Cambridge Companion to Galileo* (Cambridge University Press, 1998), p. 170-1.

¹⁴ The rejection of the final cause was discussed in Chapter 3. The formal cause, which for Aristotle was responsible for the essence of a thing was rejected along with the Cartesian rejection of essences. Neither the formal cause nor the material cause were necessary since all 'qualitative' differences have been reduced to 'quantitative' differences; all change has been reduced to movement and is explicable according to quantitative criteria such as the size, speed and direction of particles.

¹⁵ The term 'mechanisation of the world picture' comes from Dijksterhuis, E.J., *The Mechanization of the World Picture* (Oxford: Oxford University Press, 1961). See also Emile Namer, *Le beau roman de la physique cartésienne et la science exacte de Galilée* (Paris: Librairie philosophique J. Vrin, 1979): "Se rattachant aussi bien au principe d'inertie qu'à celui de la composition des mouvements, le principe de conservation porte que le mobile n'a pas besoin de l'*Impetus* mystérieuse de l'École parisienne, pour conserver son mouvement, ni d'une nature particulière pour accueillir un mouvement différent." (p. 73).

human body and any dissection that took place before Vesalius was carried out with the object of confirming, not questioning, his writings. However, as Galileo questioned the authority of Aristotle, Vesalius questioned the authority of Galen by recognising only the higher authority of empirical observation. If there was a contradiction between what he observed in his dissections and what Galen wrote in his books, then it was Galen who stood corrected, not Vesalius.

In the history of anatomy, Vesalius is rightly considered a revolutionary. At a time when the lesser-ranking surgeon or barber wielded the dissection knife while the doctor explicated from medical texts, Vesalius the doctor held the knife himself. He was the expert; it was up to him to push the limits of anatomical knowledge and to contradict, if necessary, the ancient authority. He approached the cadaver as an object of science. At the same time, his work remains situated within the Renaissance context where the human body was still conceived as an integral part of nature. His drawings of the skeleton or of the *écorché* are always placed in a natural setting—in a field surrounded by trees and bushes, seated on a bench, even, in one often-seen drawing of a skeleton, leaning on a tomb. The body remains contextualised, a life-like pose in a life-like setting; its objectification has begun, but is not yet complete. Le Breton has commented on the importance of this fact:

Objectivement scindé de lui-même, réduit à l'état de corps, l'écorché de Vésale ne cesse de manifester par l'humanité de ses postures le refus de cet état de fait...objectivement coupé du cosmos, il baigne dans un paysage naturel, caricature du microcosme, mais prouve que Vésale ne peut encore le faire disparaître totalement. L'homme de Vésale annonce la naissance d'un concept moderne: celui de corps, mais il demeure à certains égards sous la dépendance de la conception antérieure de l'homme comme microcosme.¹⁶

Vesalius did not invent the practice dissection of human cadavers, far from it. But

he presided over the beginnings of the activity as a normal scientific practice.

Throughout the entire period of the Middle Ages, the Church either forbade or strictly controlled the practice. Le Breton points out that during the time of St. Boniface, "l'homme ne s'absente de lui-même pour l'au-delà qu'une fois achevée la durée du pourrissement. Pour Boniface et bon nombre de ses contemporains, nul ne doit interrompre le travail de la nature qui s'exerce dans l'épaisseur de l'homme après sa mort, car tant que la chair demeure, *l'homme est implicitement présent*, même si ce n'est que sous la forme du cadavre."¹⁷ This appears to the modern scientific spirit as pure superstition but in reality it was the inevitable result of the ambiguity that surrounded the connection of body and soul. In the pre-Cartesian world, and in particular within the context of the Christian belief in the Resurrection, precise boundaries between the mind and body, the living and the dead were less easy to draw and respect for the dead body was paramount. Even as dissection became a more regular practice, the availability of corpses was strictly controlled by the religious authorities and the only bodies given up to the practice were those of executed criminals for whom a sentence of hanging followed by dissection brought double humiliation to the victim and his or her family.¹⁸

The practice of dissection in the Renaissance raised both fascination and revulsion. The body was considered to house the secrets of the self, so opening it up to explore its insides was seen as a way of unveiling of these 'secrets'. Helkiah Crooke, an anatomical writer of the time, tells us that "anatomy is as it were a most certaine and sure

¹⁶ Le Breton, *Anthropologie du corps et modernité*, op. cit., p. 57.

¹⁷ Le Breton, *La chair à vif*, op. cit., p. 50.

¹⁸ There is a parallel in China today with respect to the 'donation' of human organs for transplant. Because of religious beliefs governing the notions of death and the dead, people do not easily volunteer their organs for transplant and recourse is made to the bodies of criminals where organs are taken with or without their permission, both before and after execution (in the latter case, the removal of both kidneys before the execution renders the latter redundant!). For a discussion of the situation of prisoners with respect to organ

guide to the admirable and most excellent knowledge of our selves, that is of our owne proper nature."¹⁹ Dissections were carried out in theatres in front of large audiences—students of medicine as well as society ladies, merchants and ordinary folk—with a definite air of spectacle. At the same time, the only corpses available were those of the worst criminals. It was, literally, a fate worse than death to have a judgment that declared not only death, but death followed by dissection. This marriage of spectacle and prohibition symbolises the ambiguity of the emerging culture of dissection²⁰ and its break with past thought and practice. At the time of Vesalius, the body was still linked to the cosmos as microcosm to macrocosm. As Le Breton puts it: "Dans l'univers des valeurs médiévales et renaissantes, l'homme est en prise sur l'univers, il condense le cosmos. Le corps n'est pas isolable de l'homme ou du monde: il est l'homme et il est, à son échelle, le cosmos."²¹ With Vesalius, the body was not yet the inert matter that it would become with Descartes and it had not yet lost what Le Breton refers to as "sa valeur d'incarnation."²² But in the almost one hundred years that separated *De Fabrica* from *Le Monde* and *L'Homme*, dissections continued, no 'soul' was found in the process, the wrath of God did not descend upon the anatomist, and the search for "our owne proper nature" was abandoned. The seventeenth century anatomist "no longer stood before the body as though it was a mysterious continent. It had become, instead, a system, a design, a mechanically organised structure, whose rules of operation, though still complex, could, with the aid of reason, be comprehended in the most minute

transplants, see Harry Wu, *Retour au laogai*, (Paris: Belfond, 1997).

¹⁹ David Hillman and Carla Mazzio (eds), *The Body in Parts* (New York and London: Routledge, 1997), p. 84.

²⁰ The term 'culture of dissection' comes from Sawday.

²¹ Le Breton, *Anthropologie du corps et modernité*, *op. cit.*, p. 47.

²² Le Breton, *La chair à vif*, *op. cit.*, p. 95.

detail."²³ The body moved from being the incarnation of the cosmos to being an object of science, devoid of mind, soul and self. "Mechanism offered the prospect of a radically reconstituted body", says Sawday; and this radical reconstitution represented a move "from an interior in which the body seems...to speak its own part, to the modern conception of a physiological system no more capable of speech than is a hydraulic pump...".²⁴ The body moved from being a source of knowledge (of the 'self') to an object of knowledge (for the knowing subject).²⁵ At the same time, the subject (anatomist, scientist) moved from a position of observation to one of systematic control of and power over both nature and the body.

A recurring theme of this thesis relates to the question of how much Descartes was influenced by the mechanistic agenda of the seventeenth century and how much he was pushing it himself. It is my position that he pushed more than he was pulled and that this is true whether the subject is method, mechanism, inertia or mechanistic physiology.²⁶ Sawday holds that the practice of anatomy made it difficult to sustain the link between soul and body and states that "...it was the susceptibility of the body (as opposed to the mind) to the process of division which confirmed the distinction between body and mind inherent within the Cartesian project."²⁷ However, as has already been pointed out in Chapter 2, Descartes' division of subject and object is implicit in his

²³ Sawday, *op. cit.*, p. 31.

²⁴ Sawday, *op. cit.*, p. 29. This also represents a de-linking of knowledge and wisdom. For the latter, some 'secrets' are not intended to be known; for the former, in the context of the new science, all reality—including the interior of the body, is to be laid bare.

²⁵ In my paper "The Body as Teacher: From a Source of Knowledge to an Object of Knowledge" given at the World Congress of Philosophy, Boston, 1998, I compared approaches to the body (as a source of knowledge) in Montaigne and (as an object of knowledge) in Descartes. (Internet Site: www.bu.edu/wcp/Papers/Anth/AnthColl.htm)

²⁶ Cf. Geneviève Rodis-Lewis, "Le paradoxe cartésien" in *L'anthropologie cartésienne*, *op. cit.*, p. 88: "Par ce souci de lier la philosophie de la nature à ses racines métaphysiques, Descartes étonne les autres mécanistes, qui se contentaient de négliger les spéculations scolastiques."

earliest writings; his method depends upon the radical distinction of mind and matter, knowing self and known world. It is probably impossible to answer with any degree of certainty the question posed by Sawday as to whether Descartes contributed more to the culture of dissection than the culture of dissection contributed to his thought. What is clear, however, is that Vesalius' experiments on the human body helped remove the epistemological obstacle of the connection of soul and body, soul and nature, as much as Galileo's experiments on inclined planes, and that Descartes was there, at the forefront of this new double-pronged empirical science, pushing the limits of its premises.²⁸

4.2 The Mechanistic Body

4.2.1 The Official Bifurcation: *Cogito ergo sum*

Chapter 2 dealt with the question of Descartes' dualistic metaphysics and its relation to his scientific endeavours. In that chapter I maintained that Descartes' distinction of mind and body was implicit in his earliest works and continued through his work on the body even though the explicit elaboration of the theory does not take place until the *Discours* and the *Meditationes*. The sub-title of Meditation II is: *The nature of the human mind, and how it is better known than the body*. In it Descartes sets out to prove that he knows he exists through thought alone. Any other way of proving his existence, e.g. through bodily action, would not suffice since there could be "a deceiver of supreme power" who is deliberately deceiving him. But even in the face of an evil

²⁷ Sawday, *op. cit.*, p. 146.

²⁸ Shapin makes the point that the legitimacy of the mechanical view of nature was found in Scripture where "the apocryphal Wisdom of Solomon handed it down that God 'has disposed of all things in number, weight and measure'" (although this also gave rise to numerology, magic, cabala, etc.) and that mechanical views had been expressed intermittently throughout the Middle Ages. "What was new in the seventeenth century was the vigor with which the principles of matter and motion were advanced as defining resources of a proper natural philosophy." (Shapin, *op. cit.*, p. 46). In this regard, Descartes can be counted among the most vigorous, particularly in the application of the mechanical principle to the human body.

deceiver, even if he thinks he might be deceived, he is still thinking: "In that case I too undoubtedly exist, if he is deceiving me; and let him deceive me as much as he can, he will never bring it about that I am nothing so long as I think I am something".²⁹ He then goes on to show that his essence is to think, that knowledge of mind does not depend on body, and, through the analogy of the piece of wax, that the knowledge of the intellect is more certain and reliable than knowledge from the senses. The same conclusions are reached in Part Four of the *Discours* where Descartes' statement of these matters is even more emphatic:

From this I knew I was a substance whose whole essence or nature is simply to think, and which does not require any place, or depend on any material thing, in order to exist. Accordingly, this 'I'—that is, the soul by which I am what I am—is entirely distinct from the body, and indeed is easier to know than the body, and would not fail to be whatever it is, even if the body did not exist.³⁰

The *Discours* was published in 1637, five years after *Le Monde* and *L'Homme* were written but not yet published; the *Meditationes* were published in 1641. But the ideas expressed in them were not new to Descartes. That this is so is demonstrated by the autobiographical nature of the *Discours* where Descartes presents his ideas as the result of meditations that took place in 1619:

While I was returning to the army from the coronation of the Emperor, the onset of winter detained me in quarters where, finding no conversation to divert me and fortunately having no cares or passions to trouble me, I stayed all day shut up alone in a stove-heated room, where I was completely free to converse with myself about my own thoughts".³¹

This was, of course, the day preceding the night of the dreams that have been recounted in Chapter 2, although the exposition of his thoughts of that day in the *Discours* leaves out any mention of the dreams. The method he sets out in Part Two of the *Discours* is a

²⁹ *Med. II*, CSM II, 17 (AT VII, 25).

³⁰ *Discours*, CSM I, 127 (AT VI, 33).

reworking of Rules 2 to 7 found in the *Regulae* and written about the time of the events of November 1619. The actual dating of the meditations that led to the *Cogito* is more problematic. At the end of Part Three, Descartes speaks of having settled in Holland "exactly eight years ago"³² where he led a withdrawn and solitary life. Then he begins Part 4 with the statement: "I do not know whether I should tell you of the first meditations that I had there, for they are perhaps too metaphysical and uncommon for everyone's taste."³³ Then he begins to recount his search for truth, his rejection "as if absolutely false [of] everything in which I could imagine the least doubt", and his subsequent realisation "that while I was trying thus to think everything false, it was necessary that I, who was thinking this, was something. And observing that this truth '*I am thinking, therefore I exist*' was so firm and sure that all the most extravagant suppositions of the sceptics were incapable of shaking it, I decided that I could accept it without scruple as the first principle of the philosophy I was seeking."³⁴

We know from his correspondence and his references to a little treatise on metaphysics³⁵ that Descartes was thinking and writing on metaphysics in 1629-30 and that by that time "he was certainly thinking seriously about at least two metaphysical questions: the existence of God and the immortality of the soul."³⁶ And, in spite of Gaukroger's warning that "we must be very circumspect indeed about reading the discussion of mind in Part 4 of the *Discours* back into the 'Little Treatise',"³⁷ in reading

³¹ *DM*, CSM I, 116 (AT VI, 11).

³² *DM*, CSM I, 126 (AT VI, 31). This would be in 1629.

³³ *DM*, CSM I, 126 (AT VI, 31).

³⁴ *DM*, CSM I, 127 (AT VI, 33).

³⁵ See letter to Mersenne, November 25, 1630: "...perhaps I may some day complete a little treatise of Metaphysics, which I began when in Friesland, in which I set out principally to prove *the existence of God and of our souls* when they are separate from the body..." CSMK, 29 (AT I, 182).

³⁶ *Descartes*, p. 195.

³⁷ *Descartes*., p. 199.

Part Four it is difficult not to interpret it as a narrative recounting the thoughts that Descartes had in 1629. Each paragraph begins with phrases such as: "Next, I examined attentively..." or "After that I considered...", etc. Gaukroger admits that there is "some continuity" between the two.³⁸ At the very least that continuity must be with respect to the distinction of mind and body, something that was essential to Descartes' views about the immortality of the soul, something that he treated in his 'Little Treatise'. In addition, Gaukroger states that

the way in which Descartes sets out the independence of the soul with respect to the body has a striking similarity to his account of the independence of God with respect to his creation. The soul, like God, transcends material things and is not dependent upon them: like God, the soul would not fail to be whatever it is, even if the body did not exist.

And further, that

the parallels between the way in which God is distinguished from matter and the way in which mind is distinguished from matter suggest that Descartes sees them as being part of the same kind of exercise: a consideration dictated by mechanism.³⁹

Still Gaukroger resists the idea that metaphysics, for Descartes, serves as the foundation of his physics. This position is in stark contrast to that of Bitbol-Hespériès already referred to in Chapter 2: "...en 1630, comme après dans le *Discours*, puis dans les *Principia*...la science trouve ses 'fondements', ou ses 'principes' dans la métaphysique."⁴⁰

The question of the relation between Descartes' metaphysics and his physics has been dealt with at length in Chapter 2. What I am attempting to show here is that even the foundations of the *Cogito* which were not elaborated and published until the *Discours* of 1637 were essentially in place at least at or about the same time that Descartes began

³⁸ Descartes, p. 199.

³⁹ Descartes, p. 199-200.

⁴⁰ Bitbol-Hespériès, *op. cit.*, p. X.

his anatomical studies and before he began writing on the body.

4.2.2 Mechanical World; Mechanical Man

Nothing indicates more clearly that Descartes perceived the study of the human body as a branch of physics than the fact that his treatise on physics contained *Le Monde* and *L'Homme* as parts of one text. In fact, *L'Homme* originally began as chapter XVIII of *Le Monde*. More revealing is the fact that *Le Monde* was, in reality, the *Treatise on Light*⁴¹ and if it seems surprising that Descartes believed he could explain the entire world based on his study of light, he has an explanation for his approach which he gives in the *Discours* where he speaks of the "Treatise which certain considerations prevented me from publishing":

...fearing that I could not put everything I had in mind in my discourse, I undertook merely to expound fully only what I knew about light. Then, as the occasion arose, I added something about the sun and the fixed stars, because almost all light comes from them; the heavens, because they transmit light; the planets, comets, and the earth, because they reflect light; about terrestrial bodies, in particular, because they are coloured or transparent or luminous; and finally about man, because he observes these bodies.⁴²

Gaukroger refers to Descartes' double treatise as "the most ambitious systematic project that Descartes ever undertook"⁴³ and Bitbol-Hespériès refers to *L'Homme* as "la fondation d'une nouvelle anthropologie".⁴⁴ It is clear from his correspondence with Mersenne that Descartes considered this work very important and that Mersenne himself

⁴¹ In fact Gaukroger's recent translation of the two texts refers to the *Treatise on Light* and the *Treatise of Man* under the collective title of *The World*. However, Bitbol-Hespériès doubts that the title *Treatise on Light* was given by Descartes himself: "L'auteur, non-identifié, de la préface de l'édition de 1664 s'en explique brièvement mais clairement: 'Et quoi qu'en divers endroits, il le nomme son Monde, ici néanmoins, où je n'ai vu dans l'Original que ces mots, *Traité de la lumière*: à quoi la vérité des choses m'a fait encore ajouter, *Et des autres principaux objets des sens*'." Descartes himself in correspondence usually referred to his treatise as 'mon Monde' or 'ma Physique'. See *L'Homme*, p.63, note 1 for a detailed discussion of the title of this work.

⁴² *DM*, CSM I, 132 (AT VI, 42)

⁴³ Stephen Gaukroger (ed.), *Descartes: The World and Other Writings* (Cambridge University Press, 1998), p.vii. (I will refer to this text as *World*.)

⁴⁴ *L'Homme*, p. XVIII.

was anxiously awaiting its publication.⁴⁵ The purpose of the work is to set out a mechanistic view of the world, including the human body:

The core doctrine at stake in *The World* is that of mechanism—above anything, the doctrine that matter is completely inert—and Descartes' aim is to provide a mechanistic cosmology, resting on the basis of quantitative 'laws of nature', and a mechanistic physiology.⁴⁶

In fact, in this work, Descartes brings together both the Copernican and Vesalian revolutions, the first in relation to the movement of the earth and the planets which can all be explained according to laws of nature that God established at creation, and the second in relation to a mechanistic description of the human body based on his own anatomical studies and his experience in the dissection of animal carcasses in Amsterdam. According to Gaukroger, "the *Treatise on Light* presents a fully mechanist alternative to Aristotelian systems, one which effectively derives heliocentrism from first principles, which offers a novel and apparently viable conception of matter, and which formulates fundamental laws of motion—laws that are clearly open to quantitative elaboration."⁴⁷ Just as his mechanistic cosmology "presents an intuitively plausible picture of orbital motion which requires no mysterious forces acting at a distance", so his mechanistic physiology shows "that we need postulate no souls at all for these organic processes, that all that is needed is the right kind of mechanical explanation."⁴⁸ Descartes' *World* has melded macrocosm and microcosm into a mechanistic whole.

Except for the laws of nature which have already been discussed in Chapter 2, the details of *Le Monde* go beyond the scope of this thesis and this chapter will focus more

⁴⁵ See Chapter 3 regarding the pressure exercised by Mersenne for Descartes to publish this work.

⁴⁶ *World*, vii.

⁴⁷ *World*, xxii.

⁴⁸ *World*, xxiii, xxiv.

explicitly on the mechanistic physiology set out in *L'Homme*,⁴⁹ the first part of which was revealingly sub-titled, by Clerselier, *On the machine of the body*. What is important is that the laws of nature that Descartes elaborates in *Le Monde* will be made to apply in his discussion of the human body in *L'Homme*. In particular, the first law concerning the conservation of motion in bodies, which is the first statement of the principle of inertia, will be the guiding principle behind Descartes' description of movement and change in the body.⁵⁰ The other laws, especially that dealing with rectilinear motion, will also play an important role.

Descartes did not concern himself with the study of the human body until about 1629 and he had no formal training in anatomy or medicine. In fact, in this area as in many others, Descartes was a self-taught man. "I am now studying chemistry and anatomy simultaneously", he wrote to Mersenne in April, 1630, and "every day I learn something that I cannot find in any book. I wish I had already started to research into diseases and their remedies, so that I could find some cure for your erysipelas, which I am sorry has troubled you for such a long time."⁵¹ This clear expression of self-confidence may strike the reader as excessive, but it is merely an indication of Descartes' confidence in his universal method and a practical expression of his search for a completely new science, begun in 1619.

Even though he lived in Amsterdam and Leiden at a time when public dissections were popular, there is no evidence in his writings that he participated in any of these

⁴⁹ For a detailed discussion of *Le Monde*, see Gaukroger, *Descartes*, Ch. 7, pp. 226-292.

⁵⁰ See *L'Homme*, p. IX, footnote 39: "Mais *Le Monde* étant resté inédit, Gassendi a publié, dans son *De Motu* de 1642, la première formulation correcte de ce principe, avant l'édition latine des *Principes*: celle des *Principia* de 1644.

⁵¹ Letter to Mersenne, April 15, 1630, CMSK, 21 (AT I, 136).

events.⁵² He was undertaking his own dissections, in his rooms, of carcasses garnered from local butchers. "I am now dissecting the heads of various animals, so that I can explain what imagination, memory, etc. consist in",⁵³ he wrote to Mersenne in 1633 when his work on *L'Homme* was nearly completed. It would appear that his anatomical and medical studies were based largely on his own reading of others and on his own dissections of animals, both dead and alive. According to his own testimony, he did read "Vesalius and others"⁵⁴ and, according to Bitbol-Hespériès, one of the others was Caspar Bauhin, "un des continuateurs les plus remarquables de l'oeuvre de Vésale."⁵⁵ What is important is that Descartes was not breaking new ground from the point of view of anatomy. In fact, according to Gaukroger, the physiology of *L'Homme* is derivative and is based on "Hippocratic and especially Galenic treatises, Scholastic writers on medicine and commentaries on the biological writings of Plato and Aristotle, including Coimbra commentaries, and biological and medical writers from the mid-sixteenth century onwards."⁵⁶ What Descartes is doing in *L'Homme* is a construction, or rather, a re-construction, of traditional views about the body to fit his dualistic and mechanistic view of the world and to conform to his universal method. This is important since it indicates that what Descartes was doing between 1629 and 1633 was less a matter of new discoveries about the body and more a matter of redefining the body to fit his picture of the world. Descartes was turning the body into a scientific construction and an object of

⁵² There is a reference in a letter of Regius in May 1640 regarding attendance at a dissection but at a much later date: "Three years ago at Leiden, when I wanted to see it [the conarium] in a woman who was being autopsied, I found it impossible to recognize it, even though I looked very thoroughly, and knew well where it should be, being accustomed to find it without difficulty in freshly killed animals." CMSK, 146 (AT III, 49).

⁵³ Letter to Mersenne, November or December, 1633, CMSK, 40 (AT I, 261).

⁵⁴ Letter to Mersenne, February 20, 1639, CMSK 134 (AT II, 525).

⁵⁵ *L'Homme*, p.XLIX. In addition, Sawday tells us that "[e]ven by the mid-seventeenth century, Vesalius' images in the *Fabrica* still provided the standard record of dissection." See Sawday, *op. cit.*, p. 155.

knowledge. And, as we will see below, his reconstruction included the re-interpretation of a number of notions or concepts about the body (such as soul, animal spirits) to fit the mechanistic paradigm.

4.3 L'Homme

Descartes' treatise is divided into five parts and, although the division and the titles were given by Clerselier, they adequately reflect Descartes' content and meaning: (1) On the machine of the body; (2) How the machine of the body is moved; (3) The external senses of this machine and how they are related to ours; (4) On the internal senses which are to be found in this machine; and (5) On the structure of the brain of this machine, and how the spirits are distributed there so as to cause its movements and sensations. Like *Le Monde*, *L'Homme* is written as a 'fable' and it refers to men who are composed "as we are, of a soul and a body".⁵⁷ Descartes' plan, at the beginning of *L'Homme* is to treat the body on its own, then the soul on its own and finally "how these two natures would have to be joined and united so as to constitute men resembling us."⁵⁸ This proposed separation of the treatment of body and soul is not a problem for Descartes since he does not presuppose that the body needs a soul to account for either life or movement. Like clocks, fountains and other machines that are made by man, this machine has been made by God in such a way that it has the power to move of its own accord.⁵⁹

⁵⁶ Descartes, p. 271.

⁵⁷ *World*, p. 99 (AT XI, 119).

⁵⁸ *Ibid.* As already pointed out, Descartes did not complete this work, although the *Passions* treats material on the soul and on the soul and body together that might have been planned as part of this work.

⁵⁹ This does not entail an immanent power, however. The power of movement comes from the structure of the parts and from God as efficient cause through continuous creation. The notion of continuous creation will be dealt with in Chapter 5.

Descartes' description of the human body is long and detailed, but what is of interest here is the way in which his account fits with his mechanistic explanation of the world in general. Just as he explains fire by the different sizes of particles that descend as ashes (the larger ones) or rise as smoke (the more refined ones), so in the process of digestion, the "agitation which is induced in the small particles of food when they are heated, together with the agitation of the stomach and the bowels in which they are contained" causes the coarser particles to descend for elimination and the more refined particles to rise to the liver where they are transformed into blood. The agitation and separation that take place in digestion are similar to what takes place "when one shakes meal in a sieve, the purest parts flow out and it is only the small size of the holes through which it passes that prevents the bran from following after them."⁶⁰ In the liver, this finer fluid "is refined and transformed, taking on the colour and form of blood, just as the white juice of black grapes is converted into light-red wine when it is allowed to ferment on the vine stock."⁶¹ The blood itself circulates through the body in a similar fashion, finding its way to the spleen, kidneys, bladder, etc. by the same process of separation:

And through whichever of these places it passes, either the *position*, *shape*, or *smallness* of the pores through which they pass is what alone makes some go through and not others, and keeps the rest of the blood from following, just as you see in various sieves which, being pierced in different ways, serve to separate different grains from one another.⁶²

But the most energetic, strongest and finest parts of the blood go directly from the heart to the brain "inasmuch as the arteries bearing them there are in the *most direct line from*

⁶⁰ *World*, 100 (AT XI, 122).

⁶¹ *World*, 101 (AT XI, 123). Gaukroger points out that this comparison "between the processes of sanguinification and fermentation was traditional, and can be found in Galen (*De usu partium*, bk. 4, ch. 3), but Descartes' account of the nature of the process involved, which offers a corpuscularian reduction, is very different from the traditional account." (p. 101, footnote 8).

⁶² *World*, 104 (AT XI, 128) emphasis added.

the heart; and as you know, all moving bodies tend as much as they are able to continue their motion in a straight line."⁶³

4.3.1 The Heat of the Heart

The operation of the heart and the circulation of the blood are based primarily on the principle of heat and fermentation. The heart, which "contains in its pores one of those fires without light," heats the blood as soon as it enters, in the same way "that the blood or milk of some animal will be dilated if you pour it a drop at a time into a very hot flask."⁶⁴ While it is the sole purpose of the fire in the heart to heat the blood, it is the heat of the blood that causes the heart to expand and contract:

The pulse or the beating of the arteries depends on eleven small membranes which, like so many small doors, close and open the orifices of the four vessels that open into the two cavities of the heart. For at the moment when a beat ceases and another one is ready to begin, the small doors at the orifices of the arteries are shut tight, while those at the orifices of the two veins are open, so that two drops of blood cannot but fall immediately from these two veins, one into each cavity of the heart. These drops of blood, being rarefied and suddenly occupying a space which is incomparably greater than that which they occupied previously, then push the small doors at the orifices of the veins shut, thereby preventing more blood from dropping into the heart, and they push open the arteries, passing through them quickly and forcefully, and cause the heart and all the body's arteries to inflate at the same time. But immediately after this, this rarefied blood is either condensed again or penetrates other parts; and thus the heart and the arteries are deflated, the small doors at the entrances to the two arteries are shut again, and those at the entrances to the two veins are reopened to allow in two more drops of blood, which cause the heart and the arteries to be inflated again, just as before.⁶⁵

This is a key passage in Descartes' mechanistic description of the body. It is the 'fire without light' of the heart, which heats the blood, which in turn causes the heart to expand and contract. This is a purely internal *process*; there is no need for any other

⁶³ *Ibid.*, emphasis added.

⁶⁴ *World*, 101 (AT XI, 123).

⁶⁵ *World*, 102 (AT XI, 125).

principle to account for this life-giving and life-sustaining movement of the heart.⁶⁶ And what is important is that it is a *process* and not a *state*; being a process and not a state makes it a subject of instrumental, rather than metaphysical reasoning.

Descartes' description above is somewhat misleading since it gives the impression that it is the heat of the heart which begins the process since the expansion of the particles of blood takes place when they enter the heart cavity and, he clearly holds, the heart is the warmest part of the body.⁶⁷ In fact it is the fermentation of the blood that begins the process and that fuels the process, and "the dilation of the blood that causes this heat is the first principal spring of our whole machine..."⁶⁸ This heat is no different in nature "from that which is caused by the addition of some fluid, or yeast, which causes the body with which it is mixed to expand."⁶⁹ This is very different from the 'innate heat' of Galen, which is a quality of the individual body; Galen insists that

one should constantly bear in mind that each body possesses some particularity of mixture which belongs to its own specific nature but differs from any other specific nature; further, that if the body transforms some familiar or proper substance into its own nature, it will thus increase the amount of substance of the heat within it...it should be clear that the assessment of what is wet, dry, cold, or hot in relation to our bodies is not something which can be properly carried out according to some external criteria, but only according to the nature of the influence that we ourselves undergo...⁷⁰

For Galen, heat is an element, like dryness or cold, and thus it is a metaphysical and cosmic quality of the body. Descartes wishes to rid the body of qualities in the same way as, in his physics, he rid the world of qualities, and wants to explain everything in

⁶⁶ While Descartes' description here is of a grown person, his explanation of the growth of the foetus will follow the same principle of heat and fermentation causing the heart to beat. See *The Description of the Human Body*, in *World*, 187 (AT XI, 254).

⁶⁷ In *The Description of the Human Body*, Descartes tells us that it "is beyond doubt that there is heat in the heart, for one can even feel it with one's hand when one opens up the body of a living animal." *World*, 172 (AT XI, 228).

⁶⁸ *Ibid.*

⁶⁹ *Ibid.*

terms of matter and movement, the size of particles and the speed at which they move.

More importantly, the heat of the heart, the 'fire without light', is like any other fire in the world: it is subject to the laws of nature and not to the qualities of the body in which it finds itself.⁷¹

Descartes does not deal with the question of where the heat of the heart originally comes from in *L'Homme*, but he does do so when he treats the formation of the foetus in the *Description*. The result of copulation in humans appears to be

...an unorganised mixture of two liquids, which act on each other like a kind of yeast, heating one another so that some of the particles acquire the same degree of agitation as fire, expanding and pressing on the others, and in this way putting them gradually into the state required for the formation of parts of the body...

Now I believe that the first thing that happens in this mixture of seed, and which makes all the drops cease to resemble one another, is that the heat generated there—which acts in the same way as does new wine when it ferments, or as hay which is stored before it is dry—causes some of the particles to collect in a part of the space containing them, and then makes them expand, pressing against the others. This is how the heart begins to be formed.

Then, because these tiny parts, which have been thus expanded, tend to continue in their *movement in a straight line*, and the heart, which has now begun to form, *resists* them, they slowly move away and make their way to the area where the brain stem will later be formed, in the process *displacing others which move around in a circle to occupy the place vacated by them in the heart*. After the brief time needed for them to collect in the heart, these in turn expand and move away, following the same path as the former. This results in some of the former group which are still in the same position—together with others that have moved in from elsewhere to take the place of those that have left in the meantime—moving into the heart. And it is in this expansion, which occurs thus in a repeated way, that the beating of the heart, or the pulse consists.⁷²

⁷⁰ P.N. Singer, (transl.), *Galen, Selected Works* (Oxford University Press, 1997), p.284.

⁷¹ Bitbol-Hespériès points out the difference between Descartes and Aristotle and Galen: "... cette conception s'oppose à Aristote, aussi bien qu'à Galien, lesquels utilisent pourtant la métaphore du feu situé dans le coeur, métaphore très largement reprise dans les ouvrages médicaux. En effet, selon Aristote, le coeur est bien le principe et le siège de la chaleur animale, mais cette chaleur animale est explicitement distinguée de la chaleur qu'engendre le 'feu ordinaire'... La conception de la chaleur comme processus mécanique chez Descartes s'oppose à celle d'Aristote et de Galien pour lesquels elle était un état." *Le principe de vie chez Descartes*, op. cit., p. 71.

⁷² *World*, 187 (AT XI, 253). Emphasis added.

This lengthy citation is important since it is Descartes' account of how the heat gets into the heart in the first place. And this account is a mechanical one based on, in Gaukroger's words, "the initial state of the combination of 'seeds', the natural tendency of matter to move in a straight line, and the branching and conglomerations of matter that result from the constraints on its motion."⁷³ It is a less than convincing explanation however. Descartes' entire explanation of blood circulation (and the basis of his disagreement with Harvey) rests on the fact that it is the heated and expanding blood which causes the heart to move; and yet it is the heat of the heart itself that causes the blood to heat and expand as soon as it enters the heart. An original process of fermentation (in the foetus) appears to heat the heart in the first place, but the proceeding processes of fermentation require the heat of the heart to spark the process. Blood is fuel that keeps the heart going, but it is the fire in the heart that heats the fuel.⁷⁴ Descartes' ultimate answer will be, of course, that the initial fire gets going because God made it so. His principal point in his explanation of the heat and movement of the heart is that there is no internal principle such as soul causing these life-sustaining functions:

It is true that it may be hard to believe that the disposition of organs alone is sufficient for the production in us of all the movements that are not determined by our thought. This is why I shall try to demonstrate this here, and to explain the entire machine of our body in such a way that we will have no more reason to think that it is our soul that excites in us those movements that we do not experience as being directed by our will, than we have to judge that there is a soul in a clock that makes it tell the time.⁷⁵

⁷³ Stephen Gaukroger, "The resources of a mechanist physiology and the problem of goal-directed processes", unpublished paper.

⁷⁴ Bitbol-Hespériès explains that the new drops of blood entering the heart are heated by "un reste de sang subsistant dans les pores des cavités du coeur" an explanation that is also less than satisfactory. How could "un reste de sang" in an already warm heart heat the new drops enough to cause the expansion necessary to activate the diastole? Hatfield makes the point that although Descartes relies on the force of the blood—as a result of the fire without light—to drive the machine of the body as a whole, he nevertheless "left unexplained the energy source of the 'fire without light' that burns in the heart." Gary Hatfield in Cottingham, *op. cit.*, p. 343.

⁷⁵ *World*, 171 (AT XI, 226).

4.3.2 Movement of the Body

Just as a process of agitation similar to what takes place in a sieve causes nourishment to be transformed into grosser and more refined liquids, including blood, so blood undergoes a similar process of agitation when it flows to the brain where the more refined particles "without any preparation or alteration, *except being separated from the larger parts and retaining the extreme speed that the heat of the heart has given them*... cease to have the form of blood and are called animal spirits."⁷⁶

The concept of animal spirits was not an invention of Cartesian physiology; it had been used in various ways since Galen. What is new is Descartes utilisation of this ancient concept to support his mechanistic physiology.⁷⁷ Their production is purely mechanical (the process of agitation and separation as through a sieve) and so is their function (which Descartes normally describes in terms of their size, position and speed or motion). Animal spirits can be compared to the water that drives the mechanical parts of the machines "in the grottoes and fountains in the royal gardens":

And the nerves of the machine that I am describing can indeed be compared to the pipes in the mechanical parts of these fountains, its muscles and tendons to various other engines and springs which serve to work these mechanical parts, its

⁷⁶ *World*, 106 (AT XI, 130). Descartes' most complete discussion of animal spirits takes place in his letter to Vorstius of June 19, 1643 where he describes 'spirits' as applicable to "every body consisting of terrestrial particles that are infused with subtle matter and are more agitated than those which make up air, but less agitated than those which make up flame." He discusses 'vital spirits' and 'natural spirits' between which there is, in his words, "virtually no difference", these two not being separated from the blood. "Only the animal spirits are pure; but they vary in strength depending on the differences in the particles which make them up". This statement reflects Descartes' general physical principle, which is also articulated to Vorstius in this letter, that in his physics he considered "nothing apart from the sizes, shapes, positions and movements of the particles of which bodies are made up." In the same letter, Descartes also describes how animal spirits leave the body: "Finally they leave the body by transpiration which cannot be detected—not merely those which pass along the nerves, but others as well which merely traveled in the arteries and veins. Whatever leaves the animal's body by this undetectable process of transpiration necessarily has the form of spirits." CMSK, 224 (AT III, 686).

⁷⁷ The importance of Descartes' transformation of the principle that had joined body and soul, man and cosmos into a purely mechanical principle governing movement of the body will be dealt with in Chapter 5. For the moment I will simply describe what animal spirits do in Descartes' description of the human body.

animal spirits to the water that drives them, the heart with the source of the water, and the brain's cavities with the apertures. Moreover, respiration and similar actions which are normal and natural to this machine, and which depend on the flow of spirits, are like the movements of a clock or mill, which the normal flow of water can make continuous.⁷⁸

Animal spirits have the power to cause movements "in all bodily parts in which the nerves terminate", including the heart, the liver, the spleen, etc.⁷⁹ The animal spirits flow through the nerves which are tiny tubes that contain "a kind of marrow made up from several very fine fibres which come from the brain's own substance" and which, not completely filling the tubes, leave "sufficient room for the animal spirits to flow easily through them from the brain into the muscles" thus causing the muscles to move.⁸⁰ The nerves also contain membranes that act like doors, letting the animal spirits in and out (reacting according to the force of the spirits entering or leaving) and preventing the spirits from returning. All of this action is purely mechanical and operates according to the laws of nature that govern all movement in the universe:

For you will readily recognise that these spirits, being like a wind or a very fine flame, must flow promptly from one muscle to another as soon as they find a passage, *even though they are propelled by no other power than the inclination that they have to continue their motion in accord with the laws of nature.*⁸¹

It is the action of animal spirits that accounts for respiration, expanding and contracting the muscles of the lungs as in a bellows; it accounts for swallowing through the opening and closing action of the throat; it also accounts for the muscular action that controls "how this machine is able to sneeze, yawn, cough, and make the motions needed to expel

⁷⁸ *World*, 107 (AT XI, 131).

⁷⁹ *World*, 114 (AT XI, 138). Including the heart in this list seems to contradict Descartes' theory of the heart being moved by the fermentation of the blood since, as Gaukroger points out, "it seems to imply that animal spirits, acting through the nerves to the heart, cause its motion--which is in effect to say that its motion is due to muscular action....," the very point on which Descartes was in disagreement with Harvey. (See *ibid.*, p. 114, footnote 22).

⁸⁰ *World*, 109 (AT XI, 133).

⁸¹ *World*, 112 (AT XI, 137).

various excretions."⁸² Animal spirits also account for how the body reacts to external stimulation through the senses since the tiny fibres that make up the marrow of the nerves "are arranged in every part serving as the organ of some sense in such a way that they are easily moved by the objects of that sense."⁸³ Thus, if the foot is placed too near to a fire, the heat of the fire touching the skin pulls the tiny fibre (the nerve) which causes the membrane at the end of the nerve (in the brain) to open ("just as when you pull on one end of a cord you cause a bell hanging at the other end to ring at the same time"⁸⁴) and the animal spirits to flow through the tiny tube of the nerve to the muscles of the foot which pull the foot away from the fire. Some animal spirits also go elsewhere "to the muscles that make the hands move and the whole body turn in order to protect itself."⁸⁵

The movements that are described above are both mechanical and involuntary, that is, they are performed without thought and therefore without any action of the will, which involves the soul. Movements that do involve the will, in other words, voluntary movements, will not become less mechanical because of the implication of the soul. In fact, to return to Descartes' analogy of the fountains, "when a rational soul is present in this machine it will have its principal seat in the brain and will reside there like the fountaineer, who must be stationed at the tanks to which the fountain's pipes return if he wants to initiate, impede, or in some way alter their movements."⁸⁶ The movements are just as mechanical, the only difference being that the mechanic is there to initiate or impede the movements.⁸⁷

⁸² *World*, 116 (AT XI, 141).

⁸³ *World*, 117 (AT XI, 141).

⁸⁴ *World*, 117 (AT XI, 142).

⁸⁵ *World*, 117 (AT XI, 142).

⁸⁶ *World*, 107 (AT XI, 131).

⁸⁷ On this point see Hatfield, "Descartes' Physiology and its Relation to his Psychology" in Cottingham, *op. cit.*, p. 348 where he makes the point that Descartes' position in *L'Homme* suggests that "all motions of the

4.3.3 Perception and Perceptual Cognition

Descartes' account of muscular movement through the action of the animal spirits is fairly straightforward and, even if at times it stretches the limits of the reader's imagination,⁸⁸ it is consistent with his principles of mechanism which can be applied in one way to animals and in a more sophisticated way to humans (i.e. the addition of the soul allows for conscious and wilful action whereas without a soul action is automatic and/or instinctual). His account of perception and of perceptual cognition is slightly more problematic and his treatment is less straightforward. Because he is not intending to discuss the soul as such in *L'Homme* (it is a 'fable' about men who are 'like us' but in whom God has not yet infused an immaterial soul) he is trying to account for everything in terms that should apply equally to humans and to animals (who, we must not forget, do not have souls). Yet he brings in the soul in ways that leave the reader perplexed as to whether or not the question being discussed pertains to animals and humans, or just to humans.⁸⁹ For example, "when God unites a rational soul to this machine, as I intend to explain later on, He will place its principal seat in the brain and will make its nature such that the soul will have different sensations depending on the different ways in which the nerves open the entrances to the pores in the internal surface of the brain".⁹⁰ Thus it would appear necessary for the machine to have a soul in order to feel pain. This is corroborated in the next paragraph where Descartes refers to certain movements in the

limbs result from a specific mechanical contrivance that is activated solely by the direction of the spirits leaving the pineal gland, which would mean that those motions governed by the soul must be effected solely by influencing the direction of the motion of the spirits."

⁸⁸ Hatfield refers to the mechanisms depicted in *L'Homme* as "artfully clever" and adds: "Less charitably, they are the product of sheer fantasy." *Ibid.*, p. 348.

⁸⁹ Strictly speaking, of course, Descartes is talking about neither humans nor animals since he is discussing 'this machine' and how it works.

⁹⁰ *World*, 119 (AT XI, 143). With respect to the words "as I intend to explain later on", Gaukroger adds a footnote: "This is presumably a reference to the projected third part of *Le Monde*, which Descartes

brain that "will cause the *soul* to have the sensation of pain".⁹¹ Clearly, for Descartes, animals do not have the sensation of pain.⁹² More remarkably, it would seem animals do not have sensations of hunger or thirst either since both of these sensations require a soul united to the machine.⁹³ In fact many other things, such as sensing movement, size, distance, colours, sounds, smells, and even pleasure, joy, sadness and other 'passions', seem to depend on the soul and are thus not available to animals.⁹⁴ It is interesting to note that for Descartes animals have brains, a pineal gland and animal spirits, all of which are implicated in the operation of the body's movements and functions; they simply do not have souls. Everything functions in the same mechanical way for all animal machines; however, the soul of humans gives them the power to change the speed and direction of the animal spirits and thus affect the movements in the brain and, consequently, in the muscles and organs of sense.⁹⁵

While the differences regarding perceptual cognition in the machine without a soul and the machine with a soul are sometimes vague in *L'Homme*, the different

apparently never reached."

⁹¹ *World*, 119 (AT XI, 144)

⁹² See letter to Mersenne, June 11, 1640: "I do not explain the feeling of pain without reference to the soul. For in my view pain exists only in the understanding. What I do explain is all the external movements which accompany this feeling in us; in animals it is these movements alone which occur, and not pain in the strict sense..." (CMSK, 148, AT III, 85)). Whatever 'external movements' the rabbit made when Descartes was dissecting its heart were obviously not the result of any sensation of pain 'in the strict sense'!

⁹³ *World*, 139 (AT XI, 163): With respect to hunger, certain movements in the brain "will cause the soul, when it is united to this machine, to conceive the general idea of hunger"; as for thirst, the parts of certain fluids in the stomach "rise instead in the form of air or smoke, and they act against the nerves in an unusual fashion, causing a movement in the brain that will make the soul conceive of thirst."

⁹⁴ *World*, 149 (AT XI, 176): "And note that by figure I mean not only things that somehow represent the position of the edges and surfaces of objects, but also anything which, as I said above, *can give the soul occasion to sense* movement, size, distance, colours, sounds, smells, and other such qualities; and even things that can make it sense pleasure, pain, hunger, thirst, joy, sadness, and other such passions."

⁹⁵ This is all the more interesting given that Descartes' empirical research was restricted to animals. There is no empirical basis for difference in the activity of animal spirits in animals and humans; nor is there textual basis since previous anatomical writers had a more all-encompassing vision of animal spirits. In fact, there is no empirical basis for the existence or operation of animal spirits at all, any more than for souls in humans. Therefore the difference between animals and humans based on animal spirits and souls is purely theoretical and governed by Descartes' dualistic metaphysics.

gradations of sense perception are more clearly stated in Descartes' replies to the Sixth Objections, compiled by Mersenne. There he distinguishes three grades of sensory response:

The first is limited to the immediate stimulation of the bodily organs by external objects; this can consist in nothing but the motion of the particles of the organs, and any change of shape and position resulting from this motion. The second grade comprises all the immediate effects produced in the mind as a result of its being united with a bodily organ, which is affected in this way. Such effects include the perceptions of pain, pleasure, thirst, hunger, colours, sound, taste, smell, heat, cold and the like, which arise from the union and as it were the intermingling of mind and body, as explained in the Sixth Meditation. The third grade includes all the judgements about things outside us, which we have been accustomed to make from our earliest years—judgements, which are occasioned by the movements of these bodily organs.⁹⁶

Hatfield points out the ontological aspect of this description: "The first grade is wholly material, the second involves mind-body interaction, and the third is wholly mental."⁹⁷

Thus it is clear that animals—or the animal machine before God has placed a soul in it—perceive only at the first level; both the second and third levels require a human soul or mind.

4.3.4 Vision

The most important fact about vision for Descartes is found not in *L'Homme*, but in the first chapter of *Le Monde*, and is contained in the subtitle: *On the difference between our sensations and the things that produce them*.⁹⁸ Descartes is going to make a clear departure from the Aristotelian account of perception as a form of "alteration" of the sense faculty: "...the sense faculty is like the actual sense-object—it is affected as being unlike but on being affected it becomes like and is such as what acts on it."⁹⁹ In vision,

⁹⁶ CSM II, 294 (AT VII, 436-7).

⁹⁷ Hatfield, *op. cit.*, p. 351.

⁹⁸ *World*, 3

⁹⁹ Aristotle, *De Anima*, (transl. & ed., Hugh Lawson Tancred), (London: Penguin Books, 1986), p.171.

the eye takes on the form (without the matter) of the object that is seen; something is transmitted from the object to the eye and the eye is transformed in the process.

Descartes, however, states that "although everyone is commonly convinced that the ideas that we have in our thought are completely like the objects from which they proceed, I know of no compelling argument for this. Quite the contrary, I know of many observations which cast doubt upon it."¹⁰⁰ As in Chapter 1 of *Le Monde*, where Descartes accounts for both heat and light simply in terms of motion and our perception of light in terms of effects on the sense organ of those motions, so his account of visual perception in *L'Homme* will rely on the same mechanistic principles. Having denied that real qualities exist in objects, there can be no transference of such a quality from the object to the sense organ.¹⁰¹ In addition, in the Aristotelian account, sense perception is a function of the sensitive or animal soul while Descartes, having dismissed the gradations of the multi-partite soul, must account for it in terms of his mind-body dualism and the fact that animals do not have souls.

Descartes does not deal with the perception of colour in *L'Homme* since he has dealt with it in his discussion of the rainbow in his *Meteorology*. There he accounts for colour in terms of "the size, shape, situation, and movement of the parts of the bodies that one terms 'coloured'" which combine in certain ways and cause sensations in us.¹⁰² What is more interesting is his treatment of distance perception and qualities such as size, shape and position, all of which involve the participation of the soul. In the case of distance

¹⁰⁰ *World*, 3 (AT XI, 3). See Gaukroger, *Descartes*, p. 282ff for an account of why the Aristotelian account of perception, where our perceptual image of the world resembles how the world is, began to fall apart in the seventeenth century, in part because of Kepler's discovery of the inverted retinal image.

¹⁰¹ Unfortunately, Descartes' language is often misleading as when he states: "The change of shape that occurs in the crystalline humour allows objects lying at different distances to paint their images distinctly on the back of the eye." *World*, 128.

¹⁰² *World*, 91 (AT XI, 335). The *Meteorology*, which Gaukroger includes as a supplementary text after the

perception, when the eye is turned toward an object, "the soul will be able to tell the position of this object inasmuch as the nerves from this eye are disposed in a different way than they would be if it were turned toward some other object."¹⁰³ This is, in part, because the shape of the crystalline humour in the eye will change depending upon how the rays collect in it, the rays being stronger in one area and weaker in another. Size and distance are related in the sense that "the soul will be able to tell the size and all other similar qualities of visible objects simply through its knowledge of the distance and position of all their points, just as, conversely, it will sometimes judge their distance from the opinion it has of their size."¹⁰⁴ This takes place "as if by a natural geometry" although the soul can often be deceived, in particular in relation to distance and size.

Much of this description (which I have considerably abbreviated and which lacks the accompanying pictures that are in Descartes' text) is, like Descartes' description of animal spirits, somewhat mysterious and it is so since, as Hatfield points out, space perception raises serious metaphysical difficulties for Descartes. "In particular, it raises the question of how extended matter can act upon a nonextended mind, and can do so over an extended area...and it also raises the question of how a nonextended mind can 'contain' an imagistic representation (as opposed to a mere conceptual understanding) of extension and its modes."¹⁰⁵ Further, given the dependence of this form of visual perception on the soul, one cannot help but wonder whether or not animals can have perception of distance, shape or size. Do animals, too, have a natural geometry?¹⁰⁶

Treatise on Light, was published in Descartes' lifetime as part of the *Discourse on Method*.

¹⁰³ *World*, 132 (AT XI, 159).

¹⁰⁴ *World*, 133 (AT XI, 160).

¹⁰⁵ Hatfield, *op. cit.*, p. 355.

¹⁰⁶ Anyone who has ever watched a cat stalk and successfully pounce on a squirrel or a bird has to be impressed with its perceptual accuracy.

Descartes' statements about the soul judging distance would seem to indicate that this type of perception is unique to humans; however, several pages later he describes the perception of distance in terms the position of the pineal gland:

You will readily accept this if, in order to understand what the idea of the distance of objects consists in, you assume that as the gland's position changes, the closer points on its surface are to the centre of the brain, the more distant are the places corresponding to them, and that the further the points are from it the closer the corresponding places are.¹⁰⁷

This account would not appear to implicate any judgment of the soul. In the next paragraph Descartes adds: "And when a soul has been put in this machine, this will allow it to sense various objects by means of the same organs, disposed in the same way and without anything at all changing except the position of the gland H."¹⁰⁸ Presumably the soul only adds the levels of awareness that are particular to human beings. The account being given here is one which, in Hatfield's words, "represents the height of Descartes' attempt to mechanise the office of the sensitive soul, in this case, of the estimative power."¹⁰⁹

However, both the difficulty of interpreting what Descartes says about perception of distance, shape, pleasure, pain, etc. and the need to give the widest interpretation possible to his position in order not to see Cartesian animals as pure insentient machines are troublesome. Gaukroger gives an account, which attributes genuine perceptual

¹⁰⁷ *World*, 155 (AT XI, 183).

¹⁰⁸ *World*, 155 (AT XI, 183). (Gland H is the pineal gland).

¹⁰⁹ Hatfield, *op. cit.*, p. 357. See also Nancy L. Maull's article "Cartesian Optics and the Geometrisation of Nature" in Georges J.D. Moyal (ed.), *René Descartes, Critical Assessments, Vol. 4* (London and New York: Routledge, 1991), where she gives a Kantian interpretation to Descartes' notion of 'natural geometry' stating: "For Descartes, the correct explanation of visual judgements of distance—within a limited range—was that such judgements *presuppose* geometrical reasoning. Indeed, such judgements presuppose the applicability of geometrical truths to the contents of sensation and, ultimately, to external objects and the relationships between them." She states further that the "apprehension of distance and all the correlates of magnitude is *always* judgemental... Judgement of distance is reasoning *about* sensation." This interpretation would appear to limit distance perception to beings with minds, which, in Descartes' world,

cognition to animals and concludes:

If my account is correct, then, at least as Descartes describes them in *L'Homme*, animal automata are unlike mechanical constructions such as clocks and organs in that they are able to have genuine perceptual cognition, in the form of a grasp of representations of perceptual stimuli, something which requires nothing over and above corporeal organs. What is mechanical about automata is the fact that their functioning can be described wholly in mechanical terms; in particular, no separated mental substance need be invoked, and nothing other than completely inert matter need be invoked.¹¹⁰

Gaukroger holds that the assumption that animals have no souls or no thoughts is misleading since "Descartes' claim is that their thoughts and experiences are not like ours, not that they do not have any thoughts and experiences at all."¹¹¹ In defence of his position he cites a number of instances (such as the replies to Gassendi's objections to the *Meditations*) where Descartes holds either that we cannot ascertain for certain whether or not animals think or that animals do not have thoughts and sensations like humans do. In defence of Descartes Gaukroger adds:

The distinction between the claim that animals have no thoughts and the claim that they have no thoughts like the ones we have seems a central one to us, and Descartes can be criticised for carelessness in not always making clear which he means; but the point remains that he sometimes unambiguously claims that animals have no thoughts *like ours*, and so far as I can tell he never (when context is taken into account) unambiguously claims that they have no thoughts at all.¹¹²

If it is true that Descartes is sometimes ambiguous on the question of just what kind of sensation or thought animals might have, he is not ambiguous about whether or not they have souls. Nor is he ambiguous about the fact that soul and mind are identical, nor that the essence of mind is thought and that thought includes such activities as willing, judging, imagining, etc. Thus one can conclude that an animal, which has no soul, cannot

does not include animals.

¹¹⁰ Gaukroger, *Descartes*, p. 288. See pages 276-288 for his account of perceptual cognition.

¹¹¹ *Ibid.*

¹¹² *Ibid.*, p. 454, footnote 165.

have the experiences that are dependent upon having a soul. In addition, Gaukroger's interpretation ignores the clear statement, cited above, of Descartes' three levels of sensory response where the second level, which includes the perceptions of pain, pleasure, thirst, hunger, colours, sound, taste, smell, heat, cold, and the like, requires the interaction of a soul and body. If animals do not have souls, how can they have the perceptions, which only the interaction of soul and body can provide?

The ambiguity surrounding the question of animal perception brings to the fore the difficulty of Descartes' goal of a purely mechanistic account of animal physiology. Attributing a degree of thought or sensation to animals that is 'not like ours' but is nevertheless there, comes precariously close to descriptions of the multi-partite soul where animals share in certain levels of awareness that humans have. Trying to account for these aspects of what had been the sensitive soul in purely mechanistic terms and without any level of mind in body is what has caused so much ambiguity in Descartes' account. The difficulty was well articulated by More who wrote to Descartes:

Please tell me, Sir, since your demonstration leads you necessarily either to deprive the beasts of all feeling or to give them immortality, why you prefer to make of them inanimate machines rather than bodies endowed with immortal souls.¹¹³

Descartes' metaphysics will not allow him to attribute thought to animals since thought is the preserve of the soul and animals cannot have souls. Likewise, since mind and matter are two distinct substances, with the mind-soul being immortal, mind cannot be used to explain the action of matter, and thought cannot be used to explain the action of body

¹¹³ See Geneviève Lewis (ed.) *Descartes: Correspondance avec Arnauld et Morus* (Paris: Librairie philosophique J. Vrin, 1953), p. 107: "Mais dites-moi, je vous prie, monsieur, puisque votre démonstration vous conduit nécessairement, ou à priver les bêtes de tout sentiment, ou à leur donner l'immortalité, pourquoi aimez-vous mieux en faire des machines inanimées, que des corps remués par des âmes immortelles..."

(except where the action involved is distinctly human). But explanations of certain aspects of sensation and perception require degrees of what is normally attributed to thought, and where Descartes attempts to explain them without any recourse to thought, the result is the ambiguity (and perhaps carelessness) that Gaukroger and others have noted.¹¹⁴

Resolution of this question goes beyond the scope of this thesis and is raised here only to point out the ambiguities and inconsistencies inherent in Descartes' effort to explain human (and animal) physiology on purely mechanistic principles.

4.3.5 Memory

Descartes' account of memory in *L'Homme* applies strictly to 'corporeal' memory. It is therefore the memory of these machines without souls or before souls are introduced by God. Descartes does speak of 'intellectual' memory in other places (e.g. in his correspondence) and holds that "intellectual memory has its own separate impressions," which do not depend on those of the corporeal memory.¹¹⁵ This separation of corporeal and intellectual memory is problematic and may indicate, as John Sutton suggests, that

¹¹⁴ Descartes' three levels of perception (and the question of which levels apply to thinking beings and which do not) may be problematic but the theory has not been without influence. Edward S. Reed writes about its considerable influence in psychology in an article entitled "Descartes' Corporeal Ideas Hypothesis and the Origin of Scientific Psychology" (in Moyal, *op. cit.*, Vol. 4, pp. 247-249). He sets out the three levels of sense, according to Descartes, as 1) the essentially physical grade of sense which is "the purely physical reaction of an animal's body and sense organs to contact with other objects"; 2) "that grade of sense which is neither essentially material nor mental and which Descartes described as 'the immediate mental result, due to the mind's union with the corporeal organ affected';" and 3) the "essentially mental grade of sense [which] is the understanding's production of objectively valid judgements..." Regarding the second grade of sense (which is the source of the ambiguity over animal 'thought' and 'feeling'), Reed states: "Descartes's second grade of sense involves awarenesses which have the body as their (main) cause. Humans tend to be aware of and react to many things in their body which might, in animals, be considered grade one of sense (hence Descartes's controversy with materialists like Gassendi and Hobbes over animal sentience)." If Reed's analysis does not clear up the ambiguity (and perhaps even exaggerates it), it clarifies wherein it lies. More importantly is the influence of Descartes' theory of sense perception. Reed says that while Descartes' hypothesis regarding the mechanisms of movement and sensation did not endure, "his general conceptual scheme nonetheless became firmly entrenched" and that this "tripartite scheme for psychology has been followed, with some modification, ever since."

¹¹⁵ Letter to Mersenne, June 11, 1640, CMSK, 148 (AT III, 84).

Descartes "holds back from the consequences of his own theory",¹¹⁶ but this is not a question I will examine here. Rather, I will confine my analysis to Descartes' description of memory as he sets it out in *L'Homme*, where memory is accounted for through "the reconstructing of patterns of motion in the animal spirits flowing through particular brain pores."¹¹⁷

For Descartes, 'idea' refers to "all the impressions which the spirits are able to receive as they issue from gland H."¹¹⁸ These idea-impressions which can come from external causes (i.e. sensations) or from internal causes (i.e. imagination), are traced on the pineal gland (gland H) by the animal spirits as they leave it and 'deposited' in tiny pores or gaps in the internal part of the brain which is the seat of memory.

And suppose that the spirits are strong enough to enlarge these gaps a little, and to bend and arrange any fibres they encounter in various ways, depending on the different ways in which the spirits are moving and the different openings of the tubes into which they pass. And they do this in such a way that they also trace figures in these gaps, corresponding to those of the objects. At first they do this less easily and perfectly here than on gland H, but they gradually improve as their action becomes stronger and lasts longer, or is repeated more often. Which is why in such cases these patterns are no longer easily erased, but are preserved in such a way that the ideas that were previously on this gland can be formed again long afterwards without requiring the presence of the objects to which they correspond. And this is what memory consists in.¹¹⁹

It is important to note that the patterns that are traced in the brain as the animal spirits fill the gaps are not ideas. Ideas are traced on the surface of the pineal gland, patterns are imprinted on the brain; only the former "should be taken as the forms or images which, when united to this machine, the rational soul will consider directly when it imagines

¹¹⁶ John Sutton, *Philosophy and Memory Traces* (Cambridge University Press, 1998), p. 67.

¹¹⁷ *Ibid.*, p. 55.

¹¹⁸ *World*, 149 (AT XI, 177).

¹¹⁹ *World*, 150 (AT XI, 178).

some object or senses it."¹²⁰ Thus, only machines with souls have ideas but both machines with and without souls have the patterns in the brain, which are the source of corporeal memory.

It is also important to note that these patterns are not faithful representations of the idea or the object of sense. As with the account of perception where the sensation does not need to resemble the sense object, it is a matter of "representation without resemblance" which, for Sutton, suggests a 'dispositional' model of memory: "patterns are 'stored' only implicitly, not kept in exactly the same form throughout the interval between experience and remembering."¹²¹

Descartes uses the analogy of needles passing through a piece of cloth and leaving holes, some of which remain open and some of which close but leave traces that make it very easy to open them up again. In fact, not all of them have to be opened up again in order to remember an image. As Descartes explains, "if I see two eyes with a nose, I immediately imagine a forehead and a mouth, and all the other parts of a face, because I am unaccustomed to seeing the former without the latter".¹²²

Descartes' account of memory slips into a discussion of the pineal gland and how it inclines in one direction or another (as has already been discussed under distance perception), this inclination being the cause of bodily movement, such as the eyes and the hand turning towards an object. But the inclination of the pineal gland can also be caused by memory:

Moreover, it should be noted that when gland H is inclined in one direction by the

¹²⁰ *World*, 149 (AT XI, 177).

¹²¹ Sutton, *op. cit.*, p. 58. Sutton points out that the patterns are retained in such a way that they "play a part in the (re-)creation of the idea on the surface of the gland", apparently overlooking the fact that only humans have traces on the surface of the gland, these being 'ideas' which require a soul.

¹²² *World*, 151 (AT XI, 179).

force of the spirits alone, without the aid of either the rational soul or the external senses, the ideas which are formed on its surface derive not only from inequalities in the tiny parts of the spirits causing corresponding differences in the humours, as mentioned earlier, but also from the imprints of memory. For if the figure of one object is imprinted much more distinctly than that of another at that place in the brain towards which this gland is properly inclined, the spirits issuing from it cannot fail to receive an impression of it. And it is in this way that past things sometimes return to thought as if by chance and without the memory of them being stimulated by any object impinging on the senses.¹²³

What is important here, for Descartes, is the fact that "without there being any soul present in this machine, it can naturally be disposed to imitate all the movements that real men—or many other similar machines—will make when it is present."¹²⁴ This statement is remarkably reminiscent of statements regarding animals imitating the movements of humans in sensation (but not feeling the pain) and it introduces as much ambiguity. Again, this ambiguity allows different interpretations of human capacities as compared to animal capacities, allowing the latter to be seen either as strictly automatic or as semi-thinking, depending on how flexible the interpreter wants to be with Descartes' admittedly ambiguous language. "Soul-less machines or beasts have many capacities which *we* would class as cognitive", Sutton tells us in his discussion of the Cartesian account of memory.¹²⁵ However, in order to hold this position he must set aside Descartes' own description of the three grades of sensory perception outlined in the replies to the Sixth Objections and outlined above. He tells us that "these distinctions are far from clear, and the intermediate mode of cognitive response which I attribute to Descartes would include both the second grade of sense and some cases of the third...."¹²⁶ This interpretation, which attributes ambiguity to a passage of Descartes that

¹²³ *World*, 155 (AT XI, 184)

¹²⁴ *World*, 157 (AT XI, 185)

¹²⁵ Sutton, *op. cit.*, p.74.

¹²⁶ *Ibid.*, p. 76 (footnote 20).

is quite unambiguous, gives a very wide berth to Descartes' account of non-human or strictly physiological capacities and would seem to come uncomfortably close to pre-Cartesian accounts of the multi-partite soul which Descartes so clearly rejects. It also would appear to ignore the fact that for Descartes only humans have 'ideas' and that parts of Descartes' account of memory and of action in the pineal gland depend on the ideas traced there.

Whatever the ambiguities present in his account of the body on mechanistic principles, Descartes concludes that, having "postulated in it only such organs and working parts as can readily persuade you that they are the same as those in us, as well as in various animals lacking reason",¹²⁷ he has given a full account of the functioning of the human body that conforms to his account of the world in general.

This chapter has traced the influences that led Descartes to conceive the human body under mechanistic principles and his efforts to give form to that conception in his description of the human body, in particular, in *L'Homme*. It has also highlighted some of the problems encountered in that description which arise as Descartes attempts to explain bodily movement and, in particular, sense perception and memory, without recourse to mind or soul.

Shapin has questioned the viability of mechanical explanatory structures applied to human experience and, in particular, human sensation. He points to the lack of parallel explanations in the macroscopic realm and wonders "whether the claimed global intelligibility of mechanical explanation was more than just practitioners' *agreement* that such explanations would count as more intelligible than alternatives."¹²⁸ And he quotes

¹²⁷ *World*, 168 (AT XI, 200).

¹²⁸ Shapin, *op. cit.*, p. 57.

Gabbey on the limitations of mechanistic explanation stating that:

the phenomena to be explained were caused by entities whose structures were such that they caused the phenomena. Previously, opium sent you to sleep because it had a particular dormitive quality: now it sent you to sleep because it had a particular corpuscular micro-structure that acted on your physiological structures in such a way that it sent you to sleep.¹²⁹

The next chapter will look at what I will call 'naturalistic ghosts', metaphysical props that Descartes called upon (in the manner of a *deus ex machina*) to support his mechanistic explanation of animal and human physiology. Animal spirits have been described in this chapter; in the next I will be examining Descartes' reduction and use of this ancient notion and the role it played in his description of the body, a role, I will maintain, which is somewhat as a world soul cut off from the world. Chapter 3 dealt at length with final causality and Descartes' rejection of it. In the next chapter, I will examine his notion of 'continuous creation' through which he explains how God, as the final (and ultimately the only) efficient cause, directs his creation from a distance. These two adaptations of earlier (and rejected) concepts considerably dilute the purity of Descartes' mechanistic account of the body and raise questions as to whether a mechanical explanation really was more intelligible than the alternative.

¹²⁹ *Ibid.*, p. 57.

CHAPTER 5

Naturalistic Ghosts in the Body-Machine

...Descartes veut dans un premier temps rompre avec la Renaissance. Dans quelle mesure il y arrive, c'est un autre problème...

Stephan Otto, "Stratégies de la *repraesentatio mundi* dans les modes de pensée de la Renaissance et dans la philosophie de Descartes"¹

The last chapter examined Descartes' effort to apply the principles of mechanism to the human body. This effort was the result of the homogenisation of matter and the domination of the general, abstract and quantifiable over the particular, concrete and qualitative in the new science. The Renaissance idea of body, emphasising the dignity of each being (or type of being) in a hierarchy of qualitative organisation and mutual influence (as described in Chapter 3) had to be discarded to make room for the mechanistic body, devoid of any special status of the personal and, as all *res extensa*, subsumed under the laws of physics. The homogenisation of matter and its distinctness from mind allowed the application of the Cartesian dream of the unity of science, along with the scientific construction of 'objects' of knowledge, the human body having become one knowable object among others. Having established the principles of mechanism for the physical world in *Le Monde*, Descartes applied them to the body in *L'Homme*.

As was seen in Chapter 4, much of his description of the human body is based on principles regarding the size, speed and direction of particles, which is all that is needed,

in Descartes' view, to explain the operation of the machine that is the body. Descartes has gone to enormous lengths to describe the body in such a way as to prove that the soul (or mind) has no role to play in its operations. All movement or biological activity that humans share with animals, which is everything except rational thought, is accounted for in strictly mechanistic terms. Even the addition of the soul does not change the mechanistic nature of the human body since the role of the soul, in willed action for example, is limited to changing the direction of the animal spirits. Descartes' analogy of the mechanical fountains is clear: the body is the fountain, the soul is the fountaineer. The latter can control the switch but the range of operation is determined solely by the arrangement of the parts of the machine.

At the same time, as was shown in Chapter 4, this application of the principles of mechanism to the human body was not without problems. Ambiguities and confusions arise regarding the precise role of the soul in activities such as perception and memory which leave the reader perplexed with regard to Descartes' meaning or sceptical with regard to his objective. Scholars who give a wide interpretation to Descartes' mechanistic physiology (such as Gaukroger with respect to Descartes' view of animal sensation or Sutton with respect to memory, as was seen in Chapter 4), tend to smooth over the difficulties of accounting for human and animal behaviour without mind or soul and even ignore some of Descartes' unambiguous statements about what activities of perception, for example, require a soul. Others, relying heavily on Descartes' later efforts to link body and soul, in particular in the *Passions* and the letters to Elisabeth, go so far as to question whether or not Descartes was really a dualist or to affirm that if he was, he was not really comfortable with it. Cottingham, for example, tells us: "The truth, perhaps, is

¹ In Faye, *op. cit.*, p.236.

that Descartes was never completely comfortable with strict dualism, however emphatically he affirmed it."² Similar debates take place around whether or not Descartes really believed that animals feel no pain, a position which leaves open the question of how he could perform vivisection so enthusiastically if he thought they did. It would seem more generous to Descartes to presume that, when he cut a rabbit open to check the temperature of its heart or the circulation of the blood, he was acting out of ignorance and not out of cruelty.

In the same article where he questions Descartes' true commitment to dualism, Cottingham writes about the "strange fuzziness" which surrounds Descartes position on animal feeling and consciousness, and states very aptly: "It is evident that Descartes is in a philosophical mess here."³ While this turn of phrase may lack the linguistic rigour essential to true philosophical analysis, it serves as a starting point for the discussion that I will undertake in this chapter: Descartes' mechanistic physiology required the importation of concepts which he officially rejected but without which he was unable to explain the workings of the human body. One of these concepts, animal spirits, was consciously taken over and reduced; the other, continuous creation, was also transformed and reduced but, while it stayed quietly behind the scenes, was equally necessary to the Cartesian explanation.

In this chapter, I will attempt to show that, within the Cartesian framework of the human body, these two notions can be seen as reductions of, or replacements for, the notions of world-soul and final causes which were discussed in Chapter 3.

² See John Cottingham, "A Brute to the Brutes? Descartes's Treatment of Animals" in Moyal, *op. cit.*, Vol. IV, p. 329.

5.1 Animal Spirits: from cosmic connection to 'wriggle work'⁴

In January 1642, Descartes wrote Regius, regarding public disputations about the question of substantial forms. "I should like it best if you never put forward any new opinions", he wrote, "but retained all the old ones in name, and merely brought forward new arguments". Then he reminded Regius of his own treatment of the question in his *Meteorology* where "I said quite expressly that I did not at all reject or deny them, but simply found them unnecessary in setting out my explanations,"⁵ and he advised Regius that to avoid conflicts in the future, "you should say that fundamentally you agree with the others and that your disagreement with them was merely verbal".⁶

This little bit of political acumen, associated in our day more with politicians than philosophers, is not totally surprising in Descartes, who, wishing to avoid trouble with the authorities, kept the names, but changed the meanings of, more than one scholastic or naturalistic notion. As pointed out in the Introduction to this thesis, Descartes reduced a number of important and long-held concepts in order to accommodate his mechanism, usually without acknowledging the reduction. For example, regarding Gassendi's objection that his use of the word *soul* in the *Meditations* was ambiguous, Descartes replied that

it is generally the ignorant who have given things their names, and so the names do not always fit the things with sufficient accuracy. Our job, however, is not to change the names after they have been adopted into ordinary usage; we may merely emend their meanings when we notice that they are misunderstood by

³ *Ibid.*, p. 328.

⁴ I am borrowing this term from John Sutton who borrows it from the name of a late seventeenth-century style of engraving. Sutton takes "wriggling as a symptom and symbol of early modern sinuous paths imagined for animal spirits in the brain's memory folds" but the image is equally applicable to all the activity that Descartes attributes to animal spirits as they wriggle their way through the body's tubes and crevices. See Sutton, *op. cit.*, p. 26..

⁵ Letter to Regius, January 1642, CMSK, 205 (AT III, 491).

⁶ CMSK, 206 (AT III, 493).

others."⁷

Descartes cleared up the ambiguity over 'soul' by eliminating the idea of the multi-level soul (which allowed for gradations of life and consciousness between plants, animals and humans) and declaring that soul is mind and only mind: "For I consider the mind not as a part of the soul but as the thinking soul in its entirety."⁸ For Descartes, mind is thought alone, while for Gassendi and all pre-Cartesian thinkers, the soul represents the principle of life, active and attuned to the cosmos, holding things together and accounting for change and movement in both humans and animals. With his simple statement that the mind is not part of the soul but the thinking soul in its entirety (a direct result of the *Cogito*), Descartes transformed the principle of life while maintaining that he was simply avoiding ambiguous terminology.

As we have already seen with respect to the soul, this type of reduction was not uncommon for Descartes whose admitted practice was to keep terms but change their meanings. Emily Grosholz states that 'reduction' can be defined broadly as

a habit of thought for dealing with complex situations by forgetting some structure in order to arrive at a more manageable and yet still significant remnant. Its advantage is conceptual streamlining; its disadvantage is forgetfulness."⁹

In the case of the reduction of the meaning of soul, Descartes has achieved some conceptual streamlining for his mechanistic physiology but the result is forgetfulness of the principle that held things together, in the body and in nature.

A similar reduction was carried out with the notion of animal spirits. Speaking of

⁷ Fifth Set of Replies, CSM II, 246, (AT VII, 256).

⁸ CSM II, 246 (At VII, 256). While it can be argued that the role of the philosopher is to clarify and, where necessary, transform the meanings of terms, Descartes' way of doing this is unique. He reduces terms in a cavalier fashion, often not acknowledging that he is doing so. Where he does acknowledge the transformation, he either does not recognise, or does not admit, its philosophical importance. As in the response to Gassendi, a major metaphysical transformation is often glossed over as a simple clarification of terms.

Descartes' transformation of the idea of animal spirits, Pierre Mesnard states:

Descartes ne va pas rompre en visière avec une théorie si généralisée, mais suivant son habitude, il va la transformer peu à peu en l'adaptant à son système, jusqu'à lui donner enfin une structure toute nouvelle.¹⁰

Sutton regards spirits theory as a test case in conceptual change and he asks under what conditions terms which designate theoretical entities are jettisoned or retained, eliminated or smoothly reduced to terms for new hypothetical constructs?¹¹

What I will be questioning in the first part of this chapter is whether Descartes' reduction was smooth or forced. At the same time, I will be looking at what was left behind in the reduction: how the connection of body with nature was lost as animal spirits were reduced to their humbler role of neural stimulators and muscle movers.

5.1.1 A Brief History

By the seventeenth century, animal spirits were an accepted part of the medical vocabulary and had been since antiquity. As one 18th century physician put it:

The Doctrine of Spirits, to explain the animal Functions and their Diseases, has been so readily and universally receiv'd from the Days of the *Arabian* Physicians (and higher) down to our present Times, that scarce one (except here and there a *Heretik* of late) has call'd this *Catholick* Doctrine in question.¹²

Many writers accept that the concept of animal spirits began with Galen and, while some hold that it ended with Descartes,¹³ others agree that the concept continued well into the

⁹ Grosholz, *op. cit.*, p. 12.

¹⁰ Pierre Mesnard, "L'Esprit de la physiologie cartésienne" in Rodis-Lewis, *La Science chez Descartes*, *op. cit.*, p. 216.

¹¹ Sutton, *op. cit.*, p. 28.

¹² George Cheyne, in *The English Malady (1703)*; cited in L.S. Jacyna, "Animal Spirits and Eighteenth-Century British Medicine" in Kawakita, Sakai and Otsuka, *The Comparison Between Concepts of Life-Breath in East and West* (Tokyo: Ishiyaku Euro America, Inc., 1990), p.139.

¹³ See for example P. Janet and Gabriel Séailles, *A History of the Problems of Philosophy*, transl. Ada Monahan (London: Macmillan and Co., 1902), p. 222: "Descartes' theory of the animal spirits is the form in which it appears for the last time."

latter half of the eighteenth century.¹⁴ In fact, the theory of animal spirits has its roots in the notion of *pneuma*, or vital or life-breath and while Galen may have adopted the theory of *pneuma* and given it more unity and coherence,¹⁵ he did not invent it. It was a core concept of Stoic philosophy and played an important part in the physiology of antiquity of both East and West. According to Shigehis Kuriyama,

The notion of *pneuma* figured at the core of traditional European discourse on the living body; the notion of *qi* similarly defined the pivot of medical analysis in China. But the two notions also shared a close conceptual affinity. Indeed, early European missionaries identified *qi* as simply the Chinese name for what Greek physicians had called *pneuma*; and until recently, both *pneuma* and *qi* were routinely rendered into English by the same term: 'breath'.¹⁶

In fact, Kuriyama's analysis shows that both concepts were originally used to signify *wind*, a fact that, he points out, medical historians have forgotten.¹⁷ The shift in prominence from wind to breath marked a shift in the notion of illness as being caused by external factors ("The vengeful spirits who brought sickness could just as easily have inflicted drought and famine"¹⁸) to a recognition of an autonomous body with inner factors of change and causality. Kuriyama's thesis is that "the surge into prominence of *pneuma* and *qi* and the crystallization, in both Greek and Chinese cultures, of the autonomous body/self, were two sides of the same development..."¹⁹

But this autonomous body was still linked to the world outside and the cosmos as a whole, and the various adaptations of *pneuma* into 'medical spirits', 'vital spirits',

¹⁴ W.T. Clower, for example, states: "Until the latter half of the 18th century, the Animal Spirits paradigm provided the standard model for explaining the control of physiological functions." In "The Transition from Animal Spirits to Animal Electricity: A Neuroscience Paradigm Shift", draft paper.

¹⁵ Janet and Séailles, *op. cit.*, p. 225.

¹⁶ Shigehisa Kuriyama, "*Pneuma, Qi, and the Problematic of Breath*" in Kawakita, Sakai and Otsuka, *op. cit.*, p. 1.

¹⁷ This is the case in early Greek tragedies, for example where in Aeschylus "winter comes by sharp winds" (*pneumatos*) or in Sophocles where Oedipus explains that war can happen when "the wind (*pneumai*) shifts between a man and his friend, or between two cities." See Kuriyama, *op. cit.*, p. 7, p. 12.

¹⁸ Kuriyama, *op. cit.*, p. 14.

'animal spirits' and even, in Christian theology the 'Holy Ghost' served to bridge divided worlds. Sherrington, in his book on Fernell, writes of Galen's 'spirits of the anima' and states that

they had dominated medicine and biology through Alexandrian, Christian, Arabian and Jewish learning. Theirs had been a privileged position. The universe, the macrocosm, had its messengers, its 'angels', between the corporeal and the occult. So the microcosm, man, had similar messengers and these were they. They were analogous to the astrologers' 'astral fluid'. The more mysterious they were, the more votaries they had.²⁰

For Fernell, who predated Descartes by a century and whom Sherrington describes as a "reformer in Medicine and its teaching", animal spirits "belonged at once to soul and to body"²¹ and although, as D.P. Walker points out, there were "confusions and contaminations" between meanings, for example, of medical spirits and the Christian Holy Spirit, "medical spirits were used in attempts to bridge the metaphysical gap between body and soul, between matter and mind."²² In the galenic version, spirits come in three versions: natural, vital and animal and, as expressed by Sherrington,

"each have their several roles. Yet they all of them are 'go-betweens' for incorporeal life-soul and corporeal body. To that part of the life-soul which is the mind, that is to the sentient soul and, in man, the rational soul, belong the so-called animal spirits. These animal spirits are for one thing the agent by which the mind becomes percipient of the external world. They are, too, the agent by which the mind moves the body, and so acts on the external world."²³

Further, since the human soul was of the same substance as the world-soul (or "a spark from the stars"), the spirits which serve the soul "are a refined essence from the innate heat, that is a celestial 'heat' implanted at outset to the heart."²⁴) Thus the spirits served

¹⁹ *Ibid.*, p. 16.

²⁰ Sir Charles Sherrington, *Man on his Nature* (Cambridge University Press, 1963), p. 197.

²¹ Sherrington, *op. cit.*, p. 3, p. 197.

²² Daniel P. Walker, "Medical *Spirits* and God and the Soul", in Fattori & Bianchi, eds., *Spiritus*, IV^o Colloquio Internazionale, 1983 (rome: Edizioni dell'Ateneo), p. 223.

²³ Sherrington, *op. cit.*, p. 36.

²⁴ *Ibid.*, p. 36.

to bridge the gap between man and the cosmos, between the human body and the substance of the heavens. This is the case with Ficino's 'medical spirits', which we have already seen in Chapter 3, where they were discussed mainly in the context of his astrology. It was also pointed out in Chapter 3 that Ficino's multi-levelled universe needed mediators to connect the various levels of being and this was the role played by his medical spirits. The medical spirits were linked to the cosmic spirit which was "an intermediary between the gross body of the world and its soul...",²⁵ but they also had a role within the body as the mediator between the soul and the body. While the soul is the source of life and has its seat in the heart, it does not act directly on the body; rather "the power of our soul is brought to bear on our members through the spirit". At the same time, the body acts on the soul through the same spirit that transforms what we ingest into the form of our life:

just as foods we eat in the right way, although not themselves alive, are converted through our spirit to the form of our life, so also our bodies rightly accommodated to the body and spirit of the world (that is through cosmic things and through our spirit) drink in as much as possible from the life of the world.²⁶

5.1.2 The Cartesian Reduction

In the world where animal spirits reigned for centuries, life and soul are intimately connected. Life comes from soul; therefore soul is in all living things. The cosmos (the macrocosm) is a living thing upon which life on earth (the microcosm) is dependent. Animal spirits, in their various forms, are the connectors. For the Stoics, the cosmic breath or *pneuma* represented the principle of life and it was in all things, including the human body. For Ficino, the World-soul was the principle of life and was linked to the human soul and body through the medical spirits.

²⁵ *De vita*, p. 259.

Descartes' conception of soul as pure thought, lodged in some manner never satisfactorily explained in the human body (and operating from the pineal gland), breaks the fundamental connection between human life and cosmic life, (along with the connection between human life and human soul). The cosmos, for Descartes, is simply matter, pure extension, and it does not have a soul.²⁶ The principle of animal life, as we have seen in Chapter 4, is in the heat of the heart and the heat of the heart is not the celestial or innate heat of Galen. It does not come from the cosmos; it develops spontaneously within the body through a process of fermentation. And the animal spirits are a distillation from the blood, formed through a process of heat. Unlike galenic spirits which initially come from the celestial fire or heat, have a spiritual component and cause life and movement in the body, Cartesian spirits are developed from within, are material and, while they do cause movement in the body, they do so most of the time without help from the soul. Their action is mechanical and depends on the size and speed of the tiny particles of which they are composed. Like everything else in the human body, animal spirits obey the laws of physics.

Thus was the concept of animal spirits, to use Sutton's words, "smoothly reduced". But was the reduction really smooth? And why did Descartes need to keep the concept anyway? Could he not simply have let it go? If animal life follows the laws of physics, and no spirits seem to be needed in the physical world, why keep them in the

²⁶ *De vita*, p. 247.

²⁷ It must constantly be borne in mind that Descartes' identification of soul and mind implies not only that, for him, the cosmos is devoid of soul but also of mind. Thus any intelligence within matter is precluded, as is any immanent intelligent direction. I am using the word 'soul' throughout because Descartes uses soul most of the time, but I am using it in the larger meaning of 'mind' or 'intelligence'. The use of 'soul' in our time has religious and spiritual connotations that suggest magical and occult qualities, especially when used in connection with nature or the cosmos, which are considered unscientific. The use of 'mind' or 'intelligence' in relation to the cosmos is considered equally unscientific in some quarters as it is, as well, in connection with the body (except in psychology).

biological world? And if the idea of animal spirits as cosmic connectors was somehow mysterious, were Descartes' spirits whirling around in the tiny tubes of the nerves and hiding out in the crevices of the brain any less so?

I want to look at Descartes' use of animal spirits from two perspectives: 1) why he needs the concept at all; and 2) whether the reduction of the concept solved the problem of the relation of body and soul, mind and matter, in the Cartesian account of mechanistic physiology.

5.1.3 Why does Descartes need 'animal spirits'?

It is somewhat surprising, given Descartes' reliance on method and mechanism as well as his laborious study of physiology through the dissection of animal carcasses, that his system has any place for animal spirits, even in what Sutton calls their "resolutely corporealized" form.²⁸ As resolutely corporealized as they may have been, there was no empirical evidence for their existence nor for their mode of operation, and accounting for them at all appears to go against Descartes' own statement to Mersenne that after years of dissecting animals he could find nothing in the body that did not confirm to the principles of his Meteorology. In fact, he did not 'find' animal spirits at all; he presupposed their existence, in spite of the fact that they were downplayed or ignored by anatomists such as Vesalius. Surprisingly, as Sutton points out, "there was a seventeenth-century shift *towards* animal spirit explanations, revealing simultaneously both increased explanatory ambition and wild speculation."²⁹

In Descartes' case, the 'increased explanatory ambition' is rooted in his original dream of the *mirabilis scientiae fundamentae* and his determination to explain animal and

²⁸ Sutton, *op. cit.* p. 44.

²⁹ *Ibid.* Sutton adds that "the use of spirits in alchemy and chemistry is not as surprising as their continued

human physiology based on the principles of mechanical physics. To do so he must reduce all causal explanation to physical, efficient causes and must explain all change and movement (since change is equivalent to movement) in terms of the size, speed and direction of particles. In relation to animal and human 'machines', this entailed excluding mind or soul from physiological explanation (in the first case because animals do not have souls and in the second because soul is nothing but pure thought). Aside from the fact that, in the Cartesian picture, body and soul, or mind and matter, are different—and mutually exclusive—substances, direct causal interaction between them is "precluded by the deduction that the quantity of motion imparted to, and conserved in, the world is necessarily constant." Any movement initiated by mind on a body would "create and communicate an additional quantum of motion to that which had already been imparted to the world, and from this it would follow that the total quantity is *not* constant but increased by increments whenever voluntarily initiated movement occurred."³⁰

Further, as has already been shown in Chapter 4, Descartes' human machine and animal machine act in the same way and according to the same principles until a soul is added to the former, giving it control over certain movements and processes that are either more elemental or non-existent in the latter. Animal spirits serve a pivotal role in this system. They act as intermediaries or messengers between the brain and other body parts. The brain is the activity centre of the machine (both animal and human) and the animal spirits are its messengers, directing muscle movement, sense perception, memory and all the other activity anywhere in the body. They are defined in purely physical and mechanistic terms in both animals and humans, the only difference being that in the latter

presence in supposedly austere mechanical philosophies." (p. 32).

³⁰ S. V. Keeling, *Descartes* (Oxford: Oxford University Press, 1968), p. 153.

case the soul, acting from its seat in the pineal gland, has the power to change the *direction* of the animal spirits (by inclining that gland in one direction rather than another, a fact that Descartes uses to explain willed action or movement). It is clear that Descartes needed the notion of animal spirits in order to explain the function of the brain and how it controlled bodily processes. He had to accommodate action at a distance from the brain within the explanatory framework of efficient causality, that is, through direct contact. He needed a 'connector' between brain centre and bodily movement (and, in the human animal between soul and brain/body) that was not spiritual or in any way 'occult'. Animal spirits were firmly rooted in medical theory and, as Sutton points out, "long before the Cartesian philosophy of the brain, Renaissance theorists of mind...employed animal spirits to embed cognitive function in the body."³¹ Descartes continued to make use of them for their 'cognitive' value but he dispensed with their metaphysical role. They were connectors but not mediators (in the Ficinian sense) and their Cartesian adaptation was not without its problems.

5.1.4 Smoothly Reduced?

Sutton remarks that a "relatively respectable history of animal spirits might be possible if one looked only at their explanatory role in theories of muscular motion" but adds that "if anything is of the essence of the wriggling animal spirits, it is that they did not tidily restrict themselves to the occasional inflation of muscle tissue at the behest of the will".³² This was certainly true before Descartes, but it was also true in Descartes' own system. Even in their resolutely corporealized form, animal spirits play a multi-faceted role in Descartes' physiology and they are called upon to play a major role in his

³¹ Sutton, *op. cit.*, p. 46.

³² *Ibid.*

psychology as well.³³ Is it really possible for Descartes' reduced concept to fulfil the explanatory demands that he has placed upon it? Is Descartes keeping more of spirits' metaphysical role than he wants to admit, bringing them in by the back door (as "smuggled goods" to use Rodis-Lewis' phrase)³⁴ to do spiritual work in materialist clothing? Is the ghost of the world-soul hovering over their mechanistic explanation helping them to continue to bridge levels of being that Descartes has attempted to collapse? Is there really a sentient soul in the Cartesian machine?³⁵

As pointed out in Chapter 4, Descartes' description of the human body is a construction, or a re-construction, of Galenic and other classical theories of the body adapted to fit his mechanistic physics. His transformation of the notion of animal spirits is equally a re-construction, once again of a classical theory, designed to fit his mechanism. "For any given new phenomenon, physical, biological, or psychological, Descartes seems to feel free to coin new particles and new machines, that is new simples and new relational structures."³⁶ In the streamlining/forgetfulness dichotomy mentioned above, Descartes has attempted to streamline physiological explanation by forgetting the soul (and created new simples for both). In his mechanistic physiology, instead of the soul directing the body via the animal spirits, the brain directs the body via the animal spirits. The question then becomes: what directs the brain? The answer is less clear.

³³ The role of animal spirits in the emotions is set out in the *Passions*. I am restraining my discussion of animal spirits to their physiological role as described in *L'Homme* and am not venturing, except peripherally, into their role in the *Passions* where, in Sutton's words, "Descartes gives physiological-fantastical accounts of peculiarities of spirit motions in various psychological states..." *Op. cit.*, p. 46.

³⁴ The idea of 'smuggling' is picked up by Grosholz as well when speaking of problems in Descartes' use of his method: "Thus Descartes must frequently smuggle in extra bits of knowledge to which he is not strictly entitled in order to generate his new subject-matters." *Op. cit.*, p. 8)

³⁵ See Grosholz, *op. cit.*, p. 120, who states: "Indeed, animal spirits often look suspiciously like material stand-ins for the soul." And further, "Descartes is trading on the ambiguity of his notion of animal spirits, to which he has assigned spiritual functions within the corporeal machine." (p. 129).

³⁶ Grosholz, *op. cit.*, p. 122.

In the case of simple sensation (e.g. Descartes' example of the foot near the fire and the sensation of heat as described in Chapter 4), the process is fairly straightforward: the nerve tubes open up all the way to the brain and animal spirits from the brain "enter and are carried through it, some to the muscles that serve to pull the foot away from the fire, and some to the muscles that make the hands move and the whole body turn in order to protect itself."³⁷ In the case of vision, it is a little more complicated: nerve fibres open as a result of rays coming from the observed object, causing a figure to be traced "on the inside of the brain", but also, due to the flowing of animal spirits in the tubes, on the surface of the pineal gland itself. It is the latter figures only that "should be taken as ideas... That is to say only these should be taken as the forms or images which, when united to this machine, the rational soul will consider directly when it imagines some object or senses it."³⁸ The ambiguity of this description again leaves the question of animal sensation and imagination open to interpretation, but the important point is that animal spirits are involved in what Grosholz calls "diverse or patterned motion":

Such motion constitutes information about the external world on the way to the brain, and the interpretation of it, as appropriate response, on the way out... Descartes wants to make use of (the so far soulless) pineal gland as a locus for complex algorithms which convert perceptual patterns into patterns inducing movement.³⁹

This, according to Grosholz, goes beyond a straightforward extension of Descartes' mechanistic physical principles "and blinds him both to their inadequacy for the task, and to his covert revision of them as he strives to make them adequate." In fact, she believes that "Descartes's attempt to model cognition in mechanical terms radically transforms his

³⁷ *World*, 117 (AT XI, 142).

³⁸ *World*, 149 (AT XI, 177).

³⁹ Grosholz, *op. cit.*, p. 126.

original notions of matter and machine."⁴⁰

This may be true, but if it is, it is a fact that went unrecognised by Descartes and did not in any way transform his metaphysical dualism. As pointed out in Chapter 4, Descartes was convinced that the function of the animal-machine followed "simply from the disposition of the organs as wholly naturally as the movements of a clock or other automaton follow from the disposition of its counter-weights and wheels."⁴¹

Animal spirits, then, appear to both bring messages to the brain and send directions out from the brain, often, but not always, via the pineal gland which appears to have a directive operation even when the soul is not involved. Although they have lost their metaphysical role as messengers from the soul and/or the cosmos and are nothing but "aggregates of bits of matter in motion and so are the subject of physics", at the same time "they are active and patterned, conveying information on the way in and directing action on the way out; they embody both information and intelligence."⁴² Thus even in the machine that has not yet been imbued with a human soul, animal spirits play a surprisingly sophisticated role. But not sophisticated enough to cover activities that require thought (or will or imagination or any of the attributes that are the preserve of soul or mind). This is somewhat puzzling. While animal spirits are active and patterned, they are so only up to a point. That is the point at which the soul comes into play in the human machine ("when God unites a rational soul to this machine"⁴³), with its capacity to impede their activity and change their direction, thus considerably increasing the complexity of their activity. How is Descartes able to establish that point? Attempting to

⁴⁰ Grosholz, *op. cit.*, p. 127, 123.

⁴¹ *World*, 169.

⁴² Grosholz, *op. cit.*, p. 129.

⁴³ *World*, 119 (AT XI, 143).

answer this question takes us back to his three levels of perception referred to earlier and, in particular, to the difficulties inherent in the second level—the one that “comprises all the immediate effects produced in the mind as a result of its being united with a bodily organ... [including] the perceptions of pain, pleasure, thirst, hunger, colours, sound, taste, smell, heat, cold and the like”—and opens up the difficulty of just what soul-less animals are capable of perceiving.⁴⁴ What is it that allows certain patterns to be programmed into animal spirits without the soul and determines that a soul is necessary for others? The ambiguities referred to in Chapter 4, regarding the sensation of pain, distance perception, memory, etc., attest to the lack of a clear response to this question.

One of the remarkable features of animal spirits, even in the soul-less machine, is that they know exactly where to go in the body to cause a certain action or reaction and this despite the fact that their only ‘qualities’ are quantities, i.e. of size, speed and direction.⁴⁵ Even when the soul is added to the machine, all it can do is change their direction (or, indirectly, their speed, since impeding their movement is a possibility). Descartes does not explain how the spirits know where to go; this is simply the result of their configuration or the arrangement of their parts, an arrangement that is, ultimately attributed to God.

5.1.5 Soul and Spirits

It is not totally accurate to say (as I did above) that in streamlining physiological explanation to conform to mechanistic principles, Descartes has forgotten the soul. More accurately he has limited its role, in conformity with another streamlining—his reduction

⁴⁴ CSM II, 294 (AT VII, 437).

⁴⁵ Of course, the pre-Cartesian animal spirits were no less remarkable, but since their ontological status was different (they were part matter, part spirit—and thus part mind) and their causal activity was not restricted to efficient causality, their explanatory possibilities were greater and offered greater coherence within an

of the multi-partite soul to pure thought, to those bodily functions that require judgement, will, or other purely mental activities. In distinctly human action the soul directs the animal spirits, as has already been pointed out, by causing the pineal gland to lean in one direction or another, thus changing the direction of the animal spirits. Aside from the obvious questions regarding the limited number of directions in which the pineal gland can move vs. the myriad activities its resident soul controls, there is one overarching problem regarding the action of the soul on the animal spirits: if mind cannot causally interact with matter, how can it causally interact with animal spirits which are material?⁴⁶ And how can it move the pineal gland? As Keeling points out, "Descartes fails to show how the self can move the pineal gland when it cannot move an arm or a leg" and he asks further, is Descartes not mistaken "in supposing that because the animal spirits are rarefied, active and almost gaseous, they are therefore less 'material' and hence of a nature more fitted for interaction with a spiritual substance or self?"⁴⁷

To summarise the above analysis, animal spirits played a necessary role in Descartes' mechanistic physiology⁴⁸ but they could only do so by diluting the mechanistic principles on which his science of the body was built. Or, to put it another way, he could only explain his mechanistic physiology by bringing in an occult concept which, although ontologically reduced, continued to perform work remarkably similar to that of its naturalistic counterpart. That Descartes was blind to this fact is extremely important if one considers the radical anthropological shift that his mechanistic physiology brought

overall system of gradations of being, and multiple causality.

⁴⁶ While there are different grades of matter in Descartes, there are only two grades of being: matter and mind. And while animal spirits are the most refined and subtle type of matter, they are, nevertheless, purely material.

⁴⁷ Keeling, *op. cit.*, p. 165.

⁴⁸ And long after Descartes as well. Sutton points out that the "Cartesian version of animal spirits theory was extraordinarily popular across medicine and culture for close to a century after Descartes." *Op. cit.*, p.

with it. That he did not entirely succeed in doing what he thought he was doing did not lessen the impact of his effort. Animal spirits were no longer a bridge between body and soul or man and cosmos: resolutely corporealized they were resolutely on the side of matter and clearly limited to bodily—not cosmic—matter. And even though cognitive aspects appear to have crept into the workings of bodily matter, true cognition remained strictly in the realm of soul as pure thought. Further, even though a sentient soul seems to invade the non-human body through the animal spirits, Descartes continued to deny any soul to animals against the objections of many of his contemporaries.⁴⁹

Descartes has reduced the soul to pure thought, the body to pure matter, and the animal spirits to simple material particles, all in the name of mechanistic science. In so doing, he established the explanatory framework of the body that endured for several centuries and which served as the basis for modern bio-medical science. At the same time, in order to explain the mechanical functioning of the body, he was forced to stretch both his mechanistic principles and his method beyond the limits of their explanatory capacity even as he clung to the mechanistic paradigm (which points to the legitimacy of Shapin's question referred to at the end of the last chapter as to whether global mechanistic explanation was really more intelligible or whether its adherents just agreed that it should be).

5.2 Continuous Creation: Bolstering the Efficient Cause

There is a second ghost of naturalism that Descartes uses to bolster his

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⁴⁹ Gassendi, of course, was the strongest, but not the only, objector and he tackled the issue head on in the Fifth Objections when he points out to Descartes that just like him "the brutes have nerves, animal spirits and a brain, and in the brain there is a principle of cognition that receives the messages from the spirits in

mechanistic physiology and that is the concept of continuous creation. More precisely, it is a Scholastic ghost since he borrowed it from Aquinas and the theologians,⁵⁰ but it also serves to replace the notion of final cause which, as discussed in Chapter 3, was one of the pillars of naturalistic philosophy that was rejected by Descartes' mechanism.

Descartes could not accept the idea that movement or change in material bodies (including animal bodies) is the result of any immanent causality. All movement, and therefore change, must have only external causal relations. The idea of an internal force, soul, or divine presence moving or directing material objects was anathema to Descartes and the mechanists, as was shown in Chapter 3.

Further, as has been maintained throughout this thesis, Descartes reduced all causal action to efficient causality and rejected the idea of final causes as being unknowable and irrelevant to science. As discussed in Chapter 3, he allowed that final causes exist in the form of God's purpose for the universe but, at the same time, as I will maintain in the following analysis, he reduced God's interaction with the world to efficient causality as well.

Although it is a very important aspect of his system, Descartes does not write about continuous creation in any thorough or systematic way. It appears as an idea more or less taken for granted in several of his works. For example, in the *Discours*:

But it is certain, and it is an opinion commonly accepted among theologians, that the act by which God now preserves [the world] is just the same as that by which he created it.⁵¹

And in the *Principia*:

Thus, from the fact that we now exist, it does not follow that we shall exist a

an exactly similar fashion and thus completes the act of sense-perception." CSM II, 187 (AT VII, 269).

⁵⁰ See Etienne Gilson, *René Descartes, Discours de la méthode*, (Paris: Vrin, 1947), p. 340.

⁵¹ CSM I, 133 (AT VI, 45).

moment from now, unless there is some cause—the same cause which originally produced us—which continually reproduces us, as it were, that is to say, which keeps us in existence.⁵²

Further, in Meditation III:

For a lifespan can be divided into countless parts, each completely independent of the others, so that it does not follow from the fact that I existed a little while ago that I must exist now, unless there is some cause which as it were creates me afresh at this moment—that is, which preserves me. For it is quite clear to anyone who attentively considers the nature of time that the same power and action are needed to preserve anything at each individual moment of its duration as would be required to create that thing anew if it were not yet in existence. Hence the distinction between preservation and creation is only a conceptual one, and this is one of the things that are evident by the natural light.⁵³

The doctrine implies, in short, that all things owe their continued existence to the continual intervention of the divine; they "could no more endure without God than they could begin to exist without him."⁵⁴ The above excerpt from Meditation III shows clearly the link between continuous creation and Descartes' notion of time, a question which has received much discussion in the literature and which was referred to briefly in Chapter 2.⁵⁵

Frankfurt refers to the doctrine as 'ontological inertia', the idea that "the existence of finite things in the world will cease unless it is continually sustained by an external

⁵² *PP* I, 21 in CSM I, 200 (AT IXB, 13).

⁵³ CSM II, 33 (AT VII, 49).

⁵⁴ Harry G. Frankfurt, "Continuous Creation, Ontological Inertia and the Discontinuity of Time", in Moyal, *op. cit.*, Vol. III, p. 1. As with several of the notions that have been discussed so far in this thesis, Descartes provides little elaboration of this important principle that, in effect, allows him to pattern his physiology on his mechanistic physics. As Frankfurt states: "Descartes does not make very explicit what he has in mind here. He leaves it unclear both why God's power is essential to the subsistence of things and how God's power accounts for their subsistence. The doctrine is introduced without argument and without explanation." And Garber states that despite Descartes' "clear commitment to the doctrine that God must continually support his creation, it is not at all clear just how he thinks God actually performs this most remarkable of feats." Garber, *op. cit.*, p. 265.

⁵⁵ As already pointed out, in Chapter 2, the argument about whether Descartes' version of continuous creation necessitates a continuous or discontinuous theory of time goes beyond the scope of my thesis and I will not dwell on it here.

force."⁵⁶ He makes two interesting points about the doctrine of continuous creation:

1) that it is inconsistent with Descartes' principle of 'kinetic inertia' whereby a body will remain in constant motion until it is interfered with by an outside force, and that while his "conception of kinetic inertia is distinctively modern, yet his conception of ontological inertia is backward looking"; and

2) that the notion is not necessary to an explanation of finite existence in that both finitude and God's omnipotence could be preserved in a principle analogous to the kinetic principle which "would simply state that existence continues until it is stopped by something external to it".⁵⁷ In other words, God could have simply created things so that they remained in existence until he chose to destroy them.⁵⁸

In fact, I would suggest, the inconsistency between Descartes ontological inertia and his kinetic inertia is more apparent than real. The reason Descartes can hold his principle of kinetic inertia in the first place is because he has the principle of ontological inertia to fall back on. His principle of inertia has done away with immanent occult or divine forces that allow bodies to move on their own, or allow influences of one body on another from a distance. Bodies move or cease to move according to purely external, efficient causes. Similarly, what maintains them in existence is not an occult or divine force—it is God as external efficient cause. Matter can only be conceived as inert *because* God is controlling its movement and change from outside. And if God is to be an external, efficient cause, then his action must be continuous.⁵⁹

⁵⁶ Frankfurt, *op. cit.*, p. 3.

⁵⁷ Frankfurt, *op. cit.*, p. 4.

⁵⁸ Frankfurt later responds to his own question on this point by stating that in Aquinas' philosophy, "God cannot cause anything to cease existing. Thus if the world had within itself a power to continue existing, god could not directly overcome that power....not because He would not be powerful enough to destroy it but because He could not use His power to destroy it." *Op. cit.*, p. 9.

⁵⁹ That Descartes sees God as an efficient cause, both of Himself and of the world, is clear from his Replies

5.2.1 A Scholastic Concept, 'Smoothly Reduced'

Garber tells us that in falling back on the notion of continuous creation, Descartes was "appealing to an old and widely accepted doctrine, a doctrine with which his audience could be expected to be both familiar and sympathetic," and he cites Descartes' response to Gassendi in the Replies to the Fifth Objections:

When you deny that to be conserved we require the continual influx of a first cause, you deny something that all metaphysicians affirm as obvious... You say that we have a power which is sufficient to ensure that we shall continue to exist unless some destructive cause intervenes. But here you do not realize that you are attributing to a created thing the perfection of a creator, if the created thing is able to continue in existence independently of anything else.⁶⁰

Descartes' approach to the notion of continuous creation is remarkably similar to his approach to the notion of animal spirits discussed above. There, as has been pointed out, he took an ancient and accepted idea, emptied it of certain 'occult' or metaphysical aspects and continued to call it by the same name. In the case of continuous creation he accomplishes a similar feat to the point that, Gilson tells us,

...l'être des choses que conserve le Dieu de Descartes est si différent de celui que conserve le Dieu de saint Thomas qu'une différence profonde s'introduit entre leurs deux notions de la création continuée.⁶¹

In Aquinas' version of continuous creation, what God conserves are essences and substantial forms. Because substantial form determines the natural becoming of a thing and guides its development towards a goal, the present of a thing is not separated from its past but in fact each moment of a thing's duration depends on the one preceding it. With Descartes, on the other hand, there are no longer substantial forms and, therefore,

Dieu n'y conserve donc plus des essences qui, grace à son concours,

to the First Objections when he states: "I should have no hesitation in calling the cause that preserves me an 'efficient' cause." CSM II, 79 (AT VII, 109).

⁶⁰ Garber, *op. cit.*, p. 265 and CSM II, 254 (AT VII, 369).

⁶¹ Gilson, *op. cit.*, p. 341.

développeraient dans le temps la continuité de leur durée; il conserve simplement des états succesifs d'un monde où nulle réalité substantielle permanente ne s'interpose entre l'action de Dieu et l'état actuel de chaque être.

... La suppression des formes substantielles par le mécanisme cartésien, plus complète encore dans le domaine de l'étendue que dans celui de la pensée, a pour résultat que chaque état successif du monde se trouve désormais immédiatement suspendu à Dieu et à Dieu seul, sans rien devoir à ce qu'il était lui-même pendant l'instant précédent.⁶²

But there is more than Descartes' view of substantial forms at issue here. In fact, Frankfurt points out that "it is not from his rejection of this theory that he derives his theory of continuous creation."⁶³ It is rather that for Descartes the continued existence of objects in the world cannot be explained by anything inherent in the objects themselves and, therefore,

must be accounted for by something outside of them. No moment of their existence depends simply and sufficiently upon a preceding moment. The continuation or duration of a temporal object is not guaranteed by the inherent nature of that object. It can be guaranteed only by the power of God.⁶⁴

And the power of God is not in the world or its objects but is external to them. In the naturalists' view of the world, things moved (or changed) because of an immanent force or power and they moved or changed in a certain way because of an inherent final cause which governed the relation of the part to the whole as well as the mutual interaction among all the parts. Because Descartes has removed soul as the immanent principle of life, movement must come from God and God alone, since it cannot come from soul.

This immanence has been lost in the mechanistic view of the world and all movement, change and mutual relations among things are explained solely through efficient causality. But mechanisms, by their very nature, have need of something to get

⁶² Gilson, *op. cit.*, p. 341, 342.

⁶³ Frankfurt, *op. cit.*, p. 13.

⁶⁴ Frankfurt, *op. cit.*, p. 15.

them started and keep them going and thus it is God who is brought in to provide what Garber refers to as "a divine Shove".⁶⁵ It is God's "creative divine freedom" according to Gueroult, which "compense métaphysiquement la prédominance de la statique sur la dynamique dans la physique."⁶⁶

The fundamental laws of nature on which Descartes builds his physics (as well as his physiology) flow from this creative divine freedom. In other words, "the conservation principle and the three laws of motion Descartes proposes are supposed to follow out of the fact that God is immutable and *operates in a constant way sustaining his creation and the motion he put into it.*"⁶⁷

Although God is recreating the world at every instant, and although each of these instantaneous creation neither depends on the previous one nor determines anything for the succeeding one, nevertheless, "on peut lire l'avenir d'un corps dans son instant présent."⁶⁸ The laws of nature are such that

Dieu les y a instituées, les ayant volontairement prescrites à sa volonté dans la création des choses en vertu de la généralité des voies, et s'y tenant inflexiblement en vertu de son immutabilité.⁶⁹

There are complex arguments in the literature regarding continuous creation and whether or not it necessitates a discontinuous notion of time, and whether or not continuous creation applies to substance in general or to things individually, and in both cases different statements of Descartes are cited to support one view or the other. The precise interpretation given to these arguments is secondary to my thesis, although with respect to the second issue, Descartes does clearly state in several places that God creates

⁶⁵ Garber, *op. cit.*, p. 278.

⁶⁶ Martial Gueroult, *Descartes selon l'ordre des raisons* (Aubier, 1968), Vol. I, p. 284.

⁶⁷ Garber, *op. cit.*, p. 280.

⁶⁸ Gueroult, *op. cit.*, p. 278.

him again at every moment.

What is important to my thesis is the fact that the doctrine in itself is needed by Descartes to bolster up his mechanistic view of the universe as well as his mechanistic view of the human body. There is no longer a spiritual or metaphysical connection between man and the cosmos, but there is a spiritual or metaphysical connection between man and God and between each thing in the world and God. The interweaving of forces between the various levels of the cosmos has been set aside as being in the realm of 'occult' explanation. Similarly, in relation to the body, the soul has been removed from the realm of physical explanation. All immanent causality has been replaced by explanation based exclusively on efficient causes. But this explanatory structure cannot sustain itself without the apparatus of continuous creation—an explanatory apparatus more than slightly tinged with the 'occult'. One is forced to ask, once again, if Descartes' mechanistic explanation is really better than the naturalistic alternatives, or if he and the mechanists simply agree that it must be.

5.2.2 An Example: Gassendi on Foetal Development

A comparison of the Cartesian and Gassendian accounts of the development of the foetus is instructive regarding their respective explanatory structures. If there exists a biological process that is teleological and where the invocation of final causes is not inappropriate, surely it is in the growth of the seed into the human (or animal) body. But, as we have seen in Chapter 4, Descartes' description makes use of only mechanical explanation. In Gaukroger's words, his basic explanatory tools are:

the fermentation-like process that produces heat and a breakdown of matter when the seeds of the two sexes are combined, the ways in which these parts subsequently recombine simply under the action of heat and the expansion and

⁶⁹ Guerout., *op. cit.*, p. 278.

increased pressure this produces, the rectilinear tendency of the parts projected under this pressure and the barriers to rectilinear motion, causing various forms of branching and the collection of matter at different termini of this branching depending on degree of fluidity, degree of agitation, size of pores in the membranes formed, and various other mechanically-conceived variables.⁷⁰

Descartes goes out of his way to ensure that his description makes no reference to intrinsic ends or goals. Thus, again in Gaukroger's words,

it is the (mechanistically-construable) chemical and mechanical processes that occur in the foetus that cause it to develop into an adult of a particular species, not the fact that it is going to develop into a member of a particular species that causes the particular chemical and mechanical processes to occur in the way they do.⁷¹

Gassendi's explanation of the growth of the foetus is quite different. Although Gassendi was an atomist, a mechanist and a materialist, his mechanism was notably different from that of Descartes: Gassendi manages to reconcile finalistic notions with an atomistic mechanism. As Olivier Bloch puts it, when Gassendi

“évoque les processus de la nutrition et de la distribution du sang dans l'organisme..., c'est exclusivement pour y justifier, contre le refus cartésien des causes finales l'hymne à la louange de la Providence divine que les 'Physiciens' peuvent tirer de l'observation anatomique ... la biologie de Gassendi, ainsi que sa physique et sa psychologie, porte la marque de ce finalisme généralisé.”⁷²

In Gassendi, it is the notion of *semina rerum*, the principle of organized things, which makes nature 'intelligent' (savante), an idea that takes us far from the inert matter of Descartes. Further, for Gassendi, the finality of nature can be known: “tout le problème est de comprendre quelle est la force qu'il a fallu imprimer aux 'semences' des choses pour leur permettre de réaliser les effets que nous constatons.”⁷³

Gassendi's explanation of the formation of the foetus is imbued with finality. As

⁷⁰ Gaukroger, "The resources of a mechanist physiology...", *op. cit.*, p. 12.

⁷¹ *Ibid.*, p. 12.

⁷² Bloch, *op. cit.*, p.443.

⁷³ *Ibid.*, p. 449.

he explains in *De la formation du foetus*:

Il semble même qu'on puisse concevoir par là en quelque manière, que l'Ame qui est dans la semence en tant qu'elle a aussi découlé de toutes les parties, sçait la manière dont il faut nourrir, animer, arranger, et disposer chacune des parties, en sorte qu'estant comme l'abregé, et le racourcy de toute l'Ame, elle continue de faire dans la matière de la semence, qui est aussi un abrégé de tout le corps, ce qu'avec toute l'Ame elle faisoit dans tout le corps.⁷⁴

The idea that the soul, which is in the seed, *knows* the manner in which the being is going to develop and that it directs this development is very far from Descartes' mechanistic idea that it is heat, through a process of fermentation, that 'causes' the development of the embryo. Further, Gassendi's idea that atoms are pre-programmed—even at the moment of creation—is an important modification of mechanism and a return to finalism which is much closer to Leibniz than to Descartes.

With reference to the Cartesian explanation of foetal development, Gaukroger states,

Descartes is not denying that there is question as to why its constituent matter behaves in such a way that the foetus develops into an adult of a particular species. What he is saying is that the explanation for that is not something *internal* to the development of the foetus but *external* to it. God made it so, and God is the only final cause.⁷⁵

This is to forget, however, that in Descartes' mechanistic account God must also act as the *efficient* cause. In Gassendi's explanation, God is still the final cause but he has pre-programmed the atoms of the universe in such a way that bodies do move and change because of *internal* causes. In his explanation, the soul is in the seed and 'knows' the direction of the organism's development which develops on its own. Descartes' explanation must ultimately fall back on continuous creation: the foetus develops as it does because God is continually creating it. The soul, as pure mind, is not involved in the

⁷⁴ *Abrégé de la philosophie de Gassendi*, (Tome V, livre 7, Ch. III, *De la formation du Foetus*.), p. 340.

process. God is doing all the work, all the time, from the outside. Descartes' mechanistic explanation cannot stand on its own; God needs to be brought in to ground every step. Gassendi's mechanistic explanation can stand on its own because God has pre-programmed an internal power of development from the moment of creation. Obviously Gassendi cannot explain how God pre-programmed the atoms of the world any more than Descartes can explain how God keeps recreating the world at every instant. But Gassendi's finalism allows a link between body and soul, and between human being and the cosmos, that Descartes' mechanism precludes.

I have referred to the Cartesian reduction of the concepts of animal spirits and continuous creation as 'ghosts of naturalism' because they hark back to naturalistic concepts which, while formally rejected by Descartes, maintain a ghostly presence in his explanation and, while remaining unrecognised, actually make his mechanistic explanation possible. Surprisingly, in spite of his fantastical explanations of animal spirits and his lack of explanation with respect to continuous creation, none of this diminished the impact of his mechanistic physiology. As Hatfield points out,

"the significance of Descartes' project should not be missed because the details are absent, or, when present, largely implausible. In his physiology, just as in his physics overall, the general vision Descartes presents is more important than his particular explanatory proposals."⁷⁶

This general vision of reducing the human body "to physicalistically conceived micromechanisms is still confidently described and still short on plausible detail."⁷⁷ In other words, the general vision of a body which can be described in purely mechanistic

⁷⁵ Gaukroger, "The resources of a mechanist physiology..." *op. cit.*, p. 25.

⁷⁶ Hatfield, *op. cit.*, p. 348.

⁷⁷ *Ibid.*, p. 366.

terms has survived while the ghostly presence of such supports as animal spirits and continuous creation has been abolished. The Cartesian (reduced and materialist) concept of animal spirits endured until late in the 18th Century when it was replaced by the notion of animal electricity.⁷⁸ The concept of continuous creation found more explicit expression in the occasionalism of Malebranche and other Cartesians but it was, in effect, "an inherently unstable theory that seemed plausible only for a moment in the history of philosophy as a desperate attempt to maintain Descartes's system despite the internal conflict between his two-substance doctrine and his concept of causality."⁷⁹

5.3 Dualism: A Bridge Between Two Monisms

Hans Jonas refers to dualism as "the vehicle of the movement which carried the mind of man from the vitalistic monism of early times to the materialistic monism of our own..."⁸⁰ That this is so is evidenced by the use of the two concepts I have been discussing in this chapter: animal spirits and continuous creation. In the vitalistic monism of the naturalists or the ancients, and to a more limited extent in the Aristotelian and Scholastic substantial forms, the principles of life and finality were internal to the human species and the cosmos as a whole. God, if he operated causally at all, operated in or through natural and human life. Descartes' reduction of the concept of animal spirits allowed him to describe the human body in purely mechanistic and physical terms (in spite of the ambiguities and inadequacies discussed in this and the previous chapters). By

⁷⁸ See W. T. Clower, *op. cit.* Clower attributes the paradigm shift to the experiments of Galvani in the late 18th century and the fact that the explanatory potential of the animal spirits paradigm was diminishing. "With a theoretically plausible alternative explanation coupled with Galvani's demonstration of Animal Electricity in a completely biological context, the Animal Spirits hypothesis was finally discarded." (p. 16)

⁷⁹ Jerome Shaffer in *The Encyclopaedia of Philosophy, Vol.5* (New York: MacMillan Publishing, 1967, 1972), p. 344.

⁸⁰ Jonas, *The Phenomenon of Life, op. cit.*, p. 12.

allowing the spirits to be influenced by mind or soul (in the limited manner of changing their direction) he keeps the soul vaguely in the picture but the picture itself (including the question animal life) remains overwhelmingly materialist. Similarly, the reduced concept of continuous creation allows Descartes to pretend that he has left the question of "Why?" aside and need only deal with the question of "How?", thus eliminating the need to think about final causes in scientific explanation. God is there but he is operating from the outside, continually creating or re-creating the states of the world at every instant, but not needing to be accounted for in any scientific explanation of those states.

Jonas describes dualism as one of the "most decisive events in the mental history of the race" and also as something that throughout its life span "continued to drain the spiritual elements off the physical realm."⁸¹ The Cartesian reductions of soul, animal spirits, and continuous creation allowed the spiritual elements to be drained off the physical realm while, in Descartes at least, remaining peripherally in the picture, being called in to ground a mechanistic account of the world and of the human body.

This draining off of the spiritual elements from the physical realm (leaving the physical realm as a "tomb to the soul or spirit"⁸²) left the various parts of the physical realm cut off from each other. The soul had been what connected various levels of being to each other and to nature as a whole. The soul was *in* the world, gave life and meaning to the world, and participated in change and growth in nature and in the human body. With Descartes' dualism, the soul becomes both reduced and, paradoxically, more important as the centre of rationality shifts from nature (or God) to man, as a reasoning subject. The world, the cosmos, the reasoning subject's body itself are all 'object' for the

⁸¹ Jonas, *op. cit.*, p. 13.

⁸² Jonas, *op. cit.*, p. 14.

mind. To cite Jonas again,

The discovery of 'self' ... had a curiously polarizing effect on the general picture of reality: the very possibility of the notion of an 'inanimate universe' emerged as the counterpart to the increasingly exclusive stress laid on the *human* soul, on its inner life and its incommensurability with anything in nature. The fateful divorce, stretched to the point of a complete foreignness which left nothing in common between the parted members, henceforth qualified them both by this mutual exclusion. As the retreating soul drew about itself all spiritual significance and metaphysical dignity ... it left the world divested of all such claims...⁸³

Thus is the human body cut off from its soul-self, but also from the nature that had heretofore given meaning to the totality of human life within the natural world. The conceptual ghosts that lingered within the Cartesian account of the body (and nature) were temporary connections to a parentage that would eventually be completely denied.

Descartes himself was not unaware of this problem, and, if he had been, the consequences of his dualism were made starkly clear to him by Elisabeth and discussed at length in their intense correspondence. As a result Descartes undertook a description of the link between body and soul that added further ambiguities to his mechanistic explanation of the body. It is this later work that has led many commentators to question the depth and breadth of Descartes' dualism and to attempt to mitigate it through a defence of Descartes' notion of the union of body and soul, and, in some cases, to hold that Descartes re-introduced an internal finality into this notion. It is to this question that I will turn in the following chapter.

⁸³ Jonas, *op. cit.*, p. 14.

CHAPTER 6

Mind Body Union and Body Mechanism: Has Anything Changed?

L'homme est double divisé, et n'a point d'unité. Il n'a pas non plus de nature propre. Car il n'y a pas de nature de l'union de l'âme et du corps...

Ferdinand Alquié, *Études cartésiennes*¹

Throughout this thesis I have maintained that the distinction of soul (mind) and body was fundamental to Descartes' physics and his metaphysics. It is presupposed by his method which sets a knowing subject over and against a known world (object); it is essential to his physics (including his physics of the body) in order to preserve his mechanistic view of the world; and it is essential to his metaphysics in order to preserve the Christian idea of the immortality of the soul.

I have also maintained that Descartes did not substantially modify his metaphysical dualism or his mechanistic physiology between his early writings and his later writings. This position is, however, less obvious when one considers his own attempts to come to grips with mind-body union in Meditation VI and in the *Passions*. Thus, the purpose of this chapter is to test my position regarding Descartes radical mind-body dualism and to determine whether or not mind-body union in Descartes necessitates a more nuanced interpretation of either his dualism or his mechanism with respect to the

¹ Ferdinand Alquié, *Études cartésiennes*, (Paris: Librairie philosophique J. Vrin, 1982, p.85.

human body.

To this end I will examine Descartes' so-called 'third primitive notion', that of mind-body union, particularly as interpreted in the work of Martial Guérault. I will also address the question of finality with respect to mind-body union as espoused by Guérault with respect to internal finality and by John Sutton with respect to external finality. My conclusion will be that neither interpretation seriously undermines my position in this thesis regarding Descartes' mechanistic physiology. Descartes' mind-body union belongs to a different order of reality, which is both ontologically and epistemologically distinct from both mind and matter and does not affect the radical distinction of mind and matter or the fundamental idea of the body-machine.

The description of the body in *L'Homme* is one of machines without souls. As discussed in Chapter 4, this description is not without problems. However, it is fundamental to Descartes that the operations of the body are distinct from the operations of the mind (except in actions resulting directly from human will) and, correlatively, that actions of the mind are distinct from actions of the body. The latter is reinforced both in Part IV of the *Discours* and in the *Meditationes* where Descartes attempts to prove that the mind and body are two distinct substances: mind is a substance whose essence is thought and the body is a substance whose essence is extension.

In both texts, Descartes elaborates his *cogito* reasoning by which he 'proves' his existence by the fact that he is thinking. As already pointed out in Chapter 4, the elaboration in the *Discours* is a recapitulation of the meditations he had during his night in the stove-heated room in November 1619. Here the conclusion of mind-body distinction is very clear:

I saw...that from the mere fact that I thought of doubting the truth of other things, it followed quite evidently and certainly that I existed...From this I knew I was a substance whose whole essence or nature is simply to think, and which does not require any place, or depend on any material thing, in order to exist. Accordingly this 'I'—that is, the soul by which I am what I am—is entirely distinct from the body, and indeed is easier to know than the body, and would not fail to be whatever it is, even if the body did not exist.²

However, the proof of the distinction of body and mind in the *Meditationes* is more subtle and is spread out between Meditation II and Meditation VI. In the former, Descartes only sets out to prove that the nature of mind is pure thought and "that knowledge of it does not depend on things of whose existence I am as yet unaware"³, one of these things being his own body. He leaves the question of the ontological status of the body in suspense until Meditation VI. As he points out clearly to Gassendi in the *Fifth Set of Replies*, regarding what Gassendi believed were his assumptions about the body in Meditation II:

...it is false that I assumed anything I did not know. On the contrary, since I did not know whether the body was identical with the mind or not, I did not make any assumptions on this matter, but considered only the mind; it was only afterwards, in the Sixth Meditation, that I said there was a real distinction between the mind and the body, and here I did not assume it but demonstrated it. But you, O Flesh, are utterly at fault here, because, despite having little or no rational basis for proving that the mind is not distinct from the body, you nonetheless assume this.⁴

Ironically, while it is in Meditation VI that he demonstrates the distinction between mind and body,⁵ it is also in Meditation VI that he begins to focus on the union of the mind and body.⁶ Later, in his letters to Elisabeth and in the *Passions*, mind-body union becomes a *fait accompli*, an assumption underlying his philosophy of the emotions

² CSM I, 127 (AT VI, 33).

³ CSM II, 19 (AT VII, 28).

⁴ CSM II, 247 (AT VII, 357).

⁵ CSM II, 54 (AT VII, 78): "...I have a clear and distinct idea of myself, in so far as I am simply a thinking, non-extended thing; and on the other hand I have a distinct idea of body, in so far as this is simply an extended, non-thinking thing. And accordingly, it is certain that I am really distinct from my body, and can exist without it".

⁶ CSM II, 56 (AT VII, 81): "...I am very closely joined and, as it were, intermingled with [my body], so that I and the body form a unit"

and of mind-body interaction.

This focus on mind-body union at the end of the *Meditationes* and in his later writings entails what Gilson refers to as the Cartesian paradox. Gilson's explanation of this paradox is worth quoting in its entirety:

Construite avec une rigueur logique absolue, la métaphysique des *Méditations* n'en aboutit pas moins à ce que l'on peut appeler *le paradoxe cartésien*. La conclusion vers laquelle elle tend tout entière est la distinction réelle de l'âme et du corps. Cette distinction suppose d'abord que nous avons des idées distinctes de l'âme et du corps, puisqu'il existe réellement des âmes, enfin qu'il existe réellement des corps. Et comme l'on ne peut prouver l'existence réelle des corps qu'en s'appuyant sur ce que la connaissance sensible a de confus et d'involontaire, il faut bien supposer une sorte de violence infligée du dehors à la pensée, une sorte de confusion de natures qui explique la confusion de la connaissance. Il semble donc résulter de là, que la preuve cartésienne de l'existence du monde extérieur implique, à titre d'élément essentiel, l'union de l'âme et du corps. Mais comme la preuve de l'existence du monde extérieur n'a d'autre fin que d'établir la distinction réelle de l'âme et du corps, il faut aller jusqu'à dire que la preuve de leur distinction s'appuie sur le fait de leur union.⁷

Gilson argues further that this union of body and soul has to be substantial and not accidental, since, if it were not, "l'élément confus de la pensée cesserait d'être explicable [et] la distinction réelle de l'âme et du corps ne serait plus que probable."⁸ Thus, according to Gilson, in spite of Descartes' total rejection of the concept of substantial forms, there must be at least one case of substantial union "celle de l'âme et du corps, et par conséquent une forme substantielle, l'âme humaine forme du corps humain."⁹

Gilson is not alone in seeing Descartes' mind-body union as falling back on the notion of substantial form. Keeling believes as well that the third primitive notion that Descartes will invoke (and which is discussed below) represents "the undisguised

⁷ Étienne Gilson, *Études sur le rôle de la pensée médiévale dans la formation du système cartésien* (Paris: Librairie philosophique J. Vrin, 1967), p. 245.

⁸ *Ibid.*, p. 245.

⁹ *Ibid.*, p. 245.

presence of a full-blown 'substantial form'.¹⁰ Rodis-Lewis refers to "cette composition hylomorphique [qui] prend une valeur toute particulière du fait même de son caractère privilégié."¹¹ Whether or not Descartes' substantial union is a return to Scholastic substantial forms (and I will attempt to demonstrate below that it is not), it raises questions about the impact on his mechanistic description of the body that I have been exploring so far. I want to examine whether or not Descartes' focus on mind-body union from Meditation VI onwards affects either his mechanism or the arguments I have made against it in this thesis.

As will be discussed below, some commentators tend to play down the dualism of Descartes' earlier writings and maintain that there is no contradiction between the distinction of mind and body and their unity. This could pose problems for the position I have been holding throughout this thesis and must be dealt with before setting out my conclusions.

6.1 Mind-Body Union

No one was more aware of the difficulties inherent in Descartes' separation of mind and body and his mechanistic physiology than the young Princess Elisabeth with whom Descartes carried on an intense correspondence during the last decade of his life.

In her first letter to him in May 1643, she asked him to answer the following question:

How can the soul of a man determine the spirits of his body so as to produce voluntary actions (given that the soul is only a thinking substance)? For it seems that all determination of movement is made by the pushing of a thing moved, either that it is pushed by the thing which moves it or it is affected by the quality or shape of the surface of that thing. For the first two conditions, touching is necessary, for the third extension. For touching, you exclude entirely the notion

¹⁰ S. V. Keeling, "Cartesian Mechanism" in Moyal, *op. cit.*, Vol IV, p. 80.

¹¹ G. Rodis-Lewis, *L'individualité selon Descartes* (Paris: Librairie philosophique J. Vrin, 1950).

that you have of the soul; extension seems to me incompatible with an immaterial thing.¹²

In contrast to the irritation he expressed when Gassendi raised similar questions,¹³ Descartes accepts Elisabeth's question with grace, telling her that the it "seems to me the one which can most properly be put to me in view of my published writings." He explains to her that while there are two things about the soul—that it thinks and that it interacts with the body—he has not so far tried to explain the latter because "my principal aim was to prove the distinction between the soul and the body, and to this end only the first was useful, and the second might have been harmful."¹⁴

Here Descartes raises (for the first time) his idea of three primitive notions: the soul, the body, and the union of the two, and tells Elisabeth that with respect to the latter "we have only the notion of their union, on which depends our notion of the soul's power to move the body, and the body's power to act on the soul and cause its sensations and passions."¹⁵ Recognising that he had not explained himself very well, he elaborated on the three primitive notions in his next letter to her:

First of all then, I observe one great difference between these three kinds of

¹² Andrea Nye, *The Princess and the Philosopher* (Lanham Maryland: Rowman & Littlefield Publishers, Inc.) p. 9. (AT III, 661).

¹³ See the Fifth Objections and replies, in particular, with respect to Meditations II and VI.

¹⁴ CMSK, 218 (AT III, 665).

¹⁵ In fact, Gueroult refers to the union of body and soul as a fourth primitive notion, referring to Descartes' reference in the *Regulae* to the three simple intellectual natures: pure understanding, extension alone, and common notions. He then refers to "la quatrième notion simple mentionnée dans la *Lettre à Elisabeth* de mai, 1643, qui est la notion simple non intellectuelle de la substance composée." Gueroult also tends to slip into referring to three *substances*; for example, when, referring to "les ouvrages de Dieu", he includes the "assemblage des trois substances, étendue, pensée, mixte psychophysique". Gueroult *op.cit.*, p. 138, note 21, and p. 219. The ontological status of these primitive notions is somewhat unclear. Descartes presents them to Elisabeth as if they were innate ideas, listing them among such notions as being, number, duration, shape, motion, etc. However, according to Keeling, they are among the 'simple notions' and, as such, "are not ideas but essential 'ontal' elements, constitutive and explanatory, presupposed throughout the whole of Descartes' Metaphysics and Natural Philosophy" and they are *presupposed* by Descartes' doctrine of innate ideas. S. V. Keeling, "Cartesian Mechanism" in Moyal, *op. cit.*, Vol IV, p. 80. Cottingham would disagree with Keeling's interpretation, denying that there are "three *ontological* categories involved here." For him the third category "corresponds to a distinct aspect of a thing's nature, not to a distinct type of thing." John Cottingham, *Descartes* (London: Basil Blackwell, 1986), p. 131.

notions. The soul is conceived only by the pure intellect; body (i.e. extension, shapes and motions) can likewise be known by the intellect alone, but much better by the intellect aided by the imagination; and finally what belongs to the union of the soul and the body is known only obscurely by the intellect alone or even by the intellect aided by the imagination, *but it is known very clearly by the senses*.¹⁶

This answer did not convince Elisabeth. She responded that while she agrees that the senses demonstrate that the soul moves the body, Descartes has not explained *how*, within his definition of soul, this can be so; nor has he convinced her that the soul does not have other properties that he denies in the *Meditationes*. Elisabeth is not being obtuse here. In light of what Descartes has said both about the soul and about the senses, the idea that the union of mind and body is known very clearly by the senses seems to be a departure from his previous views about clear and distinct ideas, known only by the intellect.

Many of Descartes' commentators have been more easily convinced of the validity of the third primitive notion than was Elisabeth. For Rodis-Lewis, Descartes

...avait toujours affirmé l'union substantielle de l'âme et du corps et l'unité essentielle de l'homme. Ici encore ses successeurs ont détruit le fragile équilibre entre la distinction et l'union...L'union réelle est en effet...un des thèmes fondamentaux de la sixième Méditation.¹⁷

¹⁶ CMSK, 227 (AT III, 692). Emphasis added.

¹⁷ Rodis-Lewis, *Anthropologie cartésienne*, *op. cit.*, p. 93. In fairness to Descartes, it must be acknowledged that he himself rejects what is now referred to as the 'heterogeneity objection' or the 'causal likeness' principle, which is the problem Elisabeth raises in her first letter, i.e. the idea that two different kinds of substances cannot act upon one another in a causal relation. In his *Appendix to the Fifth Objections and Replies*, he answers the charge that the soul cannot move the body if it is not material by stating that "the whole problem contained in such questions arises simply from a supposition that is false and cannot in any way be proved, namely that, if the soul and the body are two substances whose nature is different, this prevents them from being able to act on each other." CSM II, 275 (AT IXA, 213). However, this position can be seen as inconsistent with what he says in Meditation III where part of his proof of the existence of God is based on the necessity that a cause contain at least as much reality as its effect. It also appears inconsistent with his first law of nature which, since it holds that bodies continue in the same state until interfered with by another, would seem to necessitate collision. If, for Descartes, all change is motion and change of motion requires collision, how do body and mind 'collide'? And if it doesn't require collision, what is there to prevent mind from moving other bodies without contact, thus permitting action at a distance, something that Descartes consistently rejects. For a full discussion of the problems regarding Descartes' position on causal interaction between mind and body see Margaret Dauber Wilson, *Ideas and Mechanism* (Princeton: Princeton University Press, 1999), ch. 4. Regarding action at a distance see Patrick Suppes, "Descartes and Action at a Distance", in Moyal, *op. cit.*, Vol. III.

Beck, while admitting that the question of mind-body unity is "one of the most difficult and controversial points in the whole Cartesian doctrine," nonetheless concludes that Descartes has been misunderstood on this question, that he "was perfectly clear in his own mind and there is no obscurity, wilful or otherwise, in his exposition of his views."¹⁸ In fact, for Beck (for whom Malebranche, Leibniz and Spinoza all attempted and failed to resolve Descartes 'insoluble' problem') there is even a "curious gap between the attitude of Descartes, who seems to consider the problem one of the second order, and the vast importance it assumed in the subsequent history of Cartesianism and its presence with us today..."¹⁹

Whether or not Descartes was as clear in his own mind as Beck suggests, the fragile equilibrium referred to by Rodis-Lewis between the distinction of mind and body and their union is, at the very least, problematic. No one has elaborated more precisely on this fragile equilibrium than Martial Gueroult in his *Descartes selon l'ordre des raisons*. And it is to his analysis that I will turn to assess whether or not Descartes has overcome his dualism through his three primitive notions and, in particular, whether or not this position weakens my main arguments in the preceding chapters regarding the limitations of his mechanistic physiology.

6.2 Different Orders of Inquiry

The issue of causal interaction, which has been extensively covered in the literature, is not central to the arguments in this chapter. Further, the heterogeneity problem is not the only one relating to mind-body interaction. As discussed in Chapter 4, there is a problem regarding how motion can be conserved if mind can add to it. In addition, there is the question raised by Watson as to how an "undetermined will can change the determined motions of bodies in the material system." Richard Watson, *The Downfall of Cartesian Metaphysics* (Indianapolis: Hackett Publishing Company, Inc., 1998), p. 191.

¹⁸ L. J. Beck, *The Metaphysics of Descartes*, op. cit., p. 262, 276.

¹⁹ *Ibid.*, p. 269.

One of the strangest aspects of the discussion of mind-body unity in the correspondence with Elisabeth is Descartes' use of the analogy of heaviness to explain how the soul is united to, and operates in and on, the body. This analogy was used in physics to explain movement in bodies and it was one that Descartes had clearly rejected. Nevertheless, he reverts to it in order to try to explain how the soul moves the body:

...when we suppose that heaviness is a real quality, of which all we know is that it has the power to move the body that possesses it towards the centre of the earth, we have no difficulty in conceiving how it moves this body or how it is joined to it. We never think that this motion is produced by a real contact between two surfaces, since we find, *from our own inner experience*, that we possess a notion that is ready-made for forming the conception in question. Yet I believe that we misuse this notion when we apply it to heaviness, which—as I hope to show in my *Physics*—is not anything really distinct from body. *For I believe that it was given us for the purpose of conceiving the manner in which the soul moves the body.*²⁰

Elisabeth was quite puzzled by this analogy (invoking as it does the ghost of substantial forms) which says more about her clarity on the question than that of her correspondent. Politely using her recent domestic occupations and worries as an excuse for her 'stupidity', Elisabeth expresses her inability to

understand the idea by which we must judge how the soul (not extended and immaterial) can move the body by an idea we have in another regard of heaviness, nor why a power—which we have falsely attributed to things under the name of a quality—of carrying a body toward the center of the earth must persuade us that a body could be pushed by something immaterial, especially when the demonstration of a contrary truth (which you promised in your *Physics*) confirms us in thinking it impossible.²¹

Elisabeth can be forgiven for her scepticism regarding Descartes' appeal to qualities acting within matter, a notion that he has clearly rejected in his physics, and his claim that while such a notion in physics is an error, *it has been given us* for the purpose of understanding how the soul moves the body (which is, it appears, how we understand

²⁰ CMSK, 218 (AT III, 667). Emphasis added.

the false idea of heaviness in the first place!). In Gilson's view, Descartes' position falls back on the notion of substantial forms that he has clearly rejected:

Ce philosophe dont toute la métaphysique vise à dissoudre les formes substantielles, parce que nous n'en avons aucune idée, nous renvoie donc à l'idée que nous avons lorsque nous lui demandons comment nous représenter l'union de l'âme et du corps. Il nous renvoie, pour comprendre l'union de l'âme et du corps, à ce dont la suppression, qu'il a lui-même voulue, nous empêche maintenant de la concevoir.²²

Not only does Descartes' position, as explained to Elisabeth, represent an appeal to the qualitative physics and substantial forms that he has rejected, but the knowledge of mind-body unity, "known very clearly by the senses"²³ would appear to contradict everything that Descartes has said in the past about the obscurity and unreliability of sensual knowledge.

The contradiction is only apparent, however. Descartes' discussion of this knowledge by the senses is vague and lacking in detail. Gueroult, however, provides an analysis that clarifies Descartes' position by explaining that the mind-body union, our way of knowing it and the clarity and reliability of this knowledge all relate to a *different order of knowledge*. What Elisabeth did not immediately understand is that, for Descartes, the elimination of the qualitative dimension in external reality relates to the order of the *understanding*, while its preservation in the internal reality of soul/body unity relates to the order of *sensation*. As expressed by Gueroult, "l'erreur fondamentale est de brouiller les deux ordres."²⁴ According to Gueroult's analysis, we are dealing with two different orders of knowledge. We cannot know the real nature of things through the senses and therefore the qualitative dimension must be excluded if we are to have clear

²¹ Nye, *op. cit.*, p. 21 (AT III, 684.)

²² Gilson, *op. cit.*, p. 248.

²³ See footnote 15.

and distinct ideas about the external world. On the other hand, we can only know the nature of the mind-body relation through the senses and therefore,

on retrouve dans la conscience, comme une de ses données incontestables, ce résidu qualitatif qui, pour être éliminé par la physique comme faux au regard de la chose extérieure, comme illusoire à l'égard des corps hors de nous, n'en existe pas moins en moi, qui suis une chose vraie, comme quelque chose de positif et de réel... la vérité qualitative n'est pas rejetée hors de toute réalité: elle reste réelle en moi.²⁵

Thus there is a clear distinction between knowledge gained through the understanding and knowledge gained through the senses and, here Descartes is quite consistent, the latter can never be of the same order as the former. While the understanding can give us clear and distinct ideas about external reality, sensation is always obscure and confused. However, and this is important, the obscure and confused knowledge of sensation with respect to mind-body unity is not the same as the obscure knowledge of external objects received through the senses before being properly analysed by the intellect. It is the *nature* of the perception of quality as mind-body unity to be obscure and to remain so; the mind-body relation cannot be clarified by the intellect, it can only be sensed.

...on obtient une *connaissance claire et distincte* de la nature de la qualité, comme *obscurité et confusion*. En m'enseignant de façon absolument sûre que je suis uni à un corps, Dieu ou 'la nature' me fait connaître de façon non moins sûre la raison ou la cause explicative de l'obscur et du confus, de la qualité comme telle... On ne doit pas confondre cette idée sensible, qui est obscure et confuse par nature, avec ces idées obscures et confuses par accident que sont des idées de l'entendement insuffisamment analysées, ou oblitérées par leur confusion avec des idées sensibles.²⁶

It is not only that the knowledge of the senses is of a different order than the clear and distinct ideas of the intellect; more importantly, its certainty comes from another source: nature. If the mathematical truths of the intellect are guaranteed by a non-

²⁴ Gueroult, *op. cit.*, p. 126.

²⁵ *Ibid.*, p. 125.

deceiving God, the more obscure and confused truths of sensation are guaranteed by God *through nature*. This is suggested by the above citation from Gueroult where he refers to "Dieu ou 'la nature'." Presumably he is extrapolating from Meditation VI where Descartes brings in Nature as proof of, and support for, the unity of soul and body. With respect to the uncertainty of certain aspects of corporeal things (e.g. the size or shape of the sun), Descartes states:

the very fact that God is not a deceiver, and the consequent impossibility of there being any falsity in my opinions which cannot be corrected by some other faculty supplied by God, offers me a sure hope that I can attain the truth even in these matters. *Indeed, there is no doubt that everything that I am taught by nature contains some truth.* For if nature is considered in its general aspect, then I understand by the term nothing other than God himself, or the ordered system of created things established by God. And by my own nature in particular I understand nothing other than the totality of things bestowed on me by God.

There is nothing that my own nature teaches me more vividly than that I have a body...

Nature also teaches me, by these sensations of pain, hunger, thirst and so on, that I am not merely present in my body as a sailor is present in a ship, but that I am very closely joined and, as it were, intermingled with it, so that I and the body form a unit.²⁷

Why has Descartes brought in nature at this point in his Meditations? According to Gueroult,

la VIe *Méditation* réintègre le sentiment à son tour dans la sphère du savoir et, par là même, elle détermine sa réalité et son degré de vérité, *corrélatif à son degré de réalité*. De la sphère de l'entendement pur, la chaîne des raisons nous a transportés au centre de la sphère du sentiment, au point de vue de la 'nature' (au sens étroit).²⁸

Thus nature allows me to know that I am a union of body and soul. As an extension of

²⁶ *Ibid.*, p. 134-5.

²⁷ CSM II, 56 (AT VII, 80-81).

²⁸ Gueroult, *op. cit.*, p. 143, emphasis added. As can be seen in the above quotation from Meditation VI, Descartes distinguishes between 'my nature' (narrow sense) and 'nature in general' (broad sense). Gueroult would appear to be using the former sense in this passage.

divine veracity nature guarantees the truth of sensation and that truth is, in itself, the proof of the union of body and soul:

C'est pourquoi la preuve de l'union, qui n'est pas autre chose que la démonstration de la vérité des enseignements du sentiment, s'est effectivement annoncée en proclamant l'extension de la véracité divine à l'ensemble de l'ouvrage divin...²⁹

This appears to be a variation on the proof of God argument in Meditation III. In that case, I have a clear and distinct *idea* that God exists; God, who is not a deceiver, guarantees the veracity of all of my clear and distinct ideas; therefore, according to Descartes, God exists. In the case of mind-body union, I have a clear and distinct *sensation* of the union of my body and soul; nature, as the extension of God, guarantees the veracity of my sensations; therefore, according to Descartes, I exist as a mind-body unity.³⁰

But this assurance of mind-body unity and the re-integration of sensation into the sphere of knowledge, as noted above, are ultimately meaningless within the overall Cartesian epistemological and metaphysical framework. The knowledge of sensation does not have the same degree of reality as the knowledge of understanding; nor, in fact, does nature, as Gueroult makes clear when he states that, for Descartes,

nature comme monde du sentiment est pour Descartes strictement limitée à la sphère de l'homme, l'ensemble de l'univers, tant celui des esprits que celui des corps, lui est étranger, le premier n'étant que pure intelligence, le second pure étendue et pur mouvement. Aussi le sentiment ne saurait-il nous mettre en communication, ni avec les esprits purs, ni avec la nature extérieure... Le *sentiment, n'existant que dans nous seuls et ne concernant que nous, nous*

²⁹ *Ibid.*, p. 146.

³⁰ The proof of mind-body unity is thus open to the same charge of circularity as the proof of God argument. It is Arnauld who first accused Descartes of arguing in a circle in the Fourth Set of Objections: "I have one further worry, namely how the author avoids reasoning in a circle when he says that we are sure that what we clearly and distinctly perceive is true only because God exists. But we can be sure that God exists only because we clearly and distinctly perceive this. Hence, before we can be sure that God exists, we ought to be able to be sure that whatever we perceive clearly and evidently is true." For an argument that refutes the charge of circularity, see Garrett Thomson, *Descartes to Kant: An Introduction to Modern Philosophy* (Prospect Heights, Illinois, Waveland Press, Inc., 1997), p. 32.

*renferme rigoureusement à l'intérieur des bornes de notre nature composée.*³¹

Gueroult here makes clear what is, in Descartes, a double exclusion: nature cannot be known to the mind; and mind-body union can *sense*, but cannot *know* nature. As discussed in Chapter 3, nature, as an object of science, is a nature devoid of cosmic connection, constructed, quantified and objectified for the human mind. It can only be known to the mind by ceasing to be nature. On the other hand, man, as a composite of mind and body, can sense nature as "undoubted *data* of experience",³² but such experiential data represents knowledge of a second order and can never be true knowledge. In effect, Descartes has established a clear and unbridgeable gulf between reason and nature. Nature is in the realm of sensation and error results from

l'intrusion de la raison dans le domaine de la 'nature'. Si le jugement se bornait aux limites du sentiment, il ne pourrait tomber dans la fausseté; mais il dépasse ces limites en procédant à son propos à des affirmations que permettent seules les idées de l'entendement.³³

Thus nature cannot be known to man as a mind-body unity. It can be known to the mind alone and then only as an object of scientific investigation, according to the laws of nature dealing with matter and motion. And the mind-body union itself cannot be 'known' by the intellect; it can only be 'known' by the senses. As such it is excluded from scientific investigation including, ultimately, bio-medical science.

Both my nature (i.e. mind-body union) and nature (outside of its quantifiable aspects) represent the "résidu qualitatif" which is eliminated by physics but which, nevertheless exists in me "comme quelque chose de positif et de réel".³⁴ Thus the mind-body union that Descartes evokes in Meditation VI and in his correspondence with

³¹ Gueroult, *op. cit.*, p. 155, note 47. Emphasis added.

³² Beck, *op. cit.*, p. 267.

³³ Gueroult, *op. cit.*, p. 145.

Elisabeth rests solely on the side of qualities, the realm that in all of his scientific writings he has set aside as objectively unknowable. Even if we grant Descartes his mind-body union, in spite of his inability to adequately explain the interaction of the two separate substances; even if we respect the fine line between separation and unity, Descartes' efforts to integrate mind and body do not fundamentally change his mechanistic view of the body discussed in earlier chapters, nor do they solve the problems that have been raised regarding such things as sensation. If the unified mind-body is used to explain human sensation, animal sensation remains substantially different from human sensation in ways that, as has already been pointed out, are difficult to defend. The anomalies discussed in Chapter 4 are not resolved by the notion of mind-body union whatever the forms of interaction that are invoked since mind-body union applies only to humans.

Mind-body union is outside the domain of science; as a result, it is also outside of the domain of medicine, as a science, a remarkable situation given Descartes' efforts to unify science and his belief in the ability of science to cure everything, including a skin disease from which Mersenne was suffering (erysipelas)³⁵. And here Gueroult's discussion of Descartes' medicine is instructive because it dramatically underlines this fact: medicine, under Descartes' analysis, is on the same order as morality; it is not a science. In fact, Gueroult goes so far as to say that medicine may even be considered as part of morality since "la santé est l'un des biens nécessaires à notre bonheur ici-bas."³⁶

Gueroult's point is reinforced by a remarkably Stoic comment by Descartes in his *Conversations With Burman* that

³⁴ Gueroult, *op. cit.*, p. 125.

³⁵ See Descartes' letter to Mersenne of January 1630: "Please look after yourself, at least until I know whether it is possible to discover a system of medicine which is founded on infallible demonstrations, which is what I am investigating at present." CMSK, 17 (AT I, 105).

it seems that nature plunges us into illnesses, so that we can emerge all the stronger...provided we obey her...with her perfect internal awareness of herself she knows better than the doctor who is on the outside.³⁷

But, given Descartes' epistemological framework, the doctor must remain on the outside in relation to the mind-body union. The Cartesian doctor can only treat the soul-less body—which is a long way from Ficino, the doctor, whose medicine was meant for both body and soul and whose diagnostic framework could not separate the two. Descartes may have two conceptions of medicine, as Gueroult suggests,³⁸ the first on the plane of mechanism (common to both humans and animals) and the second on the plane of soul-body union (limited to humans), but for Descartes the latter cannot move beyond the level of sensation, and thus cannot enter the realm of science. As Gueroult admits, the notion of nature as the best medicine seems to be a dismissal of the very idea of scientific medicine.³⁹ As regards his health, man is, as with nature, enclosed within the bounds of his own composite nature in an inescapable solipsism.

Thus I do not believe that Meditation VI with its third primitive notion of mind-body union has significantly altered Descartes' radical dualism or his mechanistic conception of the body. Those commentators who think it has, according to Gilson, have forgotten the language of Descartes:

Tout ce que Descartes veut dire, c'est que la distinction de l'âme et du corps se *pense*, au lieu que leur union se *sent*.⁴⁰

³⁶ Gueroult, *op. cit.*, p. 220.

³⁷ *Conversations with Burman*, *op. cit.*, p. 51. This is strikingly reminiscent of Montaigne for whom: "It owes it to disease as to health that each should run its course. It will not be bribed to favour one at the expense of the rights of the other: for then it would become Disorder. For God's sake, let us follow. I repeat, follow. That Order leads those who follow: those who will not follow will be dragged along, medicine, terror and all." Michel de Montaigne *The Complete Essays*, transl. M.A. Screech (London: Penguin Books, 1991), Book II. 37, p. 868.

³⁸ Gueroult, *op. cit.*, p. 248.

³⁹ *Ibid.*, p. 250.

⁴⁰ Gilson, *op. cit.*, p. 249.

Both dualism and mechanism are re-iterated in later writings (the *Principia*⁴¹ and the *Description*) and even in the *Passions*, which deals with the emotions (and assumes the mind-body union of Meditation VI), the fundamental separation of the soul and body is maintained and the description of the functioning of the body is comparable to that in *L'Homme*.⁴²

Similarly, I have reservations regarding the position of both Gilson and Keeling with respect to Descartes' mind-body union being a return to substantial forms. Descartes is clear that perception of the union does not belong in the realm of thought or ideas, which is where any concept that has ontological or metaphysical status must be for him. In other words, thought, extension, God, for example, are all notions of which we can have a clear and distinct idea. They have ontological status as knowable existents. If substantial forms existed for Descartes, they would have similar status. It is, at least in part, because we cannot have a clear and distinct idea of them (as Gilson himself points out⁴³) that Descartes rejects them. Mind-body union is in the realm of sensation and can never have the same status as the ideas of God or thought or extension. Nor would I rank mind-body union as a reduction of the notion of substantial forms since, unlike the other reductions dealt with in this thesis where Descartes keeps the notion but revises the content, Descartes does not preserve the notion of substantial forms in his explanatory framework.

One may argue that the reductionism that allowed Descartes to subsume physiology to physics was purely methodological and that his third primitive notion re-

⁴¹ In particular the re-iteration of the *cogito* arguments in Part I, section 7-11, and dual substance arguments in I, 52-54). CSM I, 193-195; 210-211 (AT VIIIA, 5-7; 25-26).

⁴² See in particular Part I, sections 1-15. CSM I, 328-335 (AT XI 328-342).

⁴³ See footnote 21.

integrated the human dimension into the body, but the point made above still holds: the integrated body has no place: not in physics, not in metaphysics. The mind-body union is in the realm of the sensible and, in Gilson's words, "le sensible n'est pas assimilable par le cartésianisme, bien que le cartésianisme ne puisse s'en passer."⁴⁴ It is a leftover, the residual realm of qualities excluded from certain, and therefore meaningful, knowledge. The body is an epistemological orphan and it can only reclaim its parentage by losing its reality.⁴⁵ In the world of mechanism, the mind-body unity is 'no-thing'.

6.3 Descartes and Finality: Has Anything Else Changed?

One of the main themes of Chapter 3 was the question of final causes and the fact that this concept was an epistemological obstacle to mechanistic science that was rejected unambiguously by Descartes. In that chapter I made the point that, for Descartes, the notion of final causes meant God's purpose for the world and that in setting it aside as unknowable, Descartes was also setting aside the notion of final cause that predominated in ancient and Renaissance philosophy, i.e., the relation of the part to the whole and of immanent unconscious direction.

A criticism can be brought to my position in this thesis regarding the rejection of teleology and the resultant rupture of the human body from nature by claiming that Descartes' mind-body union, particularly in the light of his discussion of nature in Meditation VI, re-integrates an element of finality into his philosophy.⁴⁶ Beck comes

⁴⁴ Gilson, *op. cit.*, p. 252.

⁴⁵ Patrick Suppes sees Descartes' physical theory as "reductionism at its worst" adding that "his simplifying general ideas had great influence, yet his positive technical contributions were slight." *Op. cit.*, p. 86. With respect to the body, it was his simplifying ideas of dualism that had great influence and not the details (such as they were) of the integrated mind-body whole.

⁴⁶ This criticism of my position has, in fact, been made. In her response to my paper "Monism, Dualism, Finalism: the 17th-century rejection of Final Causes" given at the Canadian Philosophical Association in

close to this position when he states that the function of our perception of other bodies around us "is to act as signs of what is beneficial or harmful to the organism."⁴⁷ This is reminiscent of the Stoic concept of *oikeiosis* that was discussed in Chapter 3 as an example of Stoic teleology. In fact, Sutton goes so far as to turn Descartes into a quasi-Stoic, referring to Descartes' 'permeable body' and criticising the commonly held view (which is more than evident in this thesis) that Cartesian physiology results in "the closing off of the human body from the world, rendering it a possession of the individual soul".⁴⁸ For Sutton, Descartes' physiology is a 'corpuscularized Galenism', "transformed into principles of fluid mechanics by which inner and outer continually interact", and where "everything affects everything else, in the body as in the cosmos."⁴⁹ In his view, "the mechanisation of physiology is a reduction of Galenic humoralism rather than an elimination" which, because modelled on hydrodynamics, "explicitly theorises an active, runny, permeable body, set in a full fluid universe."⁵⁰ Sutton points to the fact that Malebranche saw the Cartesian view of the body as implying a kind of connection with the entire universe since, as a result of the nature of animal spirits, culture and cosmos permeate the innards, for everyone is joined "through his body to his relatives, friends, city, prince, country, clothes, house, land, horse, dog, to the entire earth, the sun, the stars, to all the heavens..."⁵¹ One could certainly not accuse Malebranche of under-

May, 2000 (and which contained much of what was argued in Chapter 3 regarding final causes), Karen Detlefsen argued in favour of finality in Descartes in relation to his mind-body union: "...knowledge gained through sensation of our union with such a body... tells us something seemingly teleological about the living body. That is, it tells us first that our souls are united with a body which is one whole thing made up of parts that nonetheless belong to that whole, and second, that the body is a relatively well- or ill-functioning whole."

⁴⁷ Beck, *op. cit.*, p. 267.

⁴⁸ Sutton, *op. cit.*, p. 95.

⁴⁹ *Ibid.*, p. 96.

⁵⁰ *Ibid.*, p. 97.

⁵¹ Quoted in Sutton, *op. cit.*, p. 96.

interpreting Descartes here and it is interesting to speculate on how Descartes would have reacted to the suggestion that his body-machine was joined to the sun, the stars and all the heavens!

Gueroult has a more modest version of Cartesian finality which is confined to the mind-body union, which union exerts a tempering influence on his mechanism as applied to the body:

le fondement de la réfutation de l'explication purement mécaniste de la nature du corps humain, c'est la vérité antérieurement démontrée de l'union substantielle de ce corps avec mon âme, union qui nous impose de reconnaître une valeur réelle à la finalité intérieure à ce tout substantiel.⁵²

If the position of some commentators noted earlier puts into question Descartes' dualism, it would seem that we are here being asked to put into question his mechanism! While I would not hold that finality is incompatible with mechanism, as is shown in both Gassendi and Leibniz, for example⁵³, I would hold that it is incompatible with *Cartesian* mechanism which, combined with his radical dualism, denies any immanent power of change or movement in matter, including the matter of the human body. The finality of the Stoics, of Aristotle, of the Renaissance naturalists allowed for the mutual relation of part to whole which was not limited by the laws of efficient causality. Causal principles explicitly rejected by Descartes (e.g. analogy, sympathy) are behind the links between man and nature and the links are sustained by the fact that there is life and soul in all of the universe, something that Descartes rejects as well.

However, given the position of some that there is a return to finality in Descartes'

⁵² Gueroult, *op. cit.*, p. 177.

⁵³ Gassendi's approach to finality was discussed in Chapter 5 where I compared his description of the growth of the foetus to that of Descartes. Leibniz was a mechanist but did not believe that mechanism was the total story and insisted on a teleological principle which was built into the centre of his philosophy with the monad.

later approaches to the body, the issue must be dealt with and the question asked: if there is a teleological principle in the Cartesian body, what is it, and how does it compare with the naturalistic account that I presented in Chapter 3? Is it teleology solely within the human mind-body union? Or is it really, as Malebranche's statement suggests and Sutton's position supports, a finality that encompasses the universe? These last two questions relate to two different sources of the notion of finality in Descartes: the former, dealing with an internal finality resulting from the 'substantial union' of mind and body, arises out of Meditation VI; and the latter, dealing with the permeability of the body and the influence of external forces on the animal spirits, arises out of a particular interpretation of Descartes' physics. I will address each question in turn, specifically asking whether or not either has an impact on Descartes' mechanistic conception of the body as set out in this thesis.

6.3.1 The Finality of the Substantial Union

Gueroult addresses this question in detail in a chapter subtitled *Union de l'âme avec toutes les parties du corps*.⁵⁴ For him the finality of the human body resides not in the mutual relation of the parts of the mechanism (or body-machine), but solely in the mind-body relation which entails a relation of means to end:

...le sentiment est dans l'âme le moyen tourné vers cette fin de pourvoir aux nécessités mécaniques impliquées par le fonctionnement et la conservation de l'assemblage mécanique des parties du corps; et, d'autre part, la conscience du sentiment fait que l'âme utilise la machine du corps comme un instrument en vue de satisfaire aux exigences de la conservation de cette machine. La finalité ne réside donc pas dans l'assemblage des parties du corps, ni dans les mouvements par lesquels ces parties s'entre-poussent, *mais dans le rapport de l'âme à cet assemblage mécaniquement explicable*... la fin véritable c'est la conservation de l'union de mon âme avec mon corps.⁵⁵

⁵⁴ Gueroult, *op. cit.*, Vol. II, Ch. XVII, pp. 169-194.

⁵⁵ *Ibid.*, p. 180 (emphasis is Gueroult's).

The idea that the soul uses the machine of the body as an instrument in assuring the conservation of the mind-body (or mind-machine) union would appear to raise more questions than it answers, particularly in relation to the vexing problem, already discussed, of mind-body interaction. Descartes is clear that the mind moves the body only through *willed* action. Theoretically, I can will the movement of my hand in order to write on this paper but I cannot will the beating of my heart or the action of my liver. Gueroult's idea of the soul using the body for the ends of the substantial union would seem to go beyond this; however, I do not want to assess the accuracy of Gueroult's idea of Cartesian finality so much as question whether it affects Descartes' mechanistic physiology. And here Gueroult himself provides the answer by underlining that this finality is "[une] finalité psychophysique qui n'introduit, en principe, nulle finalité dans la physique."⁵⁶ For Gueroult, the teleological principle involved in mind-body union is

un principe téléologique spirituel, qui, ressentant, par son union avec le corps les péripéties du fonctionnement mécanique, les vicissitudes de l'état de la machine, use de celle-ci en s'appliquant, comme à sa propre fin, à l'excellence de ce fonctionnement et de cet état.⁵⁷

If this idea of the Cartesian soul as a kind of guardian angel overseeing, but not interfering in, the functioning of the body-machine seems somewhat mysterious, it is no more so, in Gueroult's view, than the mystery of the transubstantiation and is, in fact, comparable to it:

Cette union substantielle n'apporte pas plus de modifications dans la structure du corps physique comme tel que la transubstantiation n'en apporte dans la structure physique de l'hostie lorsqu'il devient le corps de Jésus.⁵⁸

It is clear that the spiritual and quasi-religious finality that Gueroult ascribes to

⁵⁶ *Ibid.*, p. 180.

⁵⁷ *Ibid.*, p. 183.

⁵⁸ *Ibid.*, p. 183.

Descartes' substantial mind-body union does not affect in any way his mechanistic physiology of the body. This is a spiritual finality that is limited to the mind-body union; it is a finality that is denied to animals and other living organisms.⁵⁹ Even taken in the non-spiritual sense of protecting the organism through a 'knowledge' of what is good for its functioning, as both Beck and Gueroult's interpretations hold, this is something that applies only to mind-body union and not to animals. Thus this connection with nature is not like the *oikeiosis* discussed in Chapter 3. Whatever self-protection mechanisms Descartes would grant to animals would be limited to pure instinct while *oikeiosis*, as already pointed out, is a form of self-conscious knowledge beyond simple instinct and applicable both to animals and humans, including babies and children. This is possible in Stoic monism because mind or soul permeates everything; it is impossible in Descartes' dualism because mind or soul is limited to humans and is non-existent in nature. Ultimately, the finality that Gueroult attributes to Descartes' mind-body union is as mysterious as God's purposes, the only true finality that Descartes can admit.

6.3.2 The Permeable Body and the Cosmos

Sutton's position regarding the permeability of the Cartesian body to the influence of the universe poses a greater challenge to the positions put forward in this thesis than does Gueroult's enclosed and mysterious internal teleology of mind-body union. Sutton recognises the ancient and Renaissance physiologies that I have discussed throughout, along with the fact that in these systems "the body was by nature open, the internal environment always in dynamic interrelation with the external environment", but he

⁵⁹ *Ibid.*, p. 184: "Cette doctrine, malgré sa parfaite cohérence, offre une grande difficulté... elle nie du corps des animaux, non seulement la finalité réelle, mais encore l'indivisibilité fonctionnelle et la réserve au seul corps humain."

maintains that "almost all of this survives in Descartes' 'corpuscularized Galenism'".⁶⁰

Sutton bases his position on an interpretation of Descartes' physics that renders it far more dynamic than the traditional account. It is an interpretation that argues, as does Gaukroger, "for a minimal reading of Descartes' official commitment to inertness"⁶¹ and it is based largely on seeing Cartesian mechanism from the point of view of hydrostatics rather than kinematics. It puts emphasis on a fluid model of causality, a "physics of circulation, displacement and endless motion"⁶² rather than on a model of collision and impact.⁶³ Sutton defends his position that the human body "is not in practice inert" on three important, if non uncontroversial, points which I summarise here:

- 1) Cartesian natural philosophy and, in particular, physiology, is a form of dynamics;
- 2) Cartesian automata are not wholly reliant on external design and direction, but have their own activity, specificity and causal powers; and
- 3) mechanisation does not eliminate but exacerbates the permeability of the open body.⁶⁴

A discussion of the hydrostatic model of Cartesian physics that allows for a more dynamic interpretation of Cartesian causality goes beyond the scope of this thesis. Thus I will not undertake either a critique or a defence of this position and will comment only on the case that Sutton makes for causal holism resulting from his acceptance of this more dynamical interpretation as it relates to Descartes' physiology. I will touch briefly on points 2) and 3) mentioned above.

With respect to the activity and causal powers inherent in Cartesian automata, as seen in Chapter 4, these come from the animal spirits, on their own in soul-less machines

⁶⁰ Sutton, *op. cit.*, p. 96.

⁶¹ *Ibid.*, p. 84.

⁶² *Ibid.*, p. 86.

⁶³ For a full discussion of the hydrostatic model of Descartes' physics, see Gaukroger, *Descartes, op. cit.*, pp. 228-237.

and (sometimes) directed by the soul in machines which have souls. But the causal power of the soul-less machines (or in the unconscious or non-willed action of machines with souls) ultimately relies on the external power of God as efficient cause, and thus on the principle of continuous creation discussed in Chapter 5. Sutton admits this. Referring to the survival, in Descartes, of the "paradoxically corporeal animal spirits", he states:

Their incessant motion is genuine activity, *whether or not it ultimately derives from God*: their coalescences, breachings, foldings, and commotions, retaining and transforming patterns over time, can continue quite independent of the individual will.⁶⁵

The important point here is that this 'genuine activity' *does in fact* derive from God and it does so because Descartes cannot posit any 'genuine activity' of any kind into matter itself, even organic matter.

In espousing a modified version of inertness in Descartes, Sutton points to the difference between matter *initiating* activity and forces being *sited* in matter but ultimately derived from God.⁶⁶ This distinction is a meaningful one but I do not believe that Descartes would have accepted it. The idea that God put power in bodies at creation and that all subsequent activity or movement is internal to the organism (e.g. Gassendi's pre-programmed atoms) is the position of Gassendi with respect to the foetus that was discussed in Chapter 5. If Descartes had been able to accept such a position, he would have been less insistent on the issue of the heat of the heart discussed in the last chapter and he would have been better able to reconcile his view of movement of the heart with that of Harvey. Descartes' obstinacy regarding the movement of the heart is only

⁶⁴ Sutton, *op. cit.*, p. 82, p. 83.

⁶⁵ Sutton, *op. cit.*, p. 84. Emphasis added.

⁶⁶ Sutton, *op. cit.*, p.84. This distinction is from Gaukroger, *op. cit.*, p. 376.

explicable by his need to eliminate all latent forces from his physiology as much as from his physics.

With respect to point 3) above regarding the permeability of the body and the causal holism that Sutton claims for the Cartesian view, the idea of "a permeable body set in a fluid universe" does not seem to sit well with Descartes' own claims about the impenetrability of extension. Writing to Henry More, who accepted his mechanism but not his dualism or his idea of matter as inert, and who argued that Descartes had not shown that impenetrability was an essential property of extended substance, Descartes wrote:

...it is impossible to conceive of one part of an extended thing penetrating another equal part without thereby understanding that half the total extension is taken away or annihilated; but what is annihilated does not penetrate anything else; and so, in my opinion, it is established that impenetrability belongs to the essence of extension and not to that of anything else.⁶⁷

Descartes is, of course, resisting any idea of spirit penetrating matter—as with More's own Spirit of Nature which permeates matter and makes it active. But it surely applies as well to other aspects of matter including causal influences that do not result from the speed, motion and size of particles which, as we can see, in Descartes are impenetrable. It is hard to picture anything else in Cartesian causality other than impact and collision, under his own principles.

I am not here making an argument against Sutton's permeable body, nor against causal holism as such. I am simply arguing that Descartes' own rules of mechanism make such an interpretation of the Cartesian body difficult to defend. If, however, one were to accept that causal holism could be applied to Descartes' physiology, two questions are worth asking. The first is: what is the role of mind or soul in the causally

holistic universe? If mind is part of the equation of everything affecting everything else, then, given Descartes' dualism, we are forced to extend the very vexing question of mind-body interaction to mind-matter interaction at all levels, something that would pose serious problems in Cartesian metaphysics. On the other hand, if mind is not part of the equation, what, ultimately, is its role? Discussing memory and soul, Sutton states: "Knowledge of the physiology here, Descartes thinks, in fact shows us how little our soul is responsible for."⁶⁸ Looked at from the larger world of body in the universe, Cartesian causal holism would seem to imply the same thing, i.e., the soul is responsible for little. It is, in Descartes' mind-body dualism, the side which contains the *essence* of the person, but is ultimately responsible for very little of the person's functioning.

The second question regarding Sutton's causal holism is this: if Descartes has gone to so much trouble to remove all trace of mind or soul from matter in his metaphysics, why would he then return to matter what appears to be all—or nearly all—of the soul's powers in his physiology? The correct answer is, of course, that he has not given the powers to matter at all. They are God's powers exercised on every aspect of matter and motion through the principle of continuous creation. Then the question becomes: why would Descartes take all the soul's powers and return them to God? It would seem better to forego causal holism in favour of keeping certain powers in the soul as part of the mind-body union. Whichever view is accepted, a metaphysical price has been paid in order to preserve mechanistic physiology.

Finally, if the causal holism that Sutton finds in Descartes' mind-world interaction is of the same order as his mind-body interaction discussed earlier, then it falls under the

⁶⁷ CMSK, 372 (AT V, 342).

⁶⁸ Sutton, *op. cit.*, p. 74.

same limitation, i.e. it is not a subject of knowledge or of science but, like the mind-body union is limited to the realm of sensation. Like the mind-body union, the body integrated with the cosmos has no place in Descartes physics or metaphysics and is equally excluded from certain and meaningful knowledge.

To return to the question posed earlier about finality in Descartes' later philosophy of the body, I do not believe that the efforts of Gueroult on the one hand or Sutton on the other to unite body and soul or body and nature in a way that links part and whole in a relation of finality necessitates any re-evaluation of the positions taken in this thesis regarding either the Cartesian rejection of final causes or his radical dualism of mind and matter and the mechanism that goes with it.

In the final analysis, the kind of finality that Gueroult finds in Descartes is an internal finality but it relates only to the mind-body union and therefore does not impinge on the mechanism of the body. The kind of finality that Sutton finds in his view of causal holism is an external finality, attributing everything ultimately to God (and thus to a final cause as being God's purpose) which is very far from the Stoic and Renaissance teleology discussed in Chapter 3.

In spite of the efforts of some to see it otherwise, the answer to Lenoble's question, *faut-il distinguer Nature et Conscience?* remains, for Descartes, a resounding *Yes*. As Richard Watson puts it: "No criticism or problem ever shook Descartes' insistence on the dualistic ontology of passive matter and active mind."⁶⁹

⁶⁹ Richard Watson, *The Breakdown of Cartesian Metaphysics*, *op. cit.*, p. 182.

CONCLUSION

An Unfinished Anthropology

What is a human being? Any systematic philosophy ought to offer an answer to that question. You would think that Descartes's philosophy would; it is natural to think that his new vision of souls and bodies provides a new way to do anthropology—a new way to conceive human beings...But I believe that, when all is said and done, he concludes that he has no answer at all to this question.

Stephen Voss, "Descartes: the End of Anthropology"¹

Given a choice, people will prefer to keep their bones from crumbling, their skin supple, their life systems strong and vital. Improving our lives through neural implants on the mental level, and nanotechnology-enhanced bodies on the physical level, will be popular and compelling...there is no obvious place to stop this progression until the human race has largely replaced the brains and bodies that evolution first provided.

Ray Kurzweil, *The Age of Spiritual Machines*²

This thesis has sketched Descartes' dream of creating a marvellous new and unified science and his lifelong quest to bring all knowledge of the external world under its umbrella. His description of the human body, in *L'Homme* and other biological writings represented a heroic effort to subsume the body under the laws of physics and to rid the scientific explanation of animal and human physiology of any occult or naturalistic tendencies. In place of the ontological unity of body and nature Descartes constructed an epistemological unity of mind and method that treated both nature and body as objects, each purified of its previous union with soul and each rendered alien to the mind that construed and dominated it.

As was demonstrated in Chapter 2, Descartes' unified science was build solidly, but discretely (Marion's 'grey ontology') on the foundation of his metaphysical dualism.

¹ In John Cottingham, ed., *Reason, Will and Sensation: Studies in Descartes' Metaphysics* (Oxford: Clarendon Press, 1994), p. 273.

His whole scientific project required that the thinking subject be conceived in such a way that it was over and above the objects of its thought. In addition, his notions of mind and idea inaugurated an epistemological era of *things as objects in the mind*, and the relation between these objects, as representations, and the things in the world that they represented, became problematic—at least until Kant's transcendental idealism offered a partial solution to the dualistic problem, by reframing the question and shifting the locus of the mind-reality rupture.

Further, it was his metaphysical dualism that supported Descartes' mechanistic conception of nature, including the human body, and which allowed, or even required, the distinction of mind and nature which is reflected in Lenoble's question, *faut-il distinguer Nature et Conscience?*—the question that has guided this thesis. This distinction between consciousness and nature could only come about through the transformation, reduction or elimination of a number of notions that had held prominence in pre-Cartesian metaphysics and, in particular, in Renaissance naturalism.

For the Renaissance naturalists, man was conceived as an integral part of nature. A thread (of life, intelligence, mind) ran through all things, connecting human life, body and soul, to the body and soul of the universe. At the same time, an underlying principle of movement or change accounted for order and direction in the universe. These two notions, world-soul and final cause, were rejected by Descartes and other mechanists as inconsistent with a mechanical conception of the world or, at the very least, as unnecessary to scientific explanation. The work of Galileo, on the one hand, and Vesalius, on the other, had shown that explanation of nature and the body required no notion of soul.

² Kurzweil, *op. cit.*, p. 141.

The story of Descartes' mechanistic physiology is the story of the elimination of these notions that has been recounted in Chapters 3 and 4. Other important concepts underwent radical transformation in order to fit with the principles of mechanism. The principle of life, formerly the soul, was reduced to the heat of the heart. The heat of the heart itself, formerly a spark of the celestial fire, was reduced to the fire without light, a process of fermentation similar to the fermenting of hay or wine. The former multi-level soul was reduced to mind alone, and the essence of man became, under Descartes' dualism, thought and thought alone. The multiple causality of Aristotle and the Scholastics was reduced to efficient causality, as all change was reduced to movement and all movement to collisions of particles (with variations according to their size, speed and direction). Even divine action in the world was reduced: continuous creation, for Descartes, was to be explained by efficient causality—God recreating the world at each instant—a transcendent, as opposed to immanent, cause.

Thus did Descartes make the body an object of knowledge. As has been shown in Chapter 3, this represented a major rupture with the notion of body held by Renaissance naturalists such as Ficino. The transition from the body of the Renaissance to the body of the Scientific Revolution was both an anthropological and an epistemological milestone, but regardless of what was lost in the passage, it was Descartes and not Ficino who provided the framework for modern biology and psychology. As pointed out throughout this thesis, it was not the particulars of Cartesian science that endured; rather it was Descartes' metaphysical and epistemological framework that determined the anthropology of the modern age.

As I have tried to demonstrate in this thesis, that metaphysical and

epistemological framework, as it pertained to the human body, led Descartes into an unfinished and unfinishable anthropology. Descartes' mechanistic physiology could not survive without the two metaphysical props discussed in Chapter 5: animal spirits and continuous creation. Soul and body in the new science were mysteriously linked by materialised spirits that were a hangover from another century, and the whole mechanistic universe was sustained by a transcendent God, the efficient cause of all things. The magic of naturalism was replaced with the magic of mechanism through numerous sleights of hand of the magician philosopher. But the result of the whole Cartesian exercise was not a description of a human being. Because Descartes could not allow either the idea of a material soul or the notion of intelligent matter, he could not bring mind and body together under his mechanistic science. So he chose only body, but it was body without mind. In fact, in spite of his distinction in *L'Homme* between machines with souls and machines without souls, all he could ever describe mechanistically was the body as a machine without soul. His descriptions of machines with souls were full of ambiguities and required dilutions of his mechanistic principles (his animal spirits being directed by the soul from the pineal gland) or had to be excluded from the realm of science and medicine (the mind-body union as a different order of inquiry). He held to his dualism in his metaphysics, and to his mechanism in his physiology, but he could not reconcile the two. Descartes' unfinished works (as pointed out in Chapter 2) attest to the difficulty he himself had in universalising his method and bringing soul and body together in a unified science. In the final analysis, his unified science did not yield an anthropology; and his mind-body union did not yield a science.

The ramifications of this lack of reconciliation are still with us. As the twenty-first century deals with the ambiguities and the ethics of the advanced technology of biomedical science, the metaphysics of the body comes to the fore, and with it questions about the relation of body and mind, body and nature. And with these come questions of finality, not in the sense of God's purpose, but in the sense of the relation of part to whole, man to nature (as discussed in Chapter 3). This is evident in almost every writer dealing with philosophy of body at the present time. The American philosopher, Tu Weiming, for example refers to "embodying the universe" as "a penetrating insight into the body as a central Problematik for philosophical reflection. For Chinese thought, the body is never merely material and mechanical, but an open and flowing system of vital energy."³ The French anthropologist, David Le Breton, whose work has been cited throughout this thesis, sees the breaking of the link of the body to nature (and thus of part to whole) as a defining moment of the modern anthropological problem:

...la définition moderne du corps implique que l'homme soit coupé du cosmos, coupé des autres, coupé de lui-même. Le corps est le résidu de ces trois retraits.⁴

Le Breton also traces what he calls the 'désacralisation du corps' from the anatomy theatre of Vesalius to the organ transplants of today. He ends his critique with the words:

Penser le corps est autre manière de penser le monde et le lien social: un trouble introduit dans la configuration du corps est un trouble introduit dans la cohérence du monde.⁵

Eric J. Cassell, writes of the body in the same vein:

From the perspective of essential form and purpose, the individual is not atomistic nor sharply boundaried and can never be understood apart from the surrounding world and the human community.....To view form or purpose as restricted to the

³ "A Confucian Perspective on Embodiment" in Drew Leder, *The Body in Medical Thought and Practice* (The Hague: Kluwer Academic Publishers, 1992), p.87-100.

⁴ *Anthropologie du corps et modernité, op. cit.*, p. 47.

⁵ *La Chair à vif, op. cit.*, p. 316.

cognitive, excluding the body and emotions, is literally impossible; the concepts of essential form and purpose deny dualisms.⁶

Cassell's article makes the assumption that I have questioned in this paper, i.e. that teleology or finality implies 'purpose', and his argument for the recuperation of the concept is also centred on the idea of 'purpose', something that, in my view, weakens his position. However, the important point is that these and other writers are attempting to explain the body in ways that are more compatible with Renaissance naturalism than with Cartesian mechanism. All of them understand that the modern conception of the human body, defined as it was by an essential break with mind and nature, needs to be re-examined.

In the last century many philosophers have attempted to come to grips with the legacy of the Cartesian *cogito*. In this regard, one of the most notable is Maurice Merleau-Ponty, whose work is a devastating critique of Cartesian dualism and the Cartesian body. In attempting to re-define the body, many other philosophical writers look to Merleau-Ponty for whom "the perceiving mind is an incarnated body."⁷ Unlike the Cartesian body which is matter (as opposed to mind), for Merleau-Ponty, the body is *flesh*:

The flesh is not matter, is not mind, is not substance. To designate it, we should need the old term 'element', in the sense it was used to speak of water, air, earth and fire, that is, in the sense of a *general thing*, midway between the spatio-temporal individual and the idea, a sort of incarnate principle that brings a style of being wherever there is a fragment of being. The flesh is in this sense an 'element' of Being.⁸

Merleau-Ponty's phenomenology of the body is especially attractive to feminist writers

⁶ "The Body of the Future" in Leder, *op.cit.* , p. 244:

⁷ See Grosz, *op. cit.*, p. 87.

⁸ Maurice Merleau-Ponty, *The Visible and the Invisible*, transl. Alphonso Lingis (Evanston: Northwestern University Press, 1968), p. 139.

who are among this century's most vociferous critics of Cartesian mind-body dualism and who have found support for a feminist critique of the body-machine his work.⁹

At the same time, there is an increasing openness to Eastern ways of looking at the body and nature and at alternative approaches to medicine. The Japanese philosopher, Yuasa Yasuo, espouses a holistic concept of body, something that is lacking in the Western perspective:

Western philosophy and science since the modern period have developed while focusing on the physical world as external nature. In contrast, traditional philosophy and science in East Asia developed as a kind of practical anthropology to actualize the original human nature latent in the mind and body... The view of human being espoused by this philosophy maintains that the human being is not a *homo faber* who conquers nature, but is an ecological, receptive being made alive by the invisible power working from beyond nature, for the human being is originally a being born out of nature.¹⁰

Our lack of a holistic approach to the mind and body is, in his view, at the root of our limited view of illness and medicine:

...the fundamental attitude which modern medicine has assumed is that of treating the mind and body separately by dividing them up, and it has only studied the organization of the body and its functions while disregarding the problem of mind.¹¹

Yuasa's discussion of *ki* energy leads him to an analysis of teleology which, in his view, is "still alive in our commonsensical world" even though it has been "gradually expelled from the world of science as the latter has progressed."¹² When Yuasa looks for links between Eastern and Western philosophies of the body, he turns away from Descartes and towards Bergson, Merleau-Ponty and Jung who "can be seen as attempting to bring

⁹ Grosz, *op. cit.*, p. 103. Grosz points out, however, that "even those feminists strongly influenced by him remain, if not openly critical, then at least suspicious of his avoidance of the question of sexual difference and specificity, wary of his apparent generalizations regarding subjectivity which in fact tend to take men's experiences for human ones."

¹⁰ Yuasa Yasuo, *The Body, Self-Cultivation and Ki-Energy*, transl. Shigenori Nagatomo and Monte S. Hall (Albany: State University of New York Press, 1993), 188.

¹¹ *Ibid.*, p. 9.

philosophy and empirical science closer again by incorporating clinical accomplishments from contemporary medical psychology."¹³

Much of Yuasa's discussion of the Eastern view of the unity of mind and body harks back to ancient, and especially Stoic, concepts of the Western tradition and to the holistic view of body and nature seen in Renaissance naturalists such as Ficino. However, rather than the magic and astrology of Ficino's world, we see that self-cultivation for Yuasa is a matter of becoming attuned to the world through techniques of meditation, breathing and physical training (e.g. through the martial arts). In contrast to the Cartesian view where mind-body unity is the common-sense attitude which must be surpassed in order to understand the true metaphysical duality of mind and body, the Eastern commonsense or 'natural' view of mind and body is dualist and the understanding of mind-body unity comes only with cultivation and practice: "the philosophy of self-cultivation within the Japanese intellectual tradition recognizes an existential transformation from provisional dualism to non-dualism."¹⁴

While Cartesian dualism has dominated the Western psychology and anthropology since the seventeenth century, the Cartesian vision was not the only, or the dominant one in Descartes' time. Other philosophers accepted his mechanism but not his dualism and had a different view of both body and finality than did Descartes. This is clear particularly in the case of Gassendi who argued against Descartes' dualism in the Fifth Objections, but it is also clear in the case of Hobbes¹⁵ and Henry More, neither of

¹² *Ibid.*, p. 175.

¹³ *Ibid.*, p. 178.

¹⁴ *Ibid.*, p. xiv (Introduction by Monte Hall).

¹⁵ With respect to Hobbes and the body, see Jamie Kassler, *Inner Music* (London: Athlone Press Ltd.,

whom accepted Descartes radical distinction of mind and body.

Similarly, following Descartes, Leibniz and Spinoza in particular articulated metaphysical positions in reaction to Cartesian dualism, the former through his notion of the monad reflecting the universe from its point of view, and the latter through a monistic materialism harking back to the Stoics. Beck sees their efforts as having been misguided, in part at least because, accepting Descartes' mind-body union as bridging his dualism, he denies the problem that they were attempting to solve. Referring to the efforts of Malebranche, Leibniz and Spinoza to overcome Cartesian dualism, Beck states:

It would not be unfair to say that each of these above-mentioned solutions has been found wanting and appears to be something of a makeshift to explain what is, in the very terms of its formulation, an impossible task... The solutions offered... have been made because Descartes is usually presumed not to have offered a satisfactory solution himself."¹⁶

Whatever the shortcomings of Descartes' own solution (or his successors' efforts to improve on it), the important fact is that it was the dualistic metaphysics and the mechanistic physiology of Descartes endured. Together they provided the new science with a framework that followed Bacon's dictum and bore fruit rather than "thorns and briars of dispute and contention".¹⁷ They influenced the beginnings of both biology and psychology and provided the underpinnings for the development of modern medicine. In such a context of overwhelming success, it is difficult to question their efficacy. That is, however, what I have attempted to do in this thesis which has questioned the roots of the Cartesian vision of the body and has argued for a re-examination of certain elements of

1995). Kassler uses a musical model of mechanism to interpret Hobbes' mechanism and, at the same time, offers a modification of accepted notions of mechanism "according to which there was only one seventeenth-century mechanical philosophy before Isaac Newton." According to her analysis, "since Hobbes conceived the internal structure of bodies as elastic substances that vibrate, a central feature of his mechanics was a theory of restitution: organic as well as inorganic bodies have a power to restore themselves." (p. 4)

¹⁶ Beck, *The Metaphysics of Descartes, op. cit.*, p. 269.

the naturalistic vision that it replaced.

Considerations of length prevent an examination of some of the alternative visions, for example, those of Gassendi and Hobbes, Leibniz and Spinoza. The same considerations preclude an examination of the contemporary visions of the body in the West and both traditional and contemporary models of the East. All of these, however, point to directions for future research. The Cartesian body machine has endured for three centuries but the limitations of that vision for modern medicine and bio-medical ethics become more apparent every day. Like a grinning ghost our dualistic vision of mind and body (along with modernity's notion of *self*) hovers over contemporary bio-medical puzzles—from abortion and euthanasia to living organ donations and human tissue research—offering no help in drawing the lines between life and death, person and non-person, human being and machine, man and God. As electronic devices and computers slowly take over our minds, we have only to wait for them to take over our bodies as well. Le Breton's notion of the body as a 'leftover' may soon be more than a metaphor, and the Cartesian distinction between machines with souls and machines without souls no more than an historical curiosity.

¹⁷ Bacon, *op. cit.*, p. 72.

BIBLIOGRAPHY

Editions of Descartes' Works:

Adam, Charles, and Tannery, Paul (eds.), *Oeuvres de Descartes*, 11 vols. Paris: 1974-86.

Bitbol Hespériès, Annie, and Verdet, Jean-Pierre (eds.), *Le Monde, L'Homme*. Paris: Éditions du Seuil, 1996.

Cottingham, John; Stoothoff, Robert; Murdoch, Dugald, *The Philosophical Writings of Descartes, Vols. I and II*, Cambridge: Cambridge University Press, 1984; with Kenny, Anthony, *Vol. III, Correspondence*, 1991.

Cottingham, John, transl., *Conversations with Burman*. London: Clarendon Press, 1976.

De la Forge, Louis, *L'Homme de René Descartes*. Paris: Fayard, 1999.

Gaukroger, Stephen (ed.), *The World and Other Writings*. Cambridge: Cambridge University Press, 1998.

Gilson, Étienne, *René Descartes, Discours de la méthode*. Paris: Vrin, 1947.

Hall, Thomas Steele (ed. and transl.), *Treatise of Man: René Descartes*. Cambridge, Mass.: Harvard University Press, 1972.

Other Primary Sources:

Aristotle, *De Anima* (Hugh Lawson Tancred, transl.). London: Penguin Books, 1986.

Augustine, *City of God*. New York: Doubleday, 1958.

Bachelard, Gaston, *La formation de l'esprit scientifique*. Paris: Librairie philosophique J. Vrin, 1947.

Bruno, Giordano, *Cause, Principle & Unity*, Jack Lindsay, transl. New York: International Publishers, 1964.

Cicero, *De Finibus Bonorum et Malorum*, H. Rackham, transl. Loeb Classical Library, 1914.

Ficino, Marsilio, *De vita libri tres [1480]*, in English, *Three Books on Life* (Carol V. Kaske and John R. Clarke, transl.). Binghamton, N.Y.: The Renaissance Society of

America, 1989.

Ficino, Marsilio, *Theologia Platonica [1482]*, in French, *Théologie platonicienne* (. Raymond Marcel, transl.) 3 volumes. Paris: Les Belles Lettres, 1964-1970.

Galen, *Selected Works*, (P.N. Singer, transl.). Oxford: Oxford University Press, 1997.

Galileo, *Dialogo dei due massimi sistemi del mondo [1632]*, in English, *Dialogues Concerning the Two Chief World System—Ptolemaic & Copernican* (Stillman Drake, transl.). Berkeley and Los Angeles: University of California Press, 1953.

Kant, Immanuel, *Critique of Judgment*, (Werner S.Pluhar transl.). Indianapolis: Hackett Publishing Company, 1987.

Leibniz, G. W., *Monadology*, in Rescher, Nicolas, *G.W. Leibniz 's Monadology*. Pittsburgh: University of Pittsburgh Press, 1991.

Mersenne, Marin, *Correspondance* (Cornelius de Waard, ed.). Paris: CNRC, 1972.

Mersenne, Marin, *L'impiété des Deistes, Athées et Libertins de ce temps [1624]*. Stuttgart-Bad Canstatt: F. Frommann, 1975.

Mersenne, Marin, *Questions inouyes [1634]*. Paris: Fayard, 1985.

Montaigne, Michel de, *The Complete Essays* (M.A. Screech, trans.). London: Penguin Books, 1987.

Plato, *Timaeus and Critias*, Desmond Lee (ed.). London: Penguin Books, 1971.

Selected Secondary Sources:

Adam, Charles, *Descartes, sa vie et son oeuvre*. Paris: Boivin & Cie., Éditeurs, 1937.

Alquié, Ferdinand, *Études cartésiennes*. Paris: Librairie philosophique J. Vrin, 1982.

Alquié, Ferdinand, *La découverte métaphysique de l'homme chez Descartes*. Paris: Presses universitaires de France, 1966.

Ariew, Roger, and Grene, Marjorie, *Descartes and His Contemporaries*. Chicago and London: University of Chicago Press, 1995.

Baillet, Adrien, *La vie de Monsieur Descartes*. La Table Ronde, 1946.

Balme, D.M., *Aristotle's Use of the Teleological Explanation*. Inaugural Lecture at Queen Mary College, University of London, June 1, 1965.

- Barnes, Jonathan (ed.), *The Cambridge Companion to Aristotle*. Cambridge: Cambridge University Press, 1993.
- Beck, L.J., *The Method of Descartes*. Oxford: Clarendon Press, 1952.
- Beck, L.J., *The Metaphysics of Descartes*. Oxford: Clarendon Press, 1965.
- Bermudez, J.L.; Marcel, A.; and Eilan, N., *The Body and the Self*. Cambridge: The MIT Press, 1998.
- Bernier, F., *Abrégé de la philosophie de Gassendi, Tome II*. Paris: Librairie Arthème Fayard, 1992.
- Bitbol-Hespériès, Annie, *Le principe de vie chez Descartes*. Paris: Librairie philosophique J. Vrin, 1990.
- Bitbol-Hespériès, Annie; and Verdet, Jean-Pierre (eds.), *Descartes: Le Monde, L'Homme*. Paris: Éditions de Seuil, 1996.
- Bloch, Olivier, *La philosophie de Gassendi*. LaHaye: Martinus Nijhoff, 1971.
- Blumenberg, Hans, *The Legitimacy of the Modern Age*. Cambridge, Mass.: The MIT Press, 1985.
- Bourgeois, Bernard, and Havet, Jacques, *L'Esprit cartésien: Actes du XXVI^e Congrès de l'Association des Sociétés de Philosophie de Langue Française*. Paris: Librairie philosophique J. Vrin, 2000.
- Carter, R.B., *Descartes' Medical Philosophy*. Baltimore: Johns Hopkins University Press, 1983.
- Cassirer, Ernst, *The Individual and the Cosmos in Renaissance Philosophy*. Oxford: Basil Blackwell, 1963.
- Cohen, H. Floris, *The Scientific Revolution: A Historiographical Inquiry*. Chicago and London: The University of Chicago Press, 1994.
- Collingwood, R.G., *The Idea of History*. London: Oxford University Press, 1956.
- Copenhaver, Brian P. and Schmitt, Charles B., *Renaissance Philosophy*. Oxford: Oxford University Press, 1992.
- Cottingham, John, ed., *The Cambridge Companion to Descartes*. Cambridge: Cambridge University Press, 1992.

- Cottingham, John, *Descartes*. London: Basil Blackwell, 1986.
- Dear, Peter, *Mersenne and the Learning of the Schools*. Ithaca, N.Y.: Cornell University Press, 1988.
- De Gandillac, Maurice, *La Philosophie de la Renaissance*, in *Histoire de la Philosophie, II, Encyclopédie de la Pléiade*, (dir. Y. Belaval). Paris: Éditions Gallimard, 1973.
- Delbos, Victor, *Le Spinozisme*. Paris: Librairie philosophique J. Vrin, 1993.
- Dijksterhuis, E.J., *The Mechanization of the World Picture*, (translated by C. Dikshoorn). Oxford: Oxford University Press, 1961.
- Duflo, Colas, *La finalité dans la nature: de Descartes à Kant*. Paris: Presses universitaires de France, 1998.
- Dupré, Louis, *Passage to Modernity*. New Haven and London: Yale University Press, 1993.
- Dutton, Blake D., "Physics and Metaphysics in Descartes and Galileo", in *Journal of the History of Philosophy*, 37: 1, January, 1999.
- Fattori & Bianchi, (eds.), *Spiritus, IV Colloquio Internationale*, 1983. Rome: Edizioni dell'Ateneo.
- Faye, Emmanuel (ed.), *Descartes et la Renaissance: Actes du Colloque international de Tours des 22-24 mars, 1996*. Paris: Honoré Champion Éditeur, 1999.
- Garber, Daniel, *Descartes' Metaphysical Physics*. Chicago and London: University of Chicago Press, 1992.
- Garin, Eugenio, *Astrology in the Renaissance*. London: Routledge & Kegan Paul, 1988.
- Gaukroger, Stephen, *Descartes: An Intellectual Biography*. Oxford: The Clarendon Press, 1995.
- Gaukroger, Stephen, *Descartes: Philosophy, Mathematics and Physics*. Sussex: The Harvester Press, 1980.
- Gayon, Jean, "La biologie entre loi et histoire" in *Philosophie*. Paris: Éditions de minuit, 1993, numéro 38.
- Gilson, Étienne, *Études sur le rôle de la pensée médiévale dans la formation du système cartésien*. Paris: Librairie philosophique J. Vrin, 1967.
- Gilson, Étienne, *D'Aristote à Darwin et Retour*. Paris: Librairie philosophique J. Vrin,

1971.

Godard, J.-C. et Labrune, M., *Le Corps*. Paris: Vrin / Intégrale, 1992.

Gouhier, Henri, *Les premières pensées de Descartes: Contribution à l'histoire de l'anti-Renaissance*. Paris: Librairie philosophique J. Vrin, 1979.

Gothelf, Allan (ed.), *Aristotle on the Nature of Living Things*. Pittsburgh and Bristol: Mathesis Publications, Inc., and Bristol Classical Press, 1985.

Groethuysen, Bernard, *Anthropologie philosophique*. Paris: Gallimard, 1952.

Grosholz, Emily, *Cartesian Method and the Problem of Reduction*. Oxford: Clarendon Press, 1991.

Grosz, Elisabeth, *Volatile Bodies: Toward a Corporeal Feminism*. Bloomington: Indiana University Press, 1994.

Gueroult, Martial, *Descartes selon l'ordre des raisons*. Paris: Aubier, 1975.

Hall, Thomas Steele, *Treatise of Man*. Cambridge, Mass.: Harvard University Press, 1972.

Hammer, Leon, *Dragon Rises, Red Bird Flies: Psychology and Chinese Medicine*. Barrytown, N.Y.: Station Hill Press, 1990.

Hillman, David and Mazzio, Carla, (eds.), *The Body in Parts*. New York and London: Routledge, 1997.

Janet, Paul, *Final Causes*. Edinburgh: T. & T. Clark, 1883.

Janet, Paul and Séailles, *A History of the Problems of Philosophy* (Ada Monahan transl.). London: Macmillan and Co., 1902.

Jonas, Hans, *Philosophical Essays*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974.

Jonas, Hans, *The Phenomenon of Life: Towards a Philosophical Biology*. New York: Harper & Row, 1966.

Kassler, Jamie C., *Inner Music*. London: The Athlone Press Ltd., 1995.

Kawakita, Yosio, Shizu, Sakai and Otsuka, Yasuo (eds.), *The Comparison Between Concepts of Life-Breath in East and West*. Tokyo: Ishiyaku EuroAmerica, Inc., 1990.

Kemp Smith, N., *New Studies in the Philosophy of Descartes*. London: MacMillan, 1966.

- Keefe, Michael, "The Dreamer's Path: Descartes and the Sixteenth Century", in *Renaissance Quarterly*, 49, 1996.
- Keeling, S.V., *Descartes*. Oxford: Oxford University Press, 1968.
- Klibansky, Raymond, Panofsky, Erwin and Saxl, Fritz, *Saturn and Melancholy*. London: Nelson, 1964.
- Koyré, Alexander, *From the Closed World to the Infinite Universe*. New York: Harper & Row, 1958.
- Kristeller, Paul Oskar, *The Philosophy of Marsilio Ficino* (transl. Virginia Conant). New York: Columbia University Press, 1943.
- Kurzweil, Ray, *The Age of Spiritual Machines*. New York and London: Penguin Books, 1999.
- Lagrée, Jacqueline, *Le Stoïcisme aux XVI^e et XVII^e siècles*. Université de Caen, 1994.
- LeBreton, David, *Anthropologie du corps et modernité*. Paris: Presses universitaires de France, 1990.
- LeBreton, David, *La Chair à vif*. Paris: Éditions A.M. Métailié, 1993.
- LeBreton, David, *L'Adieu au corps*. Paris: Éditions A.M. Métailié, 1999.
- Leder, Drew, *The Body in Medical Thought and Practice*. The Netherlands: Kluwer Academic Publishers, 1992.
- Lenoble, Robert, *Esquisse d'une histoire de l'idée de nature*. Paris: Éditions Albin Michel, 1969.
- Lenoble, Robert, *Mersenne ou la naissance du mécanisme*. Paris: Librairie philosophique J. Vrin, 1943.
- Lerner, M.P., *La notion de finalité chez Aristote*. Paris: Presses universitaires de France, 1969.
- Lindebloom, G.A., *Descartes and Medicine*. Amsterdam: Editions Rodopi N.V., 1978.
- Long, A.A., and Sedley, D.N., *The Hellenistic Philosophers*. Cambridge: Cambridge University Press, 1987.
- Machamer, Peter (ed.), *The Cambridge Companion to Galileo*. Cambridge: Cambridge University Press, 1998.

Marion, Jean-Luc, *Sur l'ontologie grise de Descartes*. Paris: Librairie philosophique J. Vrin, 1981.

Maritain, Jacques, *Le songe de Descartes*. Paris: Buchet/Chastel, 1965.

Mayr, Ernst, *Toward a New Philosophy of Biology: Observations of an Evolutionist*. Cambridge, Mass.: Harvard University Press, 1988.

Menn, Stephen, *Descartes and Augustine*. Cambridge: Cambridge University Press, 1998).

Moyal, Georges J.D.(ed.), *René Descartes, Critical Assessments*. London: Routledge, 1991.

Namer, Emile, *Le beau roman de la physique cartésienne et la science exacte de Galilée*. Paris: Librairie philosophique J. Vrin, 1979.

Nasr, Seyyed Hossein, *Man and Nature*. Chicago: ABC International Group, Inc., 1997.

Needham, Joseph, *Science and Civilisation in China*. Cambridge: Cambridge University Press, 1956.

Nye, Andrea, *The Princess and the Philosopher*. Lanham, Maryland: Rowman & Littlefield Publishers Inc., 1999.

Parel, Anthony, *The Machiavellian Cosmos*. New Haven and London: Yale University Press, 1992.

Rodis-Lewis, G., *Anthropologie cartésienne*. Paris: Presses universitaires de France, 1990.

Rodis-Lewis, G., *La science chez Descartes*. New York and London: Garland Publishing Inc., 1987.

Rodis-Lewis, G., *L'individualité selon Descartes*. Paris: Librairie philosophique J. Vrin, 1950.

Ross, W.D. (ed.), *Aristotle's Physics*. Oxford: Clarendon Press, 1936.

Ruyer, Raymond, *La gnose de Princeton*, Paris: Fayard, 1974.

Sambursky, S., *The Physics of the Stoics*. Princeton University Press, 1959.

Sawday, Jonothan, *The Body Emblazoned: Dissection and the human body in Renaissance culture*. London: Routledge, 1995.

Schmitt, Charles B. and Skinner, Quentin, *The Cambridge History of Renaissance Philosophy*. Cambridge: Cambridge University Press, 1988.

Shanteau, James, and Jackson, Richard, (eds.), *Organ Donation and Transplantation: Psychological and Behaviour Factors*. Washington: American Psychological Association, 1990.

Shapin, Steven, *The Scientific Revolution*. Chicago and Longdon: The University of Chicago Press, 1996.

Sherrington, Sir Charles, *Man on his Nature*. Cambridge: Cambridge University Press, 1963.

Smith, Norman Kemp, *New Studies in the Philosophy of Descartes*. London: Macmillan, 1966.

Sutton, John, *Philosophy and Memory Traces*. Cambridge: Cambridge University Press, 1999.

Thomson, Garrett, *Descartes to Kant*. Prospect Heights, Illinois: Waveland Press, Inc., 1997.

Tiles, Mary, *Bachelard, Science and Objectivity*. Cambridge: Cambridge University Press, 1984.

Toulmin, Stephen, *Cosmopolis, The Hidden Agenda of Modernity*. Chicago: University of Chicago Press, 1990.

Védrine, Hélène, *Philosophie et magie à la Renaissance*. Librairie Générale française, 1996.

Védrine, Hélène, *La conception de la nature chez Giordano Bruno*. Paris: Librairie philosophique J. Vrin, 1967.

Verbeke, Gerard, *The Presence of Stoicism in Medieval Thought*. Washington: Catholic University of America Press, 1983.

Watson, Richard, *The Downfall of Cartesian Metaphysics*. Indianapolis: Hackett Publishing Company, Inc., 1998.

Wilson, Margaret Dauler, *Ideas and Mechanism*. Princeton: Princeton University Press, 1999.

Wu, Harry, *Retour au laogai*. Paris: Belfond, 1997.

Yates, Frances, *Giordano Bruno and the Hermetic Tradition*. London: Routledge and Kegan Paul, 1964.

Yates, Frances, *The Rosicrucian Enlightenment*. London and New York: Routledge, 1972.

Yuasa, Yasuo, *The Body, Self-Cultivation and Ki-Energy*. Albany: State University of New York, 1995.