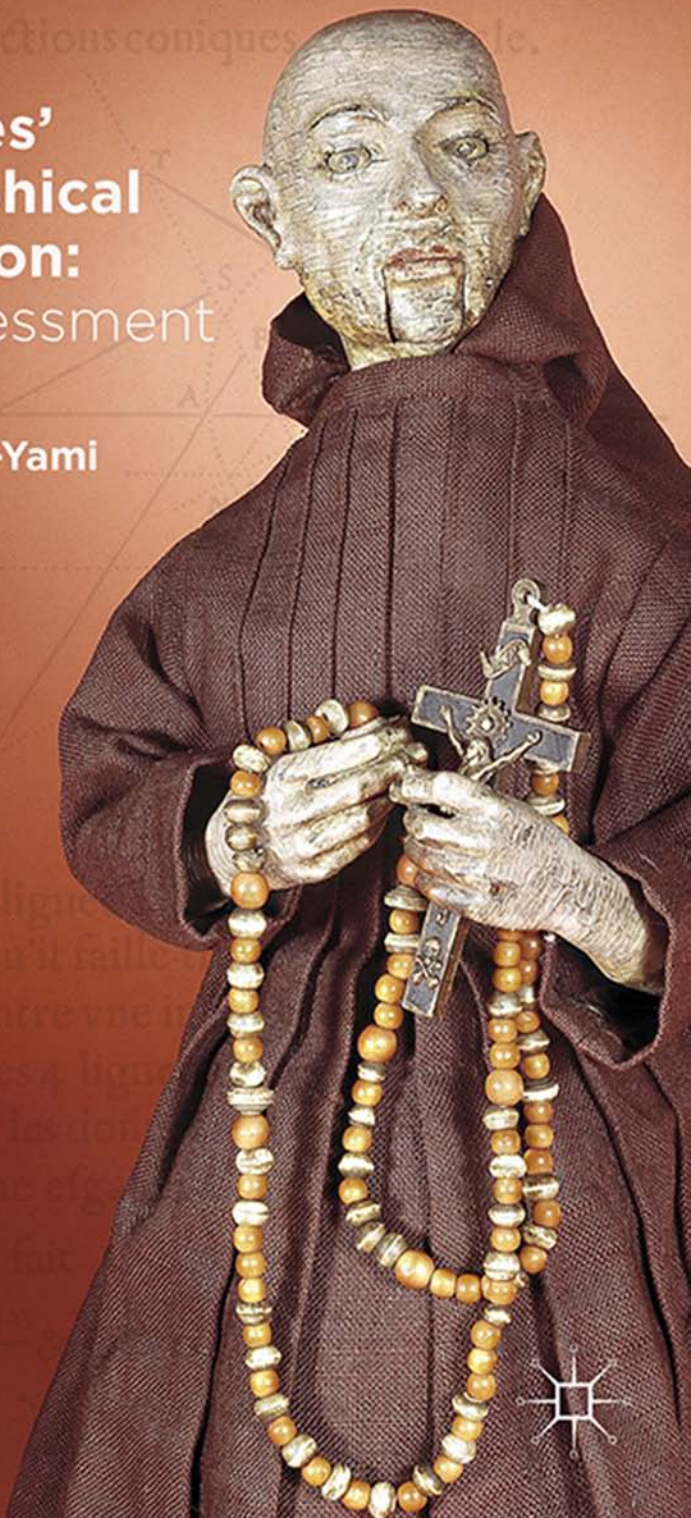
Descartes' Philosophical Revolution: A Reassessment

Hanoch Ben-Yami



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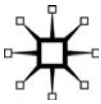

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To Vered
Who helped wind up the mechanism that set this work a-going

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Preface

This book developed out of three areas of research, initially rather independent of each other. First, my interest in the philosophy of perception and the attention I pay to the history of the issues I work on led to research into Descartes' theory of perception. Secondly, my wife, Vered Glickman, investigated the emergence of the mind–body problem, and this led her to work on Descartes' understanding of life and soul and on the influence of automata on his thought. And lastly, we both have taught and struggled with the Meditations over the years. When significant interconnections between these different areas of research began to emerge, the project of the book was born.

As is clear from the above, the book was initially conceived as a joint project. However, other occupations kept creeping in and gradually demanded more and more of Vered's attention, and the time she could devote to the book project shrunk accordingly, ultimately disappearing altogether some years ago. Since then I have been working on the book virtually on my own. Still, some of the research leading to Chapters 4, 5 and 7 is Vered's. But as we have been sharing and discussing our ideas and results from the very earliest stages of this work, it is practically impossible to separate our respective contributions.

The book is intended not only for scholars but also for graduate students and advanced undergraduates. I have thus had to balance between the varied interests and needs of these different readerships. I made the main text self-standing, assuming only the kind of familiarity with the history of philosophy and with contemporary philosophy that an advanced undergraduate would have.

In order to arrive at new areas of interest, I often had to travel over familiar ground that has been well-covered in recent secondary literature: Descartes' physiology, some aspects of his view of animals as natural automata, and more. I allowed myself to be concise in my presentations of these issues, mentioning only what is necessary for later discussions and for the comprehensibility of Descartes' position. In such cases I give, in footnotes, references to sources in which the subject is expounded in more detail.

Wherever available, which meant almost always, I used existing translations of Descartes' writings, primarily the translation of the extensive selections from his philosophical works and correspondence made by Cottingham, Stoothoff, Murdoch and Kenny and published by Cambridge University Press (1984–1991). References to the three volumes of this translation are abbreviated CSM I, CSM II and CSMK, respectively. I allowed myself, however, to change the translation where I thought necessary, for reasons of accuracy or uniformity. These changes are infrequent, but they are occasionally significant; usually they are not noted in the text. The same applies to other translations from works by Descartes or other authors.

Peter Hacker read most of the manuscript while Ivan Milić and Judit Szalai parts of it: all of them provided many helpful comments. György Geréby helped me with some Latin texts, as did Gábor Betegh, István Bodnár and Paul Scade with Greek ones, also suggesting references to primary and secondary literature on ancient philosophy. Hywel Griffiths made valuable suggestions and comments on Galileo.

I have taught courses covering material from this book from the late 1990s on, first at Tel-Aviv University and then at Central European University, and these contributed considerably to the book. One of these courses was a seminar on Descartes given together with Mike Griffin, whose comments were of great help. I have delivered talks and seminars on parts of my work at several universities, too many to be listed here. The discussions on these occasions contributed not only to the accuracy and to the presentation of my work, but also to my confidence that philosophers may find it interesting.

Authors often conclude their acknowledgments by thanking their husband or wife, without whose support, they write, their work would never have come into being. For the reasons mentioned in the opening paragraphs of this preface, this book owes its existence to Vered, to whom it is dedicated, in an even more significant way.

1
Introduction

Descartes revolutionised philosophy. With which of his ideas? And how did he arrive at them?

When we read the works of the great philosophers from Descartes onward, we feel much closer to them than we do while reading those of their predecessors from antiquity, the Middle Ages or the Renaissance. The works of those older masters is of course still of philosophical relevance, and much is to be gained from the writings of Plato, Aristotle, and later philosophers who preceded Descartes. Moreover, in some areas earlier philosophy has more to offer than does Early Modern philosophy – logic and the philosophy of language being perhaps the most obvious examples. Yet all the same, the philosophy of Descartes clearly marks a new turn, and it starts a tradition of which we justly consider ourselves a part.

Descartes restarted everything from the very beginning, said Hegel, and constituted afresh the foundations of philosophy (1986, p. 123). This is undeniably wrong: although Descartes writes as if it were so, he is indebted to earlier philosophers, from Plato to his seventeenth century contemporaries (as many scholars have shown and as we shall see in detail in this book). But some of the ideas of his philosophy must be, first, new, and second, later adopted by most other philosophers; in addition, they should also have that vague quality of being revolutionary. Otherwise there would not be this feeling of both a break with earlier traditions and an initiation of the Cartesian one, to which we belong. Which ideas are these?

When one thinks of the philosophy of Descartes, the Cartesian ideas that first come to mind are those central to the *Meditations*. The most prominent of these are probably scepticism and its refutation, the dream

argument, the deceiving God or demon, the *cogito*, the proof of the real distinction between mind and body, the proofs of God's existence, and the reasons for error. But, apart from the *cogito*, none of these meets all the criteria mentioned in the previous paragraph.

Extreme forms of *scepticism* appeared time and again in philosophy, from Pyrrho in the fourth century BC to Descartes' own day. In the sixteenth century Sextus's scepticism gained an unprecedented influence, as is shown, among other things, by the translation into Latin of his works (*Outlines of Pyrrhonism*: 1562, Geneva; *Against the Dogmatists*: 1569, Paris). Cicero's *Academica* was printed even earlier, in 1553, also in Paris. Works developing extreme forms of scepticism were written in the generations preceding Descartes', the most influential being Michel de Montaigne's (1533–1592) *Essays* (*Essais*, 1580) and Pierre Charron's (1541–1603) *Of Wisdom* (*De la sagesse*, 1601). In Descartes' own day, François de La Mothe Le Vayer (1585–1672) published in 1630–1631 radical sceptical views in his *Dialogues*.[1] Descartes wrote that he had seen many ancient writings on scepticism and that he was therefore reluctant to reheat and serve this stale cabbage (Second Replies, AT VII 130; cf. his *Comments on a Certain Broadsheet*, AT VIIIB 367). And he also commented that

> we should not suppose that sceptical philosophy is extinct. It is vigorously alive today, and almost all those who regard themselves as more intellectually gifted than others, and find nothing to satisfy them in philosophy as it is ordinarily practised, take refuge in scepticism because they cannot see any other alternative with greater claims to truth. (Seventh Objections with Replies, AT VII 548–549, CSM II 374)

The revival of the interest in scepticism is not due to Descartes. As Floridi has recently written, 'by the time the *Meditations* were published, we should no longer speak of the influence of sceptical arguments on modern philosophy, but rather take them to be an integral part of it' (2010, p. 284).

Similarly, the *refutation of scepticism* became a preoccupation of Descartes' contemporaries. His close friend Marin Mersenne (1588–1648) published in 1625 his book, *The Truth of the Sciences: Against the Sceptics and Pyrrhonists*. Jean de Silhon (c. 1600–1667), another person with whom Descartes associated during the mid-twenties, published in 1626 his anti-sceptical book, *The Two Verities: The one of God and his*

Providence, the other of the Immortality of the Soul. In this respect too Descartes belonged to his times and did not depart from them.[2]

This is not to say that Descartes did not make original contributions to the sceptical tradition or to the attempts to refute scepticism; he definitely did. No idea that passed through his hands came out of them looking the way it previously had. I discuss these contributions later in the book. But in his focus on scepticism and its refutation we do not find the turning point we are after.

The *dream argument* first appeared in Plato's *Theaetetus* (158b–e), and has been one of the cornerstones of scepticism ever since. It was used by other ancient authors who were widely read in Descartes' time – Cicero, Sextus and Augustine – and frequently reused in Renaissance philosophy, its best-known occurrence being in Montaigne's *Apology for Raymond Sebond*.[3] And of course, Descartes' contemporaries recognised it as a commonplace. Here is what Hobbes had to say of the argument's occurrence in the *Meditations*:

> From what is said in this [first] Meditation it is clear enough that there is no criterion enabling us to distinguish our dreams from the waking state and from true sensation. ... I acknowledge the correction of this Meditation. But since Plato and other ancient philosophers discussed this uncertainty in the objects of the senses, and since the difficulty of distinguishing the waking state from dreams is commonly pointed out, I am sorry that the author, who is so outstanding in the field of original speculations, should be publishing this ancient material. (AT VII 171; CSM II 121)[4]

Descartes responded that he 'was not trying to sell [these arguments] as novelties' (ibid.). Indeed, his presentation of the dream argument is typically concise and elegant, and it has therefore justly become a classic. More importantly, the conclusions Descartes drew from the argument are not the same as those drawn by earlier philosophers, but much more like those that have typically been drawn by later ones. Yet these conclusions, as we shall see below, follow from other aspects of his philosophy, and not just from the dream scenario and the claim that there is no criterion distinguishing the waking state from dreaming. In his employment of the dream argument we do not find an original or revolutionary Cartesian contribution to philosophy.

The *deceiving God or demon*, apart from not being original with Descartes,[5] has not gained in post-Cartesian philosophy a prominence that resembles those of the dream argument, the *cogito*, or any other

influential Cartesian idea. It seems that none of the great post-Cartesian philosophers allotted this thought-experiment or alleged possibility any important role in their writings. This idea is also not a contribution to the Cartesian revolution in philosophy.

Of course, Descartes' discussion of the deceiving God or demon continues to occupy Cartesian scholarship, which has flourished since around the mid-nineteenth century. Nor do I maintain that it is not an interesting idea – *all* the ideas of the *Meditations* mentioned above are of philosophical interest. But we are looking for a different, wider kind of influence: one that permeates philosophy, even when it does not have Descartes' thought as its subject. The deceiving God or demon did not achieve this status.

But the *cogito* did. The argument itself, as well as its use to refute scepticism, are indeed due to Augustine and not to Descartes, as Descartes' contemporaries were quick to note (more on this below); and some of them had used it for this purpose in their writings before Descartes published his version of it.[6] But beginning philosophy from the point of view of the thinking subject as the primary source of certainty and constructing the philosophical system in this way, while attempting to eliminate any prior theoretical assumptions, are Descartes' innovations. Moreover, they recurrently appear in later philosophy, in such otherwise dissimilar philosophers as, for instance, Berkeley, Hume, Kant, Husserl and Russell. Here is what Russell wrote about this move in the second chapter of his *The Problems of Philosophy*, 275 years after the first appearance in print of Descartes' *cogito*:

> Descartes (1596–1650), the founder of modern philosophy, invented a method which may still be used with profit – the method of systematic doubt. He determined that he would believe nothing which he did not see quite clearly and distinctly to be true. Whatever he could bring himself to doubt, he would doubt, until he saw reason for not doubting it. By applying this method he gradually became convinced that the only existence of which he could be *quite* certain was his own. ... 'I think, therefore I am', he said (*Cogito, ergo sum*); and on the basis of this certainty he set to work to build up again the world of knowledge which his doubt had laid in ruins. By inventing the method of doubt, and by showing that subjective things are the most certain, Descartes performed a great service to philosophy, and one which makes him still useful to all students of the subject. (1912, Chapter 2)

In much of post-Cartesian philosophy we time and again meet with attempts to restart the philosophical project from Descartes' point of departure, namely the thinking subject, only to conduct it better than he did and thus establish safer results. Husserl was explicit about this dual-aspect of his philosophy: in his *Cartesian Meditations* of 1929 he characterises 'Descartes' *Meditations* as the prototype of philosophical reflection' (heading of Section 1); and when describing Descartes' influence on his own transcendental phenomenology he writes:

> One might almost call transcendental phenomenology a neo-Cartesianism, even though it is obliged – and precisely by its radical development of Cartesian motifs – to reject nearly all the well-known doctrinal content of the Cartesian philosophy. (1950, p. 1)[7]

And if we abstract from the subjectivist aspect of Descartes' *cogito* approach, we shall find an even wider influence. As Hegel said, Descartes tried to restart philosophy from the very beginning and to construct it afresh on indubitable foundations. *Descartes'* starting point was the existence of the thinking subject and what can be learned from his ideas (the idea of God, clarity and distinctness in ideas, and so on). Some other philosophers accepted the general methodological approach, but had different starting points: Spinoza, for instance, starts his *Ethics* with allegedly evident axioms, and builds his system afresh on *them* as foundations. Another very different example is Wittgenstein's *Tractatus*.

This philosophical methodology was not used by earlier philosophers. It did appear as an ideal, in Plato's divided line (*Republic* VI, 511b–c), where we find both the dialectical cancelling of hypotheses in order to arrive at the first principle, and then the new beginning from it in order to build knowledge in successive steps. But this ideal was not applied, either by Plato himself, who considered its application 'a task which is really tremendous' (ibid.), or by any other pre-Cartesian philosopher. This is not to say that none had a philosophical system, in the sense of interconnected doctrines supporting each other and together offering a *Weltanschauung*; Aristotle's philosophy can serve as a paradigm of a system in *this* sense. But none tried to present or justify his system in the Cartesian manner, namely starting afresh from a minimal number of fundamental claims, supposedly secure from any doubt, and building the whole edifice on them.[8]

By contrast, after Descartes this method almost became the rule, with philosophers either starting from roughly the same subjective point as did Descartes, or substituting other foundations for his.[9]

Indeed, by now this Cartesian method has largely been rejected in philosophy. We are all familiar with Neurath's simile (1932, p. 209), made famous as the motto of Quine's *Word and Object* (1960):

> We are like sailors who must reconstruct their ship on the open sea, without ever being able to take it apart on a dock and build it afresh from the best constituents.

We cannot advance our knowledge by first dismissing everything which is not immune to doubt; rather, we should start with the system of beliefs we already have, and improve on them piecemeal.[10] Very few today would adopt the point of view of the thinking subject as their point of departure and try construct from it, with minimal assumptions about the world, a significant philosophical system.

We thus find in various aspects of Descartes' *cogito* dialectic a deep methodological influence on future philosophy, influence that has nevertheless been waning in recent decades.

If the Cartesian method is misconceived, as Neurath and others have powerfully claimed, it must have failed in Descartes' own case as well. It is, of course, generally acknowledged that the *Meditations* as a whole is not a success: the system of nature with which the book ends, which includes a benevolent omnipotent God, an immaterial mind united with a body, clarity and distinctness as a criterion of truth, and so on, has not been established. However, the first two Meditations might seem more successful: starting philosophy afresh, largely free of any theory-laden presuppositions, and achieving certainty in some significant claims. Bernard Williams's description of the thoughts of the *Meditations* probably represents the way many conceive of at least the first two:

> Indeed, the 'I' who is having these thoughts may be yourself. Although we are conscious, in reading the *Meditations*, that they were written by a particular person, René Descartes, and at a particular time, about 1640, the 'I' that appears throughout them from the first sentence on does not specifically represent that person: it represents anyone who will step into the position it marks, the position of the thinker who is prepared to reconsider and recast his or her beliefs, as Descartes supposed we might, from the ground up. (1996, p. vii)

One central aim of this book is to show that this is not in fact the case: that what these two Meditations contain, as well as some things they omit, are the result of complex theories, some borrowed some original, all developed on the open sea.[11] Their 'I' is deeply embedded in his context and cannot be abstracted from it. The apparent structure of the *Meditations*, laid on secure foundations and free of theoretical presuppositions, is a thin monochromatic varnish covering its multi-coloured metal.

Returning to the quest for other revolutionary ideas of Descartes' that constituted a turning point in philosophy, the other central ideas of the *Meditations* mentioned above – the proof of the real distinction between mind and body, the proofs of God's existence, and the reasons for error – are certainly not good candidates for that title. Many of us would probably identify with the ironic response of 'a group of philosophers and geometers', as expressed in the Sixth Objections to the *Meditations*:

> We perceive very well that three and two make five and that if you take equals from equals the remainders will be equal; we are convinced of these and numerous other matters, just as you find yourself to be. But why are we not similarly convinced on the basis of your ideas, or our own, that the soul of man is distinct from the body, or that God exists? You will say that you cannot graft this truth into us unless we are prepared to meditate along with you. Well, we have read what you have written seven times, and have lifted our minds, as best we could, to the level of the angels, but we are still not convinced. We do not believe you will allege that our minds are in the grip of a brutish stupor and are wholly unfitted for metaphysical subjects, when we have had thirty years practice in them! Surely you will prefer to accept that your arguments derived from the ideas of the mind and of God do not have the kind of weight or strength that could or should conquer the minds of learned men who have tried with all their might to detach themselves from corporeal stuff. (AT VII 421, CSM II 283–284)

These ideas were not only found unconvincing by this group of philosophers and geometers, they were also the object of strong, perhaps conclusive criticisms, advanced already by Descartes' contemporaries.

Arnauld powerfully criticised Descartes' proof of the real distinction between mind and body (Fourth Objections, AT VII 197–204); and it is doubtful whether Descartes succeeded in responding to Arnauld's

argument against his inference from epistemic premises to a conclusion about reality. Of the proofs of the existence of God that Descartes used, only the ontological argument has sustained philosophers' interest. ('I always had a very mean opinion indeed of that argument in the third Meditation', wrote already Henry More.[12]) But first, the ontological argument is derived from Anselm, as already Mersenne noted in his correspondence (Descartes to Mersenne, Dec 1640, AT III 261), and therefore cannot be considered an original contribution of Descartes'; and already Caterus, in the First Objections to the *Meditations* (AT VII 98–100), showed that it is very close to the version Aquinas had formulated in *Summa Theologiae* (Part I, Question 2, Article 1), quoted Aquinas's powerful criticism of the argument, applied it to Descartes' version, and added a *reductio* of his own. And secondly, given the growing secularisation of Modern Philosophy from Descartes' time on, a controversial proof of God's existence that continues the medieval debate cannot be considered a formative contribution to its development.

Modern Philosophy took a new turn not because of theory-free arguments built afresh on secure foundations, but because of scientific and technological developments. Our world view, and with it our insistent puzzles, are to a large degree a product of what we judge as possible – sometimes justly, sometimes not – on the basis of our science and technology. Descartes was the first to develop a persuasive world view that both continued earlier influential traditions and integrated into them what the science of the age and the achievements and limitations of its technology seemed to demand. This Cartesian view was by and large adopted by later philosophy and culture, and in this way they became significantly unlike those that preceded them. In this lies much of Descartes' philosophical revolution.

This new world view was not developed by the method allegedly followed in the *Meditations* but was based on a synthesis of a variety of influences. Moreover, it shaped the argument of the *Meditations*, determining some of the options to be considered and some of the conclusions to be drawn. I shall try to show all this in detail in the book.[13]

A revolution similar in important respects to the Cartesian one occurred in recent decades, starting around the middle of the last century. The development of the digital computer gave a strong impetus to a materialist world view, which continues to a significant degree the Cartesian tradition although rejecting, through a reconsideration of its arguments, some of its central tenets. Central aspects of recent philosophy were reshaped under the influence of this technological breakthrough – again, sometimes justly and sometimes not – and some Cartesian puzzles have

been substituted by new ones. I shall compare and relate these two philosophical turning points later in the book. This comparison, apart from shedding light on both events, will serve to emphasise the influence of technology on philosophy.

The book focuses on two clusters of Cartesian ideas: Descartes' theory of perception and Descartes' ideas about the relation between life, soul and mind. I shall describe the innovations that they contain and also show that these were by and large adopted by later philosophers and, in fact, by our culture. Some of the more important ramifications of these idea-clusters will be considered as well. I shall also try to show in what respects they were responsible for a significant change in the modern world view generally and in philosophy more particularly. Another central theme of the book will be the way in which Descartes developed and justified these philosophical ideas, a way which is very different from the one he declares he adopts in the *Meditations*.

The book falls into three parts: Descartes' theory of perception (Chapters 2 and 3); Descartes' conception of life, its origin and ramifications (Chapters 4 and 5); and the *Meditations*, with exegesis of mainly some aspects of the first two Meditations (Chapters 6 and 7).

In Chapter 2 I present Descartes' theory of perception and the way it is justified in his writings. I then show in which crucial respects it was innovative. Chapter 3 explores its development: I begin with the earlier theory of perception of the *Rules*, show how Galileo's ideas influenced Descartes' development of his later philosophy, and then consider Descartes' original contribution to the understanding of representation, a contribution that has its roots in his work in mathematics.

Chapter 4 opens with a concise presentation of Descartes' physiology. I then discuss the influence of the technological innovations of the generations preceding his, in particular of the development of clockwork automata, on his mechanisation of life and new conception of the soul. The conceptual change in the understanding of the soul that his ideas involve is also presented. I then survey the reception of Descartes' ideas of the soul and the mechanisation of life in later physiology, and how this reception was strongly assisted by the technological developments mentioned. The related reasons for the temporary decline of his influence in the early eighteenth century are also discussed.

Chapter 5 shows how the limitations of technology in Descartes' age are at the basis of his dualism. It also compares the rise of Cartesian dualism with the similar rise of materialism following the technological breakthrough around the middle of the twentieth century, with the development of the computer. I next consider Descartes' reasons for

denying animals a mind. The combination of Descartes' ideas of perception and his ideas of life, soul and mind lead to his new ideas about animal sensation and the possibilities of unconscious perception, which are explored in the last section of this chapter.

Chapter 6 prepares the ground for a discussion of the *Meditations*. I discuss Bérulle's influence on Descartes' project, and then Descartes' reasons for writing the *Meditations*. As Augustine's influence on Descartes will be explored while discussing the *Meditations*, I conclude the chapter with some methodological considerations on the assumptions I make in comparing their works.

Chapter 7 contains an analysis of various aspects of the first two Meditations. It is not intended as a comprehensive analysis of the text, and neither do I attempt to give equal attention to all of Descartes' claims there. What I mainly try to show is how he in fact does not follow the method he declares to be following: a method free of any theoretical assumptions, which tries to cast everything in doubt, see what can be saved and then build on these secure foundations. Rather, Descartes derives both doubt and certainty from his developed theories, which are at the background from the First Meditation onwards. Contrasting Descartes with other philosophers who influenced the ideas and arguments of the *Meditations*, primarily with Augustine, I show that Descartes' influential innovations are conclusions from his new theory, whose development was described in the earlier parts of the book. I hope that new light will be shed on Descartes' originality in consequence of this analysis.

The book does not have one main thesis which it tries to establish: as can be seen from the book plan above, several significant claims are made along the way. Some of these claims are also independent of others. For instance, Chapters 2 to 5 are independent of whether the actual dialectic of the *Meditations* should indeed be reassessed in the way suggested in the last chapter. However, the critical reassessment of the way in which Descartes reached and justified some of his more influential philosophical innovations, including those of the *Meditations*, functions as an organising theme of this book.

2
Descartes' Theory of Perception

2.1 Descartes' theory of perception, from *The World* on

Between the years 1629 and 1633 Descartes worked on a book which he called, in his correspondence, *The World* (*Le Monde*). In 1633, however, he decided to suppress the book, and he did not publish it later in his life. He used some of its materials in his *Discourse on the Method* and in the first two of its three accompanying Essays (*Optics* and *Meteorology*, the third essay being the *Geometry*, 1637). Later again, in 1644, some of the materials of *The World* were published, revised and reworked, in the *Principles of Philosophy*. And some of *The World*'s materials can also be found in Descartes' *The Passions of the Soul* (*Les Passions de l'Ame*), the last book he published during his life (1649).

Substantial parts of *The World* survived, however, and were published in their original French in 1664, fourteen years after their author's death. The first part was called, when published, *The World of Mr Descartes or the Treatise on Light* (*Le Monde de M. Descartes ou le Traité de le Lumière*; I refer to it below as *Light*). The second part, which was earlier published in a Latin translation (Leiden 1662), was called, when published in French, *René Descartes' Man* (*L'Homme de René Descartes*; *Man* below).

To judge from Descartes' description of his book in his correspondence and in the fifth part of the *Discourse*, the two surviving parts comprise most of the original manuscript. In them, Descartes discusses the nature of the material world, the motion of celestial bodies, the nature of light, and related subjects (*Light*); and physiology and physiological psychology, also touching on the relation of mind to body (*Man*). Although parts of *The World* were later revised, elaborated and included in the books Descartes published during his life, the discussion in the earlier, suppressed book is still important for the research into the

development of Descartes' thought; moreover, the book also contains ideas that were not published in any later work, and occasionally it also sheds light on Descartes' later presentation of the same ideas.

Already in the first paragraph of *The World* we find a theory of perception quite unlike any theory suggested by anyone before Descartes:

> The subject I propose to deal with in this treatise is light, and the first point I want to draw to your attention is that there may be a difference between the sensation [*sentiment*] we have of light (i.e. the idea [*idée*] of light which is formed in our imagination [*imagination*] by the mediation of our eyes) and what it is in the objects that produces this sensation within us (i.e. what it is in a flame or the sun that we call by the name 'light'). For although everyone is commonly convinced that the ideas we have in our thought [*en notre pensée*] are wholly similar to the objects from which they proceed, nevertheless I cannot see any reason which assures us that this is so. On the contrary, I note many observations which should make us doubt it. (*Light*, AT XI 3–4, CSM I 81)

In *The World* Descartes was interested in light as a physical phenomenon more than in colour. But what he says in this opening paragraph of light is equally applicable, according to his position, to colour. And in later writings Descartes indeed discusses colour as well when presenting his theory of perception. In his *Optics*, for instance, he writes as follows, addressing the reader of the essay:

> You may perhaps even be prepared to believe that in the bodies we call 'coloured' the colours are nothing other than the various ways in which the bodies receive light and reflect it against our eyes. You have only to consider that the differences a blind man notes between trees, rocks, water and similar things by means of his stick do not seem any less to him than the differences between red, yellow, green and all the other colours seem to us.[1] And yet in all those bodies the differences are nothing other than the various ways of moving the stick or of resisting its movements. Hence you will have reason to conclude that there is no need to suppose ... that there is something in the objects which resembles the ideas or sensations [*aux idées ou aux sentiments*] that we have of them. In just the same way, when a blind man feels bodies, ... the resistance or movement of the bodies, which is the sole cause of the sensations he has of them, is nothing like the ideas he forms of them. (Discourse One, AT VI 85, CSM I 153)

In this passage Descartes distinguishes between the colour in bodies and the idea of colour. He has similarly distinguished in *The World* passage above between the idea of light and what it is in the objects that we call by the name 'light'. The idea or sensation of colour is in our imagination (*imagination*), thought (*pensée*), or – as he writes in other places (e.g. *Principles* IV 196–198) – in our mind (*mens*) or soul (*anima*, *âme*).[2]

Moreover, Descartes suggests in these passages that the colours in bodies may not resemble our ideas of colour. And indeed, later in *The World*, in the *Optics* and in many other places, Descartes will claim that this is in fact the case. He will even go further and claim that in pure bodies *there cannot be* anything like our ideas of colour. More generally, we can ascribe to Descartes the view that in material nature there is not and there cannot be anything like our sensory ideas. The objective sensory qualities – the colour, heat, smell, taste and sound in material nature – do not and cannot resemble our ideas of them.

(A note on terminology: outside philosophical and scientific contexts we do not distinguish between the colour of things and our idea or sensation of colour; we talk simply about colour. We take ourselves to be directly aware of the colour of things, and not to perceive it by means of some subjective item of which we are directly aware (an idea, sensation, sense-datum or whatever). This applies to many other sensory qualities. However, within Descartes' system, as within many other systems that either preceded or followed his, this distinction does exist. Accordingly, when discussing such systems, I shall distinguish between the *objective* sensory quality and our idea or representation of it, which I shall occasionally call the *subjective* sensory quality. By contrast, when discussing our pre-theoretical approach to perception, I shall refer simply to sensory qualities, without assuming a distinction between objective and subjective qualities.)

In addition, Descartes claims that the colour in bodies *causes* the idea of colour in our mind. The colour of the thing we perceive causes various movements in our retina, and these are transmitted to the brain, where they bring about the idea or sensation of colour in the mind. As the title of Part IV, section 197 of the *Principles* declares, 'The nature of the mind is such that simply by motions in the body various sensations can be produced in it [*varii sensus in eâ possint excitari*]' (CSM I 284). Later in that section Descartes writes that the mind can be stimulated [*posit impelli*] to have sensations by various motions in the body. He similarly observes in the Sixth Meditation 'that any given movement occurring in the part of the brain that immediately affects [*afficit*] the mind brings

about [*infert*] just one corresponding sensation' (AT VII 87, CSM II 60). And again this position occurs as early as *The World* (AT XI 144–145).[3]

As is suggested by the quotations above, colour is the *disposition* in bodies which causes, in appropriate conditions, the idea of colour in our mind. And so Descartes writes in the *Principles*:

> [W]hen we say that we perceive colours in objects, this is really just the same as saying that we perceive something in the objects whose nature we do not know, but which produces in us a certain very clear and vivid sensation which we call the sensation of colour. (I 70, CSM I 218)

And later in the same work, when he generalises to any sensation or perception:

> In view of all this we have every reason to conclude that the properties in external objects to which we apply the terms light, colour, smell, taste, sound, heat and cold – as well as the other tactile qualities and even what are called 'substantial forms' – are, so far as we can see, simply various dispositions [*dispositiones*] in those objects which make them able to set up various kinds of motions in our nerves <which are required to produce all the various sensations in our soul>.[4] (IV 198, CSM I 285; see also ibid., § 199)

By 'disposition' Descartes does not mean merely a power or tendency, as the term is often used today, but an arrangement or configuration of parts of a body that endows it with certain powers or tendencies. Such dispositions in bodies are responsible for the formation of the ideas or sensations in the mind or soul. (Sensations for Descartes are a species of ideas: the qualitative ideas produced by perceived bodies.)[5]

The coloured objects do not act directly on the mind, but only by means of the causal mediation of the material medium between them and the eye, as well as by that of the nerves between the retina and the place where the mind is connected to the brain, the pineal gland (I return to these causal processes in later chapters). It follows that, according to Descartes, we – namely our souls – do not see directly the colours of things:

> It is the soul which sees [*c'est l'âme qui voit*], and not the eye; and it does not see directly [*immédiatement*], but only by means of the brain. (*Optics*, Discourse Six, AT VI 141, CSM I 172)

By contrast, we are conscious of the ideas of colour (or of any other perceived quality), which are in our mind, without the causal mediation of any other thing. We may therefore say that we are conscious of these ideas directly or immediately. In *The World* Descartes describes these ideas as existing on the surface of the brain's pineal gland, where the mind or soul is united with the body. He therefore writes there that the rational soul considers these ideas immediately (*Man*, AT XI 177).[6] This view of the immediate data of consciousness in perception occurs in his later writings as well (*Meditations* VI, AT VII 75;[7] Conversations with Burman, 16 Apr 1648, Question 42, AT V 162–163). In perception, the immediate data of consciousness are ideas in the mind.[8]

According to Descartes, the idea in the mind represents (*représenter*) its cause in the perceived body.[9] Yet although Descartes is explicit on this relation, this interpretation – that our ideas of colour, heat and so on represent objective sensory qualities – has been challenged in the secondary literature. 'Having excised colors, sounds, flavors, odors and tactile qualities from the corporeal world', writes Simmons, while describing a common view of Descartes, 'he relocated them in the mind in the form of sensations that do little more than give an ornamental (and epistemically misleading) flair to our sense perceptual experience.' (1999, p. 347)[10] However, this view fails to distinguish between what Descartes says of the *idea* of colour and what he says of the colour *in things* (see next quotation). Descartes not only does not deny colour to things, he has a positive theory of its nature. Objective colour, according to him, is the ratio between the pressure in the direction of propagation of light and the rotational pressure of the globules whose pressure *is* light.[11]

A central and original claim of Descartes theory of perception is that *the representation need not resemble what it represents in order to be an adequate representation*. Descartes criticises in the *Optics* the philosophers who assumed such resemblance:

> We must take care not to assume – as our philosophers [namely, the Scholastics] commonly do – that in order to perceive [*pour sentir*] the soul must contemplate certain images transmitted by objects to the brain; or at any rate we must conceive the nature of these images in an entirely different manner from that of the philosophers. For since their conception of the images is confined to the requirement that they should resemble the objects they represent [*les objets qu'elles représentent*], the philosophers cannot possibly show us how the images can be formed by the objects, or how they can be received by

> the external sense organs and transmitted by the nerves to the brain. (Discourse Four, AT VI 112, CSM I 165)

Descartes elaborates later in that discourse and shows how one thing can represent another without any resemblance between them. He first gives the example of signs and words, 'which in no way resemble the things they signify'. Next he gives the example of an engraving, in which, in order to be adequate, the representation occasionally *should not* resemble what it represents; and from that he generalises to all sensation:

> Moreover, in accordance with the rule of perspective [engravings] often represent circles by ovals better than by other circles, squares by rhombuses better than by other squares, and similarly for other shapes. Thus it often happens that in order to be more perfect as an image and to represent an object better, an engraving ought not to resemble it. Now we must think of the images formed in our brain in just the same way, and note that the problem is to know simply how they can enable the soul to perceive [*sentir*] all the various qualities of the objects to which they correspond – not to know how they can resemble these objects. (AT VI 113–114, CSM I 165–166)

The representation should correspond to the represented object, not resemble it. The idea is that every aspect of what is represented should correspond to some aspect of the representation, but these corresponding aspects need not resemble each other. Descartes uses again the example of the blind man, exploring his environment with his stick:

> For instance, when our blind man touches bodies with his stick, they certainly do not transmit anything to him except in so far as they cause his stick to move in different ways according to the different qualities in them, thus likewise setting in motion the nerves in his hand, and then the regions of his brain where these nerves originate. This is what occasions his soul to perceive [*donne occasion à son âme de sentir*] of just as many different qualities in these bodies as there are differences in the movements caused by them in his brain. (AT VI 114, CSM I 166)

By contrast to the engraving, the blind man is not just an analogy but an example of Descartes' theory of perception. The correspondence between the images in our mind and the objects they represent is of the

same general kind as the correspondence between the blind man's ideas and the properties of the bodies he feels with his stick.

Accordingly, perception need not occur by means of representations that resemble what is represented, and indeed it does not occur in this way – Descartes repeats this point in the beginning of the fifth and of the sixth discourses of his *Optics*. Later in the sixth discourse, Vision, Descartes shows how the soul knows the direction in which the perceived body is by means of the direction of eyes and head; how it knows its distance according to the form of the lens needed to focus the image on the retina, the angle between the eyes, and other cues; how illusions are formed in this way, and why our ability to imagine, namely visualize, great distances is limited; and other aspects of sight. (Some of his explanations turned out to be correct while others were wrong – the details are irrelevant to our discussion.) As we learn from his physiology, to all the physiological distinctions he mentions in his explanation there correspond distinctions in the ideas formed on the pineal gland, which are those the soul considers directly.

Descartes begins Discourse Six of his *Optics* with the following remark on the transmission of the image on the retina further into the brain:

> Now, when this picture thus passes to the inside of our head, it still bears some resemblance to the objects from which it proceeds. As I have amply shown already, however, we must not think that it is by means of this resemblance that the picture causes our perception of these objects [*que nous les sentons*] – as if there were yet other eyes within our brain with which we could perceive [*apercevoir*] it. Instead we must hold that it is the movements composing this picture which, acting directly upon our soul in so far as it is united to our body, are ordained by nature to make it have such sensations [*sentimens*]. (AT VI 130, CSM I 167)

This passage, with its denial of eyes within the brain, has often been interpreted as showing that Descartes was aware of the homunculus fallacy and was trying to avoid it.[12] But this seems to be a misinterpretation. The homunculus fallacy ensues when one explains how it is that we perceive or are aware of things around us by maintaining that this comes about through the mind's or brain's perception or awareness of some internal representation: such an explanation merely reproduces the phenomenon to be explained – perception or awareness – at some internal level, instead of making progress towards its explanation. And as we saw earlier in the text, and as can be seen in the last sentence of

this passage, Descartes explicitly maintains that we perceive things by virtue of our soul being aware of their representations.

What the 'eyes within the brain' remark is meant to reject is the idea that the brain and mind should be *sensitive to light and colour*. They may instead be sensitive to representations of a different nature (movement patterns), which, as Descartes emphasises again in this passage, represent without resemblance. 'Eyes' within the brain, by contrast, which should be taken almost literally, would have been sensitive to light and colour. This rejection of internal 'eyes' was far from trivial when Descartes was writing, for all earlier representational theories of vision did hold that the brain and soul *are* sensitive to light and colour, which are somehow transmitted further on, after an image has been formed in the eye.

Descartes explains clearly why there is no need that the representation should resemble what it represents, gives good examples of representation without resemblance, and develops a rich theory of perception that successfully incorporates this idea.[13]

Wilson wondered 'what sense can be made of the sober denial that certain mental entities or "thoughts" "resemble" physical qualities or states' (1994, p. 222). Since the mind is an immaterial substance, how *could* its ideas of physical things resemble these physical things? This drove her to claim that 'the concept of "resemblance" should be understood partly metaphorically … A non-resembling idea, that is, should be construed as one that fails to yield intelligibility' (p. 226). But as we have just seen in the quotations from the *Optics*, Descartes in fact *emphasises* that an adequate, intelligible representation need not resemble the thing it represents; so Wilson's interpretation is unacceptable.

As we shall soon see, philosophers and scientists preceding Descartes did hold that ideas literally resemble what they represent, so there certainly was place at the time for a 'sober denial' of such claims. Moreover, as I shall show in more detail below, the mind, according to Descartes, is in some sense 'mixed' with a part of our body during our life, and in this way *can* have ideas of material things that literally resemble what they are ideas of, as it occasionally has when it has ideas of geometrical properties.

2.1.1 Brain and sensation

I turn now to a different element of Descartes' theory of perception, which unlike any of those so far discussed involves a non-trivial claim about the role in perception of a specific organ, namely the brain. According to Descartes, the soul's perceptions are determined by the brain's state. The perceived objects act on our sense organs, which act,

by means of the nerves, on the brain; and the ideas in the mind or soul are determined directly by the state of the brain.

This position appears already in *The World*:

> Now I maintain that when God unites a rational soul to this machine (in a way that I intend to explain later) he will place its principle seat in the brain, and will make its nature such that the soul will have different sensations corresponding to the different ways in which the entrances to the pores in the internal surface of the brain are opened by means of the nerves. (*Man*, AT XI 143, CSM I 102)

I shall later explain the specific aspects of Descartes' physiology mentioned in this passage, namely the pores and how they are opened by the nerves; I shall also later discuss the reference to man as a machine. What I would like to emphasise at this point is that according to Descartes the soul's perceptions are determined by the state of the brain, and not by the state of any other bodily organ or of the perceived objects.

This position is repeated in more detail in the *Optics*, where Descartes also argues in its support. This is what he writes in the fourth discourse, The Senses in General:

> And we know that it is not, properly speaking, because of its presence in the parts of the body which function as organs of the external senses that the soul perceives, but because of its presence in the brain, where it exercises the faculty called the common sense. For we observe injuries and diseases which attack the brain alone and impede all the senses generally, even though the rest of the body continues to be animated. (AT VI 109, CSM I 164; cf. *Meditations*, AT VII 86, where a similar determination claim appears but without argument.)

This argument is quite abstract: it does not mention any specific disease or known kind of injury that causes the claimed phenomenon. And its abstract nature reduces its effectiveness: our attention is not drawn to any case with which we are familiar, and no other documented case is described in any detail; it thus provides but weak support to Descartes' claim. Descartes proceeds in the *Optics* to present some elements of his physiology, which he developed in *The World*, elements that explain how perception is determined by the brain because the soul is present in it. But accepting this physiology depends to a considerable extent on the independent previous acceptance of Descartes' position, according to which perception is determined by brain state alone. Descartes'

description of his physiology is therefore not a real argument in support of this position.

And indeed, after the publication of the *Optics* in 1637, Fromondus (Libert Froidmont, 1587–1653), a theologian from Louvain, sent Descartes a series of objections to his claims in the *Discourse* and its accompanying essays, in which he also expressed doubts concerning this Cartesian position. In his response Descartes mentions for the first time the case of phantom limb pain in support of his position (To Plempius for Fromondus, 3 Oct 1637, AT I 420). This is, in fact, the first time in history anyone mentioned the case of phantom limb pain in a philosophical text. Moreover, it seems that Fromondus's reaction convinced Descartes that his argument in the *Optics* in support of his position was insufficient; he therefore reuses this phantom limb argument in more detail and adds to it in the *Principles*.

He first repeats in the *Principles* his claim that our soul has perceptions or sensations only because of its seat in the brain (IV 189), and he even uses it as a section heading (IV 196, CSM I 283): 'The soul perceives only in so far as it is in the brain'. And in the later section he provides detailed arguments for his position, none presupposing the particulars of his physiology. He first mentions the *Optics* argument, according to which various diseases 'affect only the brain but remove or interfere with all sensation'; but again he mentions no specific disease. Secondly, he notes that sleep occurs only in the brain, yet we are deprived of most of our sensations during sleep. Thirdly, 'an obstruction in the paths by which the nerves reach the brain from the external limbs…is enough to destroy sensation in those limbs.' Lastly, 'we sometimes feel pain in certain limbs even though there is nothing to cause pain in the limbs themselves; the cause of the pain lies in the other areas through which the nerves travel in their journey from the limbs to the brain.' In support of this last claim Descartes describes the case of pain in a phantom limb that he had earlier described to Fromondus:

> A girl with a seriously infected hand used to have her eyes bandaged whenever the surgeon visited her, to prevent her being upset by the surgical instruments. After a few days her arm was amputated at the elbow because of a creeping gangrene, and wads of bandages were put in its place so that she was quite unaware that she had lost her arm. However she continued to complain of pains, now in one then in another finger of the amputated hand. The only possible reason for this is that the nerves which used to go from the brain down to the hand now terminated in the arm near the elbow, and

> were being agitated by the same sort of motions as must previously have been set up in the hand, so as to produce in the soul, residing in the brain, the sensation of pain in this or that finger. <And this shows clearly that pain in the hand is felt by the soul not because it is present in the hand but because it is present in the brain.> (ibid., CSM I 283–284)

Descartes' arguments and his dramatic and effective example indeed convinced people that the brain state, and not the state of the perceived bodies or of the sense organs, determines sensation. His phantom limb pain argument in particular has proved persuasive, and it has been used time and again from Descartes' days to the present as the main argument for the view that brain state determines sensation.

For instance, when Nicolas Malebranche (1638–1715), the most influential French philosopher of the second half of the seventeenth century, follows Descartes and maintains, in his book *On the Search for Truth* (*De la recherché de la vérité*, 1674–1675), that the soul is connected to a part of the brain, he gives only the phantom limb pain example in support of his claim:

> It might be noted here in passing that it is known through experience that we can feel pain in parts of our bodies that have been amputated, because if the corresponding filaments of the brain are disturbed in the same way as if these parts had been injured, the soul senses a very real pain in these imaginary parts. All these things clearly show that the soul immediately resides in that part of the brain to which all these sense organs lead. (First Book, Chapter 10, Section III, p. 50)

And a contemporary example: in the entry Pain of the *Stanford Encyclopaedia of Philosophy*, the case of phantom limb pain is given as the main argument for the claim that pains, despite what is suggested by our ordinary use of the word 'pain', are not states of our body, namely 'physical features or conditions of our body parts, probably […] some sort of physical damage or trauma to the tissue' (section 1.1). If they were such, it is claimed there, then a man who is apparently in pain would not actually be in pain when the pain is in a phantom limb, which does not agree with what we understand by pain. (In addition, Descartes' third *Principles* argument for his position is also used there: with local anaesthetics, for instance, the same physiological state which ordinarily causes pain does not cause pain, and therefore it cannot be identified with pain.)

Descartes' position, according to which our sensation is determined by our brain state, has been accepted, supported by his arguments, in Western science and culture. And this despite the fact that the particulars of his physiology have by and large proved mistaken and his mind–body dualism has not been generally accepted.

The cluster of ideas often expressed by the claim that the soul or mind has its seat in the brain did not originate with Descartes. It may have been put forward in some form already by Alcmaeon, around 500 BC, probably following his discovery of the optic nerve, which connects eye and brain. It gained much support with the discovery of the nervous system and the knowledge of its functions acquired through dissection and vivisection of animals as well as, probably, humans by the third-century BC Hellenistic doctors Herophilus and Erasistratus. The latter was able to write:

> By and large the brain appears to be the source of the nerves in the body. For the sensation that comes from the nostrils passed to the member through the apertures, and also the sensations that come from the ears. And outgrowths from the brain went also to the tongue and the eyes.[14]

Galen (129–*c*.210) has subsequently held that the soul is located in the brain, where the psychic pneuma, its 'primary instrument', is processed. He persuasively supported this claim by means of his own observations during vivisection:

> And all who wish may learn from me by the procedure I have had cause to demonstrate many times to no few disbelievers forthwith by comparison with another animal or many times in one and the same animal, whatever is the case, the number as well as the type of misfortunes that seize the body when one of the ventricles of the brain is wounded. However why do I say 'wounded'? For if even before inflicting a wound, pressure is applied to any of the ventricles the animal will forthwith be without motion as well as sensation, breathless as well as voiceless. The same thing is shown to happen in persons who have themselves undergone trepanation. For when we chisel out the fragments of bone we are compelled for safety to put underneath the so-called protectors of the meninx, and if these are pressed a little too heavily on the brain, the effect is to render the person senseless as well as incapable of all voluntary motion, but this does not occur when pressure is applied to the exposed heart.[15]

Through Galen's influence and authority the idea was accepted in Medieval and Early Modern Europe. Albertus Magnus (1200–1280), for instance, following Galen, located perception, reasoning and memory in different ventricles of the brain (Wade 2005, p. 67). By Descartes' time, it was obvious to all that the principal seat of the soul is in the brain.

However, it was still considered possible that the soul somehow reaches to the sense organs, and that it perceives their modification directly, through its presence there. Galen himself thought that the nerve is part of the brain and that the sense organ, receiving into itself the sensory power, is capable of perception.[16] Similar opinions were held time and again by later writers on the physiology of perception. And even in the generation preceding Descartes', Kepler could write (1604) as follows, while describing his ground-breaking discovery that the image in the eye is formed not in the lens but on the retina (emphasis added):

> I say that vision occurs when the image of the whole hemisphere of the world that is before the eye…is fixed on the reddish white concave surface of the retina. How the image or picture is composed by the visual spirits that reside in the retina and the [optic] nerve, and whether it is made to appear before the soul or the tribunal of the visual faculty by a spirit within the hollows of the brain, *or whether the visual faculty, like a magistrate sent by the soul, goes forth from the administrative chamber of the brain into the optic nerve and the retina to meet this image, as though descending to a lower court* – [all] this I leave to be disputed by the physicists.[17]

Descartes' contribution was not in convincing people that the main seat of the soul is in the brain: this opinion had been established long before he wrote and he added little if anything in its support. His contribution was in convincing people that the state of the sense organ *does not* determine perception and that *only* the brain state determines it. Descartes rejected the former possibility by some original and persuasive arguments. After him and through his influence his position on the relation of brain state and perception became the universally received view.

As could clearly be seen above, Descartes' arguments for his claim that sensation is determined by brain state have evolved over the years: while *The World* contained no argument for this position, the *Principles*, a little more than a decade later, already contains several persuasive arguments. This is of course to be expected: the more you work on your theory and the more responses it receives, the better you know what needs argument and the better your arguments become, and Descartes was no

exception to this rule. I mention it here because I shall later argue that similar developments can be detected in other areas of his philosophy, such as his sceptical arguments, where some interpreters have assumed that this is not the case.

I conclude this section by summarising in seven points the main elements of Descartes' theory of perception, as it appears in his writings from *The World* on. This list will be useful later in the book:

- When we see colours we are immediately conscious of the idea of colour in our mind.
- The idea of colour is caused by the colour in the things we see.
- The colour in seen things does not resemble the idea of colour in our mind.
- The colour in seen things is their disposition that causes the idea of colour.
- The colour in seen things is represented by the idea of colour in the mind.[18]
- This representation in the mind, even when it is adequate, does not resemble what it represents.
- The idea in the mind is determined by the brain's state.

I have formulated here the theory with respect to colour, but it can be formulated in the same way with respect to any sensory quality, as we saw Descartes doing in several places above. (The more general and abstract formulation would not have been clearer than the formulation of the theory by means of one of its instances, and I therefore chose the latter option here.) Such a theory can be called a *mental representation* theory of perception, although the term does not exhaust all its characteristics – it does not suggest, for instance, that perception involves a causal relation, or that the representation need not, or even cannot, resemble what it represents.

This theory would strike any contemporary reader as expressing current orthodoxy, and perhaps as obviously true. Yet, as was said at the beginning of this section, Descartes was the first person in history to develop it. His deep influence on later understanding of perception is thus evident. How did he justify this revolutionary theory?

2.2 Descartes' justification of his theory

Of the seven claims characterizing Descartes' theory of perception that I listed above, we saw in the previous section how he justified

the seventh one, namely that the idea of the perceived quality in the mind is determined by the brain's state. This claim is also comparatively independent of the other six claims: on the one hand, unlike any of the others, it is a claim about the role of a specific organ in perception, the brain. And one can clearly hold a representational theory of perception whether one believes that the representation of which we are conscious is determined by the brain, the heart (as many ancient philosophers believed), the sense organs, or even the perceived bodies. On the other hand, one can also claim that perception is determined by brain state and still reject most of the other six claims. It is possible, for instance, to hold that the brain state determines the idea of colour, and that colour in seen things does resemble the idea of colour in our mind (thus rejecting the third point). In this case, the representation in the mind, when it is adequate, would resemble the colour it represents (rejecting the fifth point). And so on. The seventh claim is of a different kind than the other six, being primarily of a physiological character.

I shall now examine the way Descartes justifies in his writings the first six claims. These claims, as we shall shortly see, are interdependent. The key one among them, in the sense that the others follow from it given some additional independent Cartesian assumptions, is the third, namely, that colour in seen things does not resemble the idea of colour in our mind. So how does Descartes justify it?[19]

The claim that bodies do not contain anything similar to the idea of colour in our mind follows from Descartes' conception of body. Although this conception was further developed in various ways after the time he wrote *The World*, some characteristics that are found already there and were not modified later are sufficient for justifying it.

In the fifth chapter of *Treatise of Light*, 'The Number of Elements and Their Qualities', Descartes presents his theory of the material world as composed of only three elements, which he characterises by reference to their motion, size and shape alone. Accordingly, the characteristics he ascribes to matter generally are only motion, size, shape, and arrangement of its parts. Descartes ascribes to matter only properties which the geometry of his day discussed. His conception of matter can thus be called *geometrical*, and he could therefore write to Mersenne, 'my entire physics is nothing but geometry' (17 July 1638, AT II 268, CSMK 119). This geometrico-corpuscular conception of matter seems to Descartes sufficient for explaining everything in the material world.

Unlike these geometrical properties, properties like heat, cold, moistness and dryness – the four basic Aristotelian properties of bodies – seem

to Descartes as both in need of explanation and explicable by means of motion, size, shape, and arrangement of parts. He writes there:

> If you find it strange that in explaining these elements I do not use the qualities called 'heat', 'cold', 'moisture' and 'dryness' as the philosophers do – I shall say to you that these qualities themselves seem to me to need explanation. Indeed, unless I am mistaken, not only these four qualities but all the others as well, including even the forms of inanimate bodies, can be explained without the need to suppose anything in their matter other than the motion, size, shape, and arrangement of its parts. (*Light*, AT XI 25–26, CSM I 89)

Later, in Chapter Six, Descartes describes the composition of the world by means of a kind of thought experiment, in which we are asked to imagine God as creating a new world, composed out of Descartes' three elements. As the book progresses, this new world is revealed as indistinguishable from our own. And Descartes avoids ascribing to matter in his new world anything he finds obscure in the least degree:

> Now since we are taking the liberty of fashioning this matter as we fancy, let us attribute to it, if we may, a nature in which there is absolutely nothing that everyone cannot know as perfectly as possible. To this end, let us expressly suppose that it does not have the form of earth, fire, or air, or any other more specific form, like that of wood, stone or metal. Let us also suppose that it lacks the qualities of being hot or cold, dry or moist, light or heavy, and of having any taste, smell, sound, colour, light, or other such quality in the nature of which there might be said to be something which is not known clearly by everyone (*évidemment connu de tout le monde*). (AT XI 33, CSM I 90–91)

The absolute comprehensibility of the world is essential to Descartes. He later claims that the world he describes does not contain anything which one could even pretend to be ignorant of, for all the qualities he ascribes to it are imaginable (ibid., 35; cf. *Discourse*, Part Five, AT VI 42–43). His new world even contains nothing that the dullest minds cannot conceive, and this clarity and intelligibility (ibid., 42) ensures that it does not hide any contradiction (*Light*, AT XI 36).

By contrast to the atomist tradition, Descartes does not ascribe to his matter any basic property of being, solidity or the filling of space, which would distinguish it from empty space. Similarly, in contrast

to the Scholastic tradition, he does not admit any primary matter or substratum. Extension, or the property of occupying space, is the true essence of matter (ibid.).[20]

Descartes' claim, that the sensory qualities are not as clearly conceived as are the geometrical properties, is quite remarkable. If it does not strike us as such at first sight, this is because we are used to approaches similar to Descartes', which are largely derived from his. But let us try to bracket common theoretical approaches to nature: are we not familiar from our daily experiences with colours, sounds, heat and cold as well as we are with shapes and motion? In what respect is there anything less clear in a red colour or a sweet taste than in a square or spherical shape? In what sense do the former, but not the latter, require explanation? It is hard to see why one should make these claims, yet Descartes asserts them without any attempt at justification.

Moreover, we do not perceive the shape of anything unless it is something we either see or feel; and the perception of motion depends on seeing, hearing or feeling something moving. The abstract concepts of shapes and motions are derived from concrete perceptions of things that have shape and are in motion. Accordingly, it can be argued that since knowledge of geometrical properties is dependent on the perception of sensory qualities, the former cannot be easier to conceive than the latter. Descartes thus presents a problematic position without attempting to justify it; what is more, it seems he thinks of it as intuitive or natural. How come?

Descartes is captivated by a geometrico-corpuscular view of the material world, a view that has its origins in Plato's work and that in his time has found several partial or full protagonists, among whom were Kepler, Beeckman and primarily Galileo. It seems that Descartes became convinced of the correctness of this view because of its transparency to his mathematical intellect, because it enables rich manipulation and thus possesses significant explanatory power, and because it has been powerfully applied in a variety of cases. Moreover, as we shall soon see, mathematics' a priori character seemed to him to confer on it divine authority. Now mathematics, in Descartes' day, meant primarily geometry; and as a mathematician – and Descartes was one of the greatest mathematicians of his age – this mathematical picture exerts tremendous power over his imagination. He consequently develops a geometrico-corpuscular model of the material world.

Sensory qualities have no place in such an ideal world. The purely geometrical particles cannot be either hot or cold, have colour, and so on. *That* is why Descartes thinks of the sensory qualities as something

not entirely clear; indeed they *are* in need of an explanation in such a world. But this view is only a consequence of his geometrical picture of material nature; again, in themselves the sensory qualities are not any less clear or intelligible than properties like shape or motion. It is not that because the sensory qualities are unclear and in need of explanation that Descartes adopts a geometrical picture of matter; rather, because he adopts such a picture they seem to him unclear and in need of explanation.

But our account is still incomplete. One could justly argue: even if geometrical matter were better understood than matter that also has sensory qualities, it still does not follow that matter does not contain these qualities. It is certainly possible that matter has properties which we incompletely understand, or even such that we *could* never completely understand. Even if Descartes' geometrical model is the one clearest to our understanding, it does not follow that it applies to reality. So why did Descartes think that material nature must be transparent to our mind?

Descartes' conviction that the principles of the material world can be completely understood, that they do not contain anything that the dullest mind cannot conceive, is related to his religious faith. God created man such that he can understand material nature. This Descartes establishes as follows. First, it is impossible that God, who is a perfect being, should ever deceive us, 'for in every case of trickery or deception some imperfection is to be found' (*Meditations*, AT VII 53, CSM II 37). Accordingly, in so far as we are created by the supreme being, there is nothing in us to enable us to go wrong (ibid., 54, 38). Now, 'every clear and distinct perception is undoubtedly something <real and positive>, and hence … must necessarily have God for its author' (ibid., 62, 43). And so,

> if, whenever I have to make a judgement, I restrain my will so that it extends to what the intellect clearly and distinctly reveals, and no further, then it is quite impossible for me to go wrong. (ibid.)

And similarly in the *Principles*:

> God is supremely good and in no way a deceiver, and hence the faculty that he gave us for distinguishing truth from falsehood cannot lead us into error, so long as we are using it properly and are thereby perceiving something distinctly. (IV 206, CSM I 290)

Descartes sees clear understanding as a divine spark in man, and therefore as something whose truth is guaranteed. And there is nothing

clearer to Descartes the mathematician than the truths of mathematics. Their a priori nature even makes him think of them as imprinted in our minds, innately, by God. And accordingly he writes to Mersenne, while working on *The World*:

> God ... has laid down these laws [the mathematical truths] 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. (15 Apr 1630, AT I 145, CSMK 23)

And later he will write in the *Discourse*:

> I have noticed certain laws which God has so established in nature, and of which he has implanted such notions in our souls, that after adequate reflection we cannot doubt that they are exactly observed in everything which exists or occurs in the world. (AT VI 41, CSM I 131; cf. *Meditations*, Third Meditation, AT VII 51)

The clarity and distinctness of the geometrical conception of matter, together with its a priori nature, convince Descartes of its truth, of its being a gift of a benevolent God, imprinted in our minds and revealing the nature of the material world to our intellect.

But it seems that Descartes' excessive self-confidence also played an important *psychological* role in his conviction that his geometrico-corpuscular model must be correct. Had Descartes met with phenomena he could not explain by means of that model, he might have come to doubt it; and the more so the more recalcitrant these phenomena had been. Now from our present viewpoint, many of his would-be explanations look simplistic and implausible, and not just completely mistaken. (Since my focus in this work is not Descartes' science, I do not give examples at this place, but we shall encounter some later.) And apparently this is not merely the wisdom of hindsight: much of the natural science found in *The World*, *Principles* and other writings was not widely accepted by post-Cartesian science. A glaring example of such an implausible explanation with negligible influence is his theory of generation in the *Description of the Human Body* (Westfall 1971, p. 98). Moderate caution should have brought Descartes to acknowledge that to most of the phenomena he considered he managed to supply at most a partial sketch of a possible explanation. Certainly a person of

his intellectual stature could have found grounds to be critical of his own models, just as he was quick to spot weaknesses in the theories of his contemporaries.

Yet Descartes' self-confidence is so great that he claims there is no natural phenomenon among those he considered that he could not explain with certainty sufficient for the conduct of life. In section 205 of Part IV of the *Principles* he declares:

> Now if people look at all the many properties relating to magnetism, fire and the fabric of the entire world, which I have deduced in this book from just a few principles, then, even if they think that my assumption of these principles was arbitrary and groundless, they will still perhaps acknowledge that it would hardly have been possible for so many items to fit into a coherent pattern if the original principles had been false. (AT VIIIA 328, CSM I 290)

But even this practical, 'moral' certainty is insufficient for Descartes. The heading of the next, penultimate section of the *Principles* is 'Indeed, my explanations possess more than moral certainty'. It seems to Descartes, as he writes in that section, that 'the general features of the universe and the earth which [he has] described can hardly be intelligibly explained except in the way [he has] suggested.' And if that is not enough, he writes to Mersenne:

> I am prepared to admit that if what I have written on [the circulation of the blood] or on refraction – or on any other subject to which I have devoted more than three lines in my published writings – turns out to be false, then the rest of my philosophy is entirely worthless. (9 Feb 1639, AT II 501, CSMK 134)

Luckily Descartes was wrong in that. (And these declarations should serve as an antidote for those who think that the first chapter of the *Meditations* evinces Descartes' sceptical frame of mind.)

A person who takes upon himself the *Meditations* project of demolishing all the knowledge humanity has accumulated over the centuries and of building everything afresh, on his own, must be the victim of an exaggerated intellectual self-image.

Thus, Descartes' overconfidence in his explanatory success in the natural sciences helped convince him that his geometrico-corpuscular model of the material world was correct. This, together with his mathematical inclinations and religious-metaphysical faith, brought Descartes

to adopt a geometrical model of material nature, one which has no place in it for sensory qualities that resemble our qualitative ideas of them.[21]

We are, however, obviously aware of these subjective sensory qualities: so in what are they instantiated? – Descartes thinks of the soul or mind as essentially different from the body. He holds a mind–body dualism, probably the most extreme in the history of thought up to his time. (As we shall see below, the considerations that led him to this dualism were probably independent of his view of sensory qualities.) Accordingly, if these qualities are not of anything whose nature is purely that of a body, they must be qualities of something which is either in the mind or in something that involves the mind. They are thus transferred from bodies to our ideas of bodies, ideas being mental entities. We accordingly get the first claim of Descartes' theory of perception, namely, that when we see colours we are immediately conscious of the ideas of colour in our minds.

If we next believe, with Descartes, that perception often provides us with adequate knowledge of the world, we shall conclude that the idea of colour is caused by the colour in things and that it represents the latter without resembling it. We thus get all the claims of Descartes' theory of perception; apart, perhaps, from the fourth one above, that is, that the colour in the things we see is their disposition that causes the idea of colour in our mind. It seems, however, quite straightforward to develop this dispositional conception of the properties of bodies responsible to the ideas of sensation in our mind, once we characterise these properties by means of their causal role.

Descartes' very talk of an idea of colour in our mind is far from being naïve or non-theoretical. To see that, let us consider how he prepares his reader for his theory in the opening paragraph of *The World*. As we saw above, he writes there as follows:

> The first point I want to draw to your attention is that there may be a difference between the sensation we have of light (i.e. the idea of light which is formed in our imagination by the mediation of our eyes) and what it is in the objects that produces this sensation within us (i.e. what it is in a flame or the sun that we call by the name 'light'). (AT XI 3–4, CSM I 81)

And similar claims, also quoted above, occur in the first discourse of the *Optics* with regard to colour (AT VI 85).

These claims already presuppose the first and second claims of Descartes' theory of perception; namely, that when we see colours we

are immediately conscious of the idea of colour in our mind, and that the idea of colour is caused by the colour of the things we see. Yet these claims are not part of our pre-theoretical conception of sight, or of sensation and perception in general; they are even incompatible with that conception.

Pre-theoretically, we do not distinguish between the seen colour of things and an idea of colour in our mind that exists while we are seeing that colour, an idea of which we are aware. We are directly aware of the colour of things, so we assume, without any mediation of any idea of colour caused by the colour of things. Our pre-theoretical conception of sight does not involve any such distinction between the colour of things and a mental idea of colour.

Descartes certainly gives good examples of cases in which a sensation is different than its cause. His favourite example in the *Optics* is the blind man's sensations of touch, in contrast to the properties of bodies which he feels with his stick. But this example does not support the distinction he tries to establish, that between the colour of things and our idea of colour. In the case of the blind man, we pre-theoretically distinguish between the sensations of touch in our body (*not* in our mind or imagination) and the properties of the touched things responsible for these sensations: solidity, texture, temperature, and so on. We may then ask whether these properties resemble our sensation (they don't). But in the case of sight, a distinction between the sensation of colour and the colour responsible for it does not exist; and therefore there is no place, outside a specific theory of vision, for asking whether they resemble each other. Descartes' examples do not draw our attention to a possibility of which we are not always aware (lack of resemblance between colour and idea of colour), but they persuade the reader to adopt a theory of representational perception, a theory that is incompatible with our pre-theoretical attitude to sight yet allows for the possibility described.

A representational theory of perception, according to which we perceive by means of some representation in our body or mind, is not an innovation of Descartes'. Such theories were prevalent in philosophy and science, from antiquity to his own day. And there is certainly nothing wrong in constructing your own theory on foundations laid by earlier thinkers, modifying some elements and introducing new ones, while sailing on the open sea. But it is important to realise that that is what Descartes is doing here. Far from starting everything afresh, he starts with the representational theories of perception prevalent in his day, and modifies them in various – significant – respects. And in this way he transforms our understanding of perception and representation.

As we saw above, Descartes' theory of perception is a result of his adoption of a geometrical conception of material nature. This conception made him remove the qualities from bodies into the mind. However, his geometrical conception was later rejected by most scientists and philosophers; yet the alternative models that replaced Descartes' seemed also not to allow matter to have sensory qualities that resemble our ideas of them. These departures from Descartes did not therefore affect the acceptability of his theory of perception. In fact, his theory of perception, on all its seven points listed above, was almost unanimously accepted. And *it is* a revolutionary theory, which deeply changed philosophy and science, and has practically become part and parcel of the modern worldview. The respects in which it discontinues earlier traditions will be examined in the next section.

2.3 The innovation in Descartes' theory of perception

Descartes' theory of perception – and by that I mean the theory consisting of the seven theses listed in the former sections – has had a huge influence on philosophy and science, from his times to our day. Without doing much injustice to facts, one can say that anyone who has been a realist about material nature held Descartes' theory: from the early Cartesians active in France immediately after his death, to Boyle, Locke and Newton in England shortly later, and so on to the present day. The theory became the self-evident orthodoxy from Descartes onward. From the 1640s on, we are all Cartesians.

Descartes' theory of perception played an essential role in the history of science: it enabled the development of theories of material nature without these theories contradicting themselves. Descartes' and Gassendi's theories on the nature of the material world in the seventeenth century, and later theories that evolved from them or replaced them, do not allow the existence of sensory qualities in material nature. The transfer of these qualities to the mind by Descartes made it possible to claim that this does not entail a contradiction. On the one hand, we are directly aware of the sensory qualities in our mind, and not of the things in the material world that they represent; and these sensory qualities do not resemble what they represent. Yet the representation can be adequate even without resemblance, and therefore we need not be under any illusion or ignorant about the perceived world. We thus hold a coherent, non-sceptical metaphysical position, which fits the modern scientific conception of matter.

Had modern science not had Descartes' conception of representation without resemblance, it would have been committed to a sceptical

position: material nature does not contain anything resembling our ideas; therefore they cannot represent it correctly; but all we know, we know through them; so we cannot know anything about material nature. And this scepticism would be forced on us even if we held a materialist position and maintained that representations in perception are only in the brain: the processes and structures in the brain do not resemble what we take them to represent. In order to avoid this sceptical position, one has to explain how a representation need not be by means of resemblance; and Descartes was the first to do that.

Until Descartes, *all* theories that explained perception as involving some kind of representation claimed that the representation *resembles* what it represents. Whether the representation is in the sense organ, soul or mind, it is similar to the thing represented in that it instantiates a property which is like, or literally the same as, the represented property.

This universal historical claim is clearly in need of justification; and, equally clearly, the justification that can be provided here cannot be exhaustive: I cannot provide here a full survey of theories of perception preceding Descartes'. What I shall instead do is show that that was the case with the most influential earlier representational theories of perception. Many of these theories are very much unlike each other in many respects; the fact that despite all these differences all of them maintain that adequate representation is by means of resemblance will support the claim that Descartes was the first to think of the possibility of an adequate representation without resemblance.

I shall not present any of these theories in detail: all I need to show is what kind of representation they employ. Moreover, I do not claim that all theories of perception preceding Descartes' were representational: Plato, Plotinus and Ockham are three important philosophers whose theories of perception – in the case of the last two, at least in their later writings – were not representational. The claim is that those who did hold a representational theory of perception thought that the representation, if it was to be adequate, ought to resemble the thing it represents.

The earliest representational theory of perception that has reached us is probably Empedocles's theory of hearing, from the fifth century BC. According to Empedocles, we hear when an organ inside our ear reverberates with the same sound that is produced by the thing we hear. This is how Theophrastus, Aristotle's pupil who headed the Lyceum after him, presents Empedocles's theory in his *De Sensibus*:

> Hearing is caused by sounds from outside. When the ear is stirred by the noise it resounds within, for it is like a bell reproducing sounds

> in the same volume [literally: a bell of the equal sounds]: he calls it 'a shoot of flesh'. The air when it is stirred strikes against the solid parts and produces a sound. (9; Guthrie's translation)

According to Empedocles, in order to hear we should have 'within' the same sound as the one outside, that which we hear. Notice that this sound 'within' is in no sense in the mind, but it is reproduced in a bodily part of the organ of hearing, the ear.

The theories of perception that Plato develops, in the *Theaetetus* and *Timaeus*, are apparently not representational. The *Philebus*, however, contains a short representational account of *memory* (38e–40a). Our soul, it says, contains an artist who draws in it pictures of the things we perceived according to our judgement of them, pictures we can later consider. Such pictures can also represent what we hope will happen in future. It is of course difficult to assess how much of this account should be taken literally, but for our purposes it suffices to note that when Plato mentions mental representation he describes it as being achieved through resemblance.

Similar ideas on representation are found in Aristotle. Perception occurs when the sense organ receives the form of the thing perceived:

> By a 'sense' is meant what has the power of receiving into itself the sensible forms of things without the matter. This must be conceived of as taking place in the way in which a piece of wax takes on the impress of a signet-ring without the iron or gold. (*On the Soul* II 12, 424a17*ff*)

By 'form' Aristotle means the properties of the thing, and in the case of perception this includes the sensory qualities. According to this approach, the eye, or some part of the eye, will have the colour of the thing the person sees as long as he sees it. And Aristotle is explicit about this resemblance between the representation and the thing represented:

> As we have said, what has the power of sensation is potentially like what the perceived object is actually; that is, while at the beginning of the process of it being acted upon the two interacting factors are dissimilar, at the end the one acted upon is assimilated to the other and is identical in quality with it. (*On the Soul* II 5, 418a3*ff*)

Perception occurs by virtue of a representation that resembles the represented thing.[22] Aristotle held the corresponding view of memory as well,

which for him is a function of the primary faculty of sense perception: remembering is a representation, related as a *likeness* to that which it represents (*On Memory and Reminiscence* I, for instance at 451a15).

Some interpreters found this literal interpretation of Aristotle's position incredible: could he indeed have thought that the eye becomes red when we see a red thing? 'Do my eyes really become pinstriped when I see a dapper man's suit?' asks Shields, who finds this position empirically dubious (2010). In face of this alleged dubiousness he suggests we interpret Aristotle's resemblance as that between a house and its blueprint, which *encodes* the represented properties rather than exemplifies them. Shields himself admits, though, that Aristotle never explicitly distinguishes between the two kinds of resemblance. In fact, no one distinguished them at Aristotle's time or earlier, so there is no positive basis for ascribing to Aristotle such a distinction.

In addition, notice, first, that it does not appear implausible at all to maintain that we feel that something is hot when we touch it with our hand because our hand becomes hot – the hand then receives the form of heat, to use Aristotle's way of describing the process. Since his account of resemblance is explicitly said to apply 'to any and every sense' (*On the Soul* II 12, 424a16), a similar interpretation should by analogy be given to his view of vision. Moreover, the alleged implausibility is merely apparent. We of course do not usually simply see a red object that fills our visual field; what we rather see are several objects that are different from each other in colour and whose colour is not uniform either. What Aristotle's position should commit us to, then, is that different parts of the eye receive the different colours of the objects we see; and as we see their shapes as well, these should be received appropriately in our eye too. That is, we should have in our eye *images* of the things we see. And this is not much different from our current view: *we* hold that such images are formed on the retina, images that can even be observed when the rear tunics of the eye are removed (as Descartes noted). Aristotle's view is thus different from the current scientific view mainly in having these images upright and inside the eye and not on its back.[23]

According to Epicurus (and Lucretius, that important source for the transmission of Epicurus's ideas), every body secretes extremely thin films, the *eidola*, which maintain the body's form and colour; and these films propagate with enormous speed in every direction. When these images, sharing the colour and shape of their sources, penetrate the eye, sight occurs.[24] Again, the shape and colour of the perceived object are represented in the sense organ (and not in the mind) by something which resembles the object in both respects, namely the *eidōlon*.

For the Stoics, an appearance (*phantasia*) is an imprinting or alteration in the soul, or in its leading part (*hēgemonikon*). 'Cleanthes understood imprinting in terms of hollows and projections, like the imprinting that occurs in wax from signet rings'; Chrysippus indeed found this literal interpretation of Zeno's 'imprinting' absurd, but not because of the resemblance involved (our sources do not report in what way his account differed, apart from substituting 'alteration' for 'imprinting') (Sextus, *Adversus Mathematicos* 7.227–36). The true appearance that is a criterion of truth was called by the Stoics an *apprehensive* (*katalēptikē*) appearance. This is how Sextus reports their characterisation of it:

> An apprehensive appearance is the one that is from a real thing and is stamped and impressed in accordance with just that real thing, and is of such a kind as could not come about from a thing that was not real. For since they trust this appearance to be capable of perfectly grasping the underlying things, and to be skilfully stamped with all the peculiarities attaching to them, they say that it has each of these as an attribute. ... The apprehensive appearance also has to come about in accordance with just that real thing. Not to mention its being stamped and impressed, so that all the peculiarities of the things that appear are skilfully stamped on. For just as carvers tackle all the parts of the things they are completing, and in the same way as seals on signet rings always stamp all their markings exactly on the wax, so too those who get an apprehension of the underlying things ought to focus on all their peculiarities. (ibid., 248–251; Long and Sedley 40**E**)[25]

The apprehensive appearance is perhaps not explicitly said here to resemble the thing that appears (yet notice the phrase, 'it has each of these as an attribute'), but one of the problems with the *non*-apprehensive appearance was said in 7.249 (omitted above) to be its *not* resembling the thing it is from, or not resembling just that thing. Moreover, all the examples of representation considered in these and other passages are of representation by resemblance. Furthermore, when Sextus turns to criticise the conception of the appearance as an imprinting (ibid., 372–387), he claims that according to this view the mind perceives the things that appear by means of their effects on us, and these effects should thus be *similar* to the appearances (ibid., 384–387): he never considers any position, Stoic or otherwise, according to which appearances represent without resemblance. Yet given his thoroughness, it is unlikely that if such a position existed he would not mention and

criticise it. It thus seems safe to ascribe also to the Stoics the position that representation in perception must be by means of resemblance.

In *The City of God* Augustine discusses our perception of colour, sound, smell, softness and hardness. We perceive all these by means of a bodily sense, he writes, and he adds (emphasis added):

> We perceive colours, for example, by seeing, sounds by hearing, smells by smelling, tastes by tasting, hard and soft objects by touching; and in all these cases it is the images *resembling* the sensible objects, but not the corporeal objects themselves, which we perceive in the mind and retain in memory, and which excite us to desire the objects. (Book 11, Chapter 26; see also *On the Trinity* (*de Trinitate*) Book 11, especially 11.2.3–4)

Again, perception occurs by means of an image *resembling* the thing perceived.[26]

The Scholastics accepted the main lines of Aristotle's theory of perception.[27] They had to integrate his theory of vision, however, with the optical theory they received from Alhazen (Abu 'Ali al-Hasan ibn al-Hasn ibn al-Haytham, c. 965–c. 1039). This was achieved in the second half of the thirteenth century, by Roger Bacon (c. 1219–1292), Witelo (fl. 1250–1275) and John Pecham (c. 1230–1292), the most important of the perspectivists, namely the Scholastic optical theorists, whose adaptation of Alhazen determined the optical orthodoxy until Kepler's time. According to Aristotle, neither rays nor anything else travels either from the object seen to the eye or vice versa; rather, the object produces its image directly in the eye, when the appropriate medium exists between them. Yet according to Alhazen, rays emanating from every point on the seen object enter the eye and form an image of it in the lens. The properties of the object should therefore be somehow transmitted to the eye by these rays. The Scholastics postulated the *species* to do this work, an adaptation of Alhazen's *forms*. Their exact nature was debated during the Middle Ages, but for our purposes it is sufficiently accurate to characterise the *visual* species as the colour and light of the points on the object's surface, multiplied or re-instantiated, either really or 'intentionally', in the medium and propagating in straight lines in all directions. (What was meant by 'intentional' existence was never entirely clear, but it did not exclude resemblance.[28]) Here is how Bacon characterised the species:

> But a species is not a body, nor is it moved as a whole from one place to another; but that which is produced [by an object] in the first part

> of the air is not separated from that part, since form cannot be separated from the matter in which it is unless it should be mind; rather, it produces *a likeness to itself* in the second part of the air, and so on. (*Opus maius*, v.1, Distinction 9, Chapter 4; tr. Lindberg; Grant 1974, p. 394; emphasis added)

When later entering the eye, the species are rearranged in the lens or on the lens's surface, according to their order on the object's surface. In this way a representation resembling the object is formed where the visual power was usually located:

> Thus, when the eye is opposite an illuminated or coloured object, light is multiplied either by itself or with the colour of the object, and arriving at the surface of sight [namely, the anterior surface of the lens], it acts on sight, and sight suffers from it. When light and colour come simultaneously to the surface of sight and act on it, and sight suffers because of them, and the power of the soul achieves understanding because of the union of the visible forms and the soul's organ, then sight takes place on account of the presence of the visible forms acting on [the organ of] sight. (Witelo, *Perspectiva* III, Theorem 6; tr. Lindberg; Grant 1974, pp. 401–402)

Here is another formulation out of many, by Nicole Oresme (c. 1320–1385), which explains how the image in the lens formed by the species resembles the object seen:

> I suppose ... that rays of light and colour represent the visible object to vision. And for such representation it is necessary that pyramids are continually incident upon the eye, since for vision [to occur] the arrangement of species or rays in the eye must be such that just as that which is seen is disposed outside [the eye], in like manner it is represented inside [the eye]. (Lindberg 1976, p. 137)[29]

Similarly, Pecham writes: 'Vision takes place by the arrangement of the species on [the surface of] the glacial humour [namely, the lens] exactly as [the parts] of the object [are arranged] outside' (*Perspectiva communis* I, Proposition 37; tr. Lindberg; Grant 1974, p. 402).

Later still, the species continue to multiply, this time not according to the laws of optics but according to physiological laws, first in the fluid filling the eye between lens and retina, and then in the visual spirits filling the optic nerve, on their way to the brain, where reason and the

power of judgement reside. Here is a passage from Henry of Langenstein (c. 1325–1389), where the further propagation of the species or simulacra into the brain is discussed:

> In the hollow nerves descending from the brain and carrying the sensitive spirits there must be a transparent body suited, when illuminated, to the multiplication of species, which body is terminated at the exterior organ of the senses; or else it is necessary that in those hollows [of the nerves] there be most subtle and clear bodies, namely spirits, flowing continually from the brain to or toward the outside and afterwards flowing back with a certain motion, in which reflowing spirits the received *simulacra* of sensible things are carried to the common sense or the imagination. (Lindberg 1976, p. 130)

Resemblance is preserved both in the representation within the eye and in the one arriving at the brain. Although sight occurs at the lens, where light and colour, the proper sensibles of sight, are perceived, the common sense and imagination are located in the brain, and judgment about common sensibles is performed there. Moreover, man has in addition a rational soul, which is united directly with the cogitative faculty which is in 'the middle cell' of the brain, that faculty being the mistress of all other sentient faculties. (See Bacon, *Opus maius*, v.1, Distinction 1, Chapters. 2–4; Grant 1974, pp. 407–410.)[30]

Peter King (2007, pp. 92–93), in his discussion of theories of representation in the Middle Ages, develops a post-Cartesian correspondence account of representation and then claims that it can be found in medieval authors. But he gives a single quotation, from Bacon, which does not prove his point: mental representations signify things, writes Bacon,

> according to conformality and the configurations of one thing to another in its parts and proper characteristics, the way images and pictures and likenesses and so on. (*De Signis*, § 5, 83)

The talk of conformality does not exclude likeness, which indeed Bacon continues to mention explicitly, as we saw him mentioning in the quotation above. Moreover, King notes that a correspondence theory of representation needs an 'account of a natural transformation-rules embodied in sense and intellect, as well as of the transformed "analogous" features in the mind' (an account that Descartes will provide in a most detailed form); but then he continues by complaining that 'unfortunately, not

only did medieval philosophers not provide such an account, there isn't any sign they even tried to.' The natural explanation of this alleged omission would be that they never envisaged such a form of representation. It would be better supported to claim with Tweedale that medieval philosophers generally adopt 'a fairly literal interpretation of the view that the species are likenesses of external objects' (1990, p. 36) than to ascribe to them with King Descartes' view of representation and then wonder why they 'use imagistic terminology to describe mental representations without apparent worry over the literalism such terminology seems to entail' (2007, p. 91). 'We have here a fundamental philosophical divide between the Scholastics and [contemporary] computational mentalists', writes Tweedale on these issues (1990, p. 45).

Tweedale's summary of the prevalent medieval view, a summary with which I concur, is worth quoting more fully:

> The Aristotelian view [shared by medieval philosophers] tied the sense faculties very closely to their organs, to their physiology, and this made a fairly literal interpretation of the view that the species are likenesses of external objects. ... In general what happens is that the property of external things that is perceived is recreated in the sense organ without its actually being a property of that organ. What we have in the organ is a species which has a color, or a sound, or a taste, etc., in the way that a mirror image has color. Even the imagination supposedly involves some organ which has this capacity to receive an image ... (ibid., p. 36)[31]

This theory of vision lasted until the seventeenth century. Kepler's epoch-making contribution, the moving of the image formed within the eye from the lens to the retina, did not change the insistence on representation by means of resemblance, nor did it affect the idea of species, carried through the air and later by the visual spirits. According to Kepler, the visual spirits, which carry the retinal image to the brain, *are themselves coloured*:

> This one optical conclusion from the first chapter can now be stated: the spirit is affected by colours and lights, and this effect is, so to speak, a certain colouring and illuminating. For the species of strong colours remain in sight after they have been looked at [Kepler has after-images in mind], and these are mixed with the colours impressed [on sight] from a new observation, and confusion of the colours occur. This species, existing independently of the presence of the visible

> object, is not in the humours or tunics [of the eye], as was proved above. Therefore vision occurs in the spirits and through this impression of species on the spirit.[32]

The after-image phenomenon, discussed already by Alhazen,[33] convinced Kepler that vision occurs somewhere in the spirits that carry the species in the nerves or brain. The species of strong colours (and presumably of strong light as well) remain for a while in the spirits even after the object that produced them is not in sight any longer. The spirits thus still carry a resemblance of the original object.[34]

Of course, it is difficult to eradicate a tradition that has endured for two millennia in one fell swoop, as can be seen in the work of Sir Kenelm Digby (1603–1665). This ardent admirer of Descartes was probably the first to publish Cartesian ideas in the English language, in his *Two Treatises* of 1644.[35] In Chapter XXXII of his first treatise he clearly explains Descartes' theory of perception and describes how, according to it, brain events are 'answerable' to the motions of the 'outward sense', which depend on the nature of the object that produced them; in this way 'we are enabled, to judge of the nature and conditions of every thing we converse withal' (p. 275). And Digby writes of Descartes:

> He is ... the first that I have ever mett with, who hath published any conceptions of this nature, whereby to make the operations of sense intelligible. (p. 276)

Yet Digby finds serious difficulties in Descartes' physical theory of light and physiological theory of nerve action (§§ 7–9, pp. 280–284), and therefore reluctantly rejects Descartes' specific account of perception. Instead he falls back on the older kind of explanation (although he argues nicely for it): in sight, he maintains, the light reflected from bodies to our eyes strikes off from the surfaces of these bodies several atoms that it carries with it, these having the tincture of the surface; and when reaching the eye, these 'species' are carried to the brain (p. 280). Digby realised that perception can be achieved even if the brain state is only 'answerable' to the properties of the perceived object, yet in the absence of any alternative theory he still makes use of representation by means of resemblance, and even by means of samples. But this was to be the swan song of the species theory.

Descartes was well aware of the fact that his theory of vision frees optics from these mysterious species, which fill the air and nerves and are the cause of vision although themselves invisible. In his *Optics*, after

having introduced his alternative approach to perception, he shows, with a touch of sarcasm, how it makes the species redundant:

> By this means, your mind will be delivered from all those little images flitting through the air, called 'intentional species', which so exercise the imagination of the philosophers. (Discourse One, AT VI 85, CSM I 153–154)

Descartes' theory of perception thus also enabled the simplification of physics by freeing it from some of its oddities.

This selection of representational theories of perception was meant to show that representation was thought of, before Descartes, as done only through the resemblance of the representation to what is represented. I am not aware of any other earlier representational theory whose conception of representation was different. A decisive contribution of Descartes' to representational theories of perception – as well as to theories that involve representation in other ways – is in his making it possible, for the first time, for the representation to be adequate without resembling the thing it represents.

Taking into consideration the central and essential place of Descartes' theory of perception for the modern world view, it is worthwhile to trace the way it was developed. This will occupy us in the next chapter.

3
The Development of Descartes' Theory of Perception

3.1 Descartes' theory of perception in the *Rules*

In order to examine the influences that brought Descartes to develop the theory of perception presented in the former chapter, we should return to his earliest work that has survived and contains a theory of perception, the *Rules for the Direction of the Mind* (*Regulae ad Directionem Ingenii*). Descartes worked on the *Rules*, perhaps intermittently, while in Paris in the mid-sixteen-twenties, and stopped his work when he moved to the Netherlands in late 1628, leaving the book unfinished. The book, written in Latin, was first published in a Dutch translation in 1684, and later in its original Latin in 1701. A copy of the original, containing several variants on the 1701 edition, was bought by Leibniz in Amsterdam in 1670 and is still extant. The original manuscript was, however, lost.[1]

In the *Rules* Descartes tries to develop a method for discovering the truth in the sciences, and some of the rules contained in the book were later mentioned, with modifications, in the *Discourse*. In the course of his discussions Descartes digresses to several areas related in various degrees to his main objective, one such digression being on the nature of perception. Perception is considered mainly in the discussion following Rule 12, and mentioned again in that following Rule 14.

Descartes thinks that all knowledge which is not obtained through simple and pure intuition results from a comparison between two or more things. Accordingly, 'the business of human reason consists almost completely in preparing for this operation', namely, for the appropriate comparison (Rule 14, AT X 440, CSM I 57). To do this, we should first abstract the problem we consider 'from every superfluous conception' (Rule 13, AT X 430, CSM I 51), until we reach a relation

between magnitudes. To that end, and in order to solve problems in the sciences, we should think of the thing sought and the initial data as equally participating in a certain nature. And then the chief part of the endeavour is to form an equation involving what we are seeking and what we already know.

To have the imagination assist the pure intellect, we should transfer the abstract relation of magnitudes we are forming 'to that species of magnitude which is most readily and distinctly depicted in our imagination', namely 'the real extension of a body considered in abstraction from everything else about it save its having a shape' (Rule 14, AT X 440–441, CSM I 58). And then Descartes writes as follows about colours and other sensory qualities:

> One thing can of course be said to be more or less white than another, one sound more or less sharp than another, and so on; but we cannot determine exactly whether the greater exceeds the lesser by a ratio of 2 to 1 or 3 to 1 but by a certain analogy with the extension of a body that has shape [*nisi per analogiam quandam ad extensionem corporis figurati*]. (ibid.)

Descartes ascribes in this passage colour and sound to the things we perceive, while their comparison to extension and shape is *merely an analogy*. This is in sharp contrast to his position from *The World* on, where colour and sound, when ascribed to the perceived things, *are nothing but* geometrical properties. From *The World* on, the analogy of the *Rules* is transformed into a claim about objective reality.

Another important distinction between the *Rules* and Descartes' later writings is that the former does not contain any argument intended to show that the colour of things, or any other sensory quality, is different from its idea in the mind. The detailed arguments that occur and reoccur in *The World*, *Optics*, *Meditations* and *Principles* are absent from the *Rules*, as is the formulation of this position. Whereas they form Descartes' point of departure in his later discussions of perception, the earlier work is silent on these issues. Descartes apparently had not yet developed them at this stage.

Accordingly, on the one hand already at this early stage of his thought Descartes *compares* the perceived objective sensory qualities to geometrical properties; while, on the other, he still does not consider the objective sensory qualities to *be* geometrical properties. Some development in his thought, later than the writing of the *Rules* – a development we shall trace in the next section – brought him to change the methodological

analogy of the *Rules* into a claim about the nature of the material world.[2]

In my interpretation of Descartes' position in the *Rules* I have so far relied mainly on the discussion following Rule 14. But an important discussion of sensory qualities, and of their representation in the mind and in science, is also found in the discussion following Rule 12, to which I now turn. Descartes' position there, however, is less clear; to facilitate following his discussion, I first summarise it.

Descartes strives to justify a formal-mathematical, namely geometrical, representation of the sensory qualities. As we saw above, this is necessary, according to him, for a quantitative-scientific treatment of everything, these qualities included. However, in contrast to his claims from *The World* on, he does not deny the existence in the perceived objects of sensory qualities that resemble our qualitative ideas of them. Instead, he adopts a variety of other strategies. He claims that the perceived qualities impress their shape or figure on our sense organs, and that this figure is transmitted to the brain and mind; he also claims that whatever other characteristics the perceived qualities have, they have formal characteristics as well, and we should deal with these. The former claim tries to present the representation in *the sense organs and brain* as formal-geometrical; the latter claim presents the *objective sensory qualities* as involving geometrical aspects as well. Lastly, Descartes also claims that the infinity of geometrical figures is sufficient for representing the sensory qualities – here he directly justifies the *scientific representation* of sensory qualities by means of geometrical figures. Thus we are presented with a variety of arguments, directed at three distinct levels, none sufficiently powerful in itself; the later position of *The World* is definitely clearer and more powerfully supported by argument. But the essential conclusion of this discussion, which is picked up again, as we saw, in the discussion following Rule 14, is the methodological one, that in science we can represent the sensory qualities with geometrical figures 'by a certain analogy'.

With this overview in place, let us consider in more detail Descartes' discussion of perception. He starts his discussion by using Aristotle's wax analogy (*On the Soul* II 12, 424a17; quoted above on page 35), claiming that in perception the sense organ receives the shape (*figura*)[3] of the perceived body in the same way that the wax takes the impression from a seal. But for Descartes this is more than an analogy:

> Sense-perception occurs in the same way in which wax takes on an impression from a seal. It should not be thought that I have a

> mere analogy in mind here: we must think of the external shape of the sentient body as being really changed by the object in exactly the same way as the shape of the surface of the wax is altered by the seal. This is the case, we must admit, not only when we feel some body as having a shape, as being hard or rough to the touch etc., but also when we have a tactile perception of heat or cold or the like. The same is true of other senses: thus, in the eye, the first opaque membrane receives the shape impressed upon it by multi-coloured light; and in the ears, the nose and the tongue, the first membrane which is impervious to the passage of the object thus takes on a new shape from the sound, the smell and the flavour respectively. (Rule 12, AT X 412–413, CSM I 40)

This position is problematic: even if while seeing 'the first opaque membrane' – presumably the retina – receives the shape impressed upon it by multi-coloured light, might not some information be lost in this way, namely, information about the objective sensory quality? In that case, representation in the sense organ, and as a result any further representation in body or mind, will be incomplete.

Descartes apparently feels that his position is not entirely satisfactory, for he adds the following justification:

> This is a most helpful way of conceiving these matters, since nothing is more readily perceivable by the senses than shape, for it can be touched as well as seen. (ibid.)

But this justification is quite weak: the question is not whether shape is clearly perceived, but whether it can adequately represent 'multi-coloured light' and other objective sensory qualities. Notice also that Descartes shifted from a physical justification of representation by shape in the former passage to a methodological justification in the latter one.

Descartes next writes, conscious of his justification so far being insufficient, that 'the consequences of this supposition are no more false than those of any other'. Apparently, what has been said so far seems to him as leaving it possible that his supposition is false. (The supposition meant is probably that the objective sensory qualities are represented by shape in the sense organ.) We therefore now find an additional, different justification: 'the concept of shape is so simple and common that it is involved in everything perceivable'. Colour, for instance, whatever else it might be, has shape (Rule 12, AT X 413, CSM I 40–41). But even if this

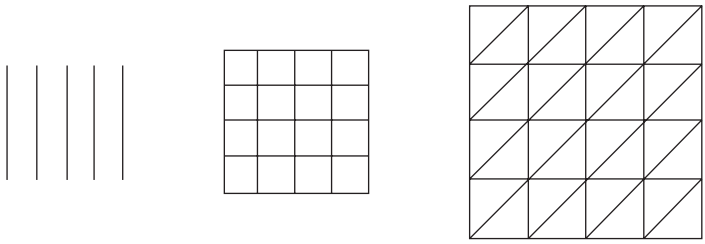

Figure 3.1 Descartes' geometrical representation of colours, taken from *Rules*, AT X 413

were true – smell and taste, for instance, do not seem to involve shape the way colour does – we again do not have enough justification for thinking that shape *exhausts* all properties of sensible qualities.

Descartes thus moves on to a further argument. There would therefore be no troublesome consequences if we ignored any additional putative feature of colour apart from its possessing the character of shape, and, making an abstraction (*abstrahamus*), conceived the differences between colours as being like the differences between shapes. Representation by means of shapes is now an *abstraction*, not intended to capture the *actual* differences between colours. This is apparent by the example of shapes that Descartes provides. We may conceive of the differences between white, blue and red, he writes, as being like the differences between the shapes in Figure 3.1 above.

By contrast to later writings, Descartes does not develop in the *Rules* any theory of the nature of colour. Yet it is unlikely that Descartes thought that these simple shapes are the actual shapes of white, blue and red colours. In his later theory of colour, objective colour is the ratio between the pressure in the direction of propagation of light and the rotational pressure of the globules whose pressure *is* light (*Meteorology*, Discourse Eight, AT VI 333–335; *Description*, AT XI 255–256), properties totally unlike the shapes he draws here. In addition, it is equally unlikely that these shapes are supposed to be instantiated in the sense organs. Moreover, once Descartes had a geometrical theory of light and colour, he made specific claims about which geometrical property corresponds to which idea of colour, while at this place *any* shapes whose differences correspond to those between colours would do, for we are using them only as means for our ratiocination or calculation. We must therefore think of them only as an abstraction, intended as 'a certain analogy', as Descartes writes later in the book (Rule 14, AT X 441, CSM I 58).

We are thus left with the question: how can we be sure that geometrical shapes are sufficient for the representation of objective sensory qualities? Descartes concludes by answering this question: all perceivable things can be represented by shapes for 'the infinite multiplicity of shapes is sufficient for expressing (*exprimendis*) all the differences of perceivable things' (Rule 12, AT X 413, CSM I 40–41).

At the end of this condensed array of an opportunist variety of arguments, none of which recurs from *The World* on, we find a methodological justification for representing sensory qualities by geometrical shapes, as an abstraction or analogy. This last argument is independent of the question of whether the form taken by the sense organ is merely geometrical shape or if it involves any qualitative property as well: the infinity of shapes would presumably have been sufficient in either case for justifying the scientific representation of quality by shape.

By contrast to Descartes' later arguments for the representation of the objective sensory qualities by geometrical means, we find in the *Rules* a much weaker set of arguments for that position, without any claim that the idea in the mind might not resemble the quality it is an idea of. From a remark written in 1620, just a few years before writing the *Rules*, it appears that Descartes then thought that knowledge of natural things *must* be through sensory ideas that resemble them (*Cogitationes Privatae*, AT X 218–219). It thus seems Descartes has not yet rejected in the *Rules* the view that sensory ideas resemble the objective properties. He has not yet developed the later clear and powerful way of justifying a geometrical representation of the sensory qualities.[4]

Descartes next proceeds to sketch a physiological theory of the transmission of the representation from sense organ to mind, a theory close in its fundamentals to the one found in his later philosophy. The shape or figure (*figura*) that the sense organ receives from the perceived thing is transmitted to the bodily organ which is the common sense, and this is done without any body passing between them. Descartes compares this transmission to the immediate connection in writing between the point of the pen moving on the paper and the tip of the quill: we have again the idea of the absolutely rigid body used to demonstrate properties of perception, the way the blind man's stick will be used later in the *Optics*.

The common sense is used as a seal and imprints in the phantasy or imagination (*phantasia vel imagination*), which is also part of the body, the figures or ideas (*figuras vel ideas*), which come pure and without body from the external senses. The seat of the phantasy or imagination is in the brain. Finally, the intellect (*intellectus*), which is purely spiritual (*pure*

spiritualem) and 'is no less distinct from the whole body than blood is distinct from bone, or the hand from the eye', is connected to the senses and the external world by means of the imagination. (Rule 12, AT X 414–417, CSM I 41–43)

Descartes' ideas at this place (some of which I omitted) are both traditional and close to those of his future position, from *The World* on, concerning the relation of mind and body, although later he will not distinguish between the bodily parts which are the common sense and those that are the imagination. And already here the state of the brain – of the phantasy or imagination – determines the perception of the mind; although we do not find here an anticipation of his later physiological theory which involves the animal spirits, pineal gland, and so on (I present this theory in the next chapter).

To sum up, we witness in the *Rules* an important step of Descartes' towards his later representational theory of perception. By contrast to his later theory, while writing the *Rules* Descartes apparently has still not come to think that the idea of which the soul is directly aware and the representation in the sense organs do not *resemble* the qualities of material things. However, for scientific purposes, these qualities can be *represented* by means of geometrical shapes. The need to apply mathematics in scientific inquiry brings Descartes to suggest that the perceived qualities be represented, as an abstraction or analogy, by means of shapes: a representation of one thing by another thing that does not resemble it. Perception itself is not claimed to involve representation without resemblance; yet such a representation is a tool for research. Descartes develops in the *Rules* the idea of representation without resemblance, an idea to which he will later ascribe objective reality. The innovation in the conception of representation exists already in that early work, but it is not ascribed there to nature.

Accordingly, the ideas of the later theory of perception that occur already in the *Rules* are the following:

- When we see colours we are immediately conscious of the idea of colour in our mind.
- The idea of colour is caused by the colour in the things we see.
- The idea in the mind is determined by the brain's state.

These three claims characterised many theories of perception in Descartes' time and earlier, as we saw above. In this respect Descartes follows his predecessors. This is demonstrated by the fact that he does

not try to justify these claims: his contemporaries would recognise them and accept them as commonplaces.

Another later claim about perception listed above, that the colour in seen things is represented by the idea of colour in the mind, although not mentioned in this form in the *Rules*, can be said to be present there in a limiting form: this representation is, in the *Rules*, representation by identity. The figure the sense organ receives is immediately transmitted to the common sense, and from there to the imagination: 'the same figures or ideas which come, pure and without body, from the external senses'.

By contrast, the following claims, characteristic of Descartes' later position, have not yet made their appearance at the *Rules* stage:

- The colour in seen things does not resemble the idea of colour in our mind.
- The colour in seen things is their disposition that causes the idea of colour.
- This representation in the mind, even when it is adequate, does not resemble what it represents.

However, as we saw, already at this stage Descartes has conceived of the possibility of representation without resemblance.

These last three claims as well as his conception of representation were not common, or even existent, in Descartes' days. The prevalent opinion was that the colour of things resembles its representation by the perceiver, and therefore, first, the colour of things is obviously not any disposition with the power to cause ideas and, secondly, representation is by means of resemblance. We should therefore inquire into how Descartes reached these non-standard and innovative views: what made him develop his revolutionary idea of representation without resemblance already at this early stage, and what brought him later to remove the qualities from material bodies and ascribe objective reality to such a representation.

3.2 Galileo's influence

In order to understand the change in Descartes' theory of perception from the *Rules* to *The World* we should turn to Galileo Galilei (1564–1642). We shall look mainly at his book *The Assayer* (*Il Saggitore*), published in 1623.

In *The Assayer* Galileo responds to a criticism of his theory of the nature of comets. Galileo's theory was published by his student Mario Guiducci in 1619 as if it were Guiducci's, but it was clear to all that it is in fact Galileo's. In the same year the theory was criticised by Horatio Grassi, a criticism published under the pseudonym Lothario Sarsi. But in this case too it was clear to all who the real author was.

Galileo replies to Grassi's criticism in *The Assayer*, but apart from the discussion of the nature of comets, the book also contains many methodological discussions. Galileo writes there on the importance of the application of mathematics in the natural sciences, on the empirical method as contrasted with reliance on authority, and more. Here we shall examine mainly the part of the book in which Galileo discusses the nature of matter and sensory qualities (Galileo 1968, pp. 347–352; 1960, pp. 27–32).

According to Galileo, whenever he conceives of any material or corporeal substance, he necessarily conceives of it as having shape and place, as being in motion or at rest, and as having other properties of this kind; namely, matter necessarily has geometrical properties (Aristotelian common sensibles). By contrast, he is not compelled to think of it as being, in addition, red or white, bitter or sweet, having sound or being mute, or possessing a pleasant or unpleasant fragrance (the proper sensibles). Without the senses, neither reason nor the imagination would arrive at ascribing these qualities (*qualità*) to matter; the qualities, Galileo maintains, are due to the senses, not to reason. He therefore thinks that they are, as far as matter itself is concerned, nothing but mere names (*puri nomi*). The qualities reside exclusively in the sentient body (*corpo sensitivo*). (Galileo 1968, pp. 347–348; 1960, pp. 27–28)[5]

To understand Galileo's argument, we should note that he is *not* arguing, as some have thought,[6] that since we do not have to conceive of matter as having a certain property, it follows that it does not have that property. This argument would be as weak as to argue that since we do not have to conceive of man as wearing a shirt, no man wears a shirt: it is unlikely that Galileo thought such an argument is any good. His argument is different. The ascription of sensory qualities to material nature, he claims, is due only to the senses and not to reason; therefore they do not have objective reality. Galileo sees pure reason as the true guide to the principles of nature.

Galileo is writing in the context of the debate between Platonists and Aristotelians on whether the common sensibles or the proper ones are essential to the understanding of nature, and his argument in *The Assayer*

would have been read by his contemporaries as a contribution to this debate. His position belongs to the Platonic tradition, highly influential in Renaissance Italy from the time of Marsilio Ficino (1433–1499) on, which disparaged the status of the senses relative to reason as a source of truth.[7] This attitude is explicit in Galileo's later works. In his *Dialogue Concerning the Two Chief World Systems* (*Dialogo sopra i due massimi sistemi del mondo*, 1632) he describes the project of inquiry as Platonic recollection (190–191), explicitly situating himself in important respects in the Platonic school vis-à-vis the Aristotelian one (p. 397). Salviati, Galileo's mouthpiece in that dialogue, admires without end Aristarchus and Copernicus who 'were able to make reason so conquer sense that, in defiance of the latter, the former became mistress of their belief' (p. 328). Earlier in the book we are advised 'to put aside the appearance, on which we all agree, and to use the power of reason either to confirm its reality or to reveal its fallacy' (p. 256) – again Reason is needed to validate the report of the senses. Similarly, in *The Assayer* what is true must be conceivable by reason, unaided by the senses; yet this is not the case with the sensory qualities.[8]

The Platonic tradition also preached the mathematization of science, mathematics being the paradigmatic rational science. And mathematics, for Plato as well as for Galileo, meant primarily geometry. In addition, by the time he wrote *The Assayer*, Galileo has already had several significant successes in applying mathematics to natural phenomena. That is why the geometrical conception of nature seems so appealing and convincing to him. And indeed, earlier in *The Assayer* he explicitly argues that nature should be understood by means of mathematics, which he there characterised as geometry:

> Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures, without which it is humanly impossible to understand a single word; without these, one wanders about in a dark labyrinth. (Galileo 1957, pp. 237–238)

These words could be written by Plato himself, who in the *Timaeus* uses the language of arithmetic and geometry to describe material nature as constituted by various kinds of triangles, characterised by their proportions.

The rationalist-mathematical conception of knowledge brings Galileo to form a purely geometrical conception of material nature and to remove the sensory qualities from it. The common sensibles, accessible to reason, are the subject matter of mathematics, while the proper sensibles, namely the sensory qualities, whose ascription to bodies is due to the senses alone, are not appropriate for mathematical treatment. He restates this view of matter several times later in *The Assayer*; for instance:

> I cannot believe that there exists in external bodies anything, other than their size, shape or motion (slow or rapid), which could excite in us our tastes, sounds, and odours. And indeed I should judge that, if ears, tongues, and noses be taken away, the number shape and motion of bodies would remain, but not their tastes, sounds and odours. (Galileo 1960, p. 30)

And Galileo explicitly holds there the same view with regard to colours and heat, (not mentioned in this passage). Via this Platonic approach the sensory qualities are removed from material nature and turned into something purely subjective.[9]

Before returning to Descartes, we should also consider another aspect of Galileo's science of matter, its corpuscularian character. Galileo develops in *The Assayer* corpuscularian theories of the nature of sensation: taste, smell, heat or fire, and light (Galileo 1968, pp. 349–352; 1960, pp. 29–32). Tastes, for instance, are caused 'in accordance with the variations in the contact of diversely shaped particles, and depending upon whether they are few or many, and whether they have high or low velocity'. A similar explanation is given of smell, and later of the feeling of heat:

> Those materials which produce and make felt in us the sense of heat and to which we give the general name 'fire' consist of a multitude of tiny particles of such and such a shape, and having such and such a velocity. These, when they encounter our body, penetrate it by means of their extreme subtlety; and it is their contact, felt by us in their passage through our substance, which is the affection we call 'heat'.

As for sight, we are first given a short Platonic eulogy, comparing it to light, and therefore this 'most excellent and noble of all the senses'

stands to the others as the finite to the infinite, darkness to light, and so on; but we later get a gesture towards a corpuscularian model of the nature of light as well: 'once we arrive at the point of ultimate and maximum dissolution into truly indivisible atoms, light itself may be created', with instantaneous diffusion and expansion, capable of filling vast spaces.

With these theories Galileo continues the corpuscularian tradition, which also stretches far back into antiquity, to Democritus, Plato, and later philosophers. If we consider fire and heat, for instance, then according to Democritus as well, the particles of fire are extremely small, and for that reason they can penetrate our bodies.[10] Plato too, in his *Timaeus*, has a similar corpuscularian theory of fire. As was mentioned above, Plato composed matter from triangles, which were his atoms; these triangles combine together to form three-dimensional bodies. Fire is the smallest, sharpest and most motile of all bodies (56ab). The fire particles penetrate our bodies because of their sharp angles, subtlety and speed; and, when they enter our bodies, they cause the sensation we call 'heat' (61d–62a).

We can also observe the historical chain of ideas if we compare Democritus's explanation of taste generally, and of the sweet and bitter particularly (Theophrastus, *De Sensibus* 65–67), with Plato's (*Timaeus* 65c–66c), with the Epicurean explanation (Lucretius, *De rerum Natura* IV 615–672), and with Galileo's (quoted above).[11] Unlike these earlier thinkers, Galileo does not feign hypotheses on the specific forms of the taste particles; perhaps because they are not needed at this place, but perhaps also because he is a much better empiricist, conscious of how unjustified such hypotheses would be – and indeed in *The Assayer* Galileo often cautions against theories with no empirical foundation and recommends admitting ignorance when it exists. However, the properties of bodies that are responsible for sensation according to him are identical to those found in earlier thinkers of the corpuscularian tradition.

Influenced by his successful application of mathematics in natural science and by the Platonic and corpuscularian traditions, Galileo develops his geometrico-corpuscularian conception of matter, and makes sensory qualities merely subjective.

Did Descartes read *The Assayer*, and if so, when? If we relied only on Descartes' own words then it would at least be implied that he did not read Galileo in the relevant period. When Mersenne asks him, several years after having suppressed *The World* and after Galileo's writings on

astronomy and mechanics were published in the 1630s, whether he has been influenced in his opinions on these matters by Galileo, Descartes responds as follows:

> Concerning Galileo, let me say that I have never met him, and have had no communication with him, and consequently I could not have borrowed anything from him. Moreover, I can see nothing in his books that gives me cause to be envious, and hardly anything I would wish to acknowledge as my own. (11 Oct 1638, AT II 388–389, CSMK 127–128)

Descartes does not say here that he did not read *The Assayer* while writing *The World* or earlier, but this is at least implied by what he does write: he could not have borrowed anything from Galileo since he did not meet him or communicate with him. But of course, books can be a source of influence as well. And as we shall soon see, it is evident from *The World* that Descartes did read *The Assayer*. I shall provide additional evidence for that as well, evidence which will help determine when Descartes read the book.

First, it is reasonable that scientific interest, which at least partly overlaps the subjects on which Galileo has written, would bring Descartes to read his writings. Galileo was the most prominent scientist of the time, and all scientists in Europe followed his work with great interest. Descartes himself had heard already in 1611, while still in school, of Galileo's discovery in the former year of the moons of Jupiter (Ariew 1992, p. 69). And we indeed have explicit evidence of Descartes' interest in Galileo's writings while conducting his own scientific research. In November 1633, while in Leiden and Amsterdam, he looks for Galileo's *Two Chief World Systems*, published the previous year (to Mersenne, end of Nov 1633, AT I 270). He eventually lays his hands on the book in August 1634, when Beeckman visits him on his way to Dordrecht: the book was lent to him for thirty hours only, and he quickly leafed through all of it (to Mersenne, 14 Aug 1634, AT I 303–304). This keen interest is surely evidence of high esteem, probably the result of earlier acquaintance with some influential ideas. Moreover, notwithstanding Descartes' later disparaging assertions about the value of Galileo's writings, namely, that there is hardly anything in Galileo's books he would wish to acknowledge as his own, he is quick to appropriate in the same letter Galileo's law of free fall, 'that the distance covered by a falling heavy body is proportional to the square of the time which the body takes to fall'. To justify this appropriation, he refers Mersenne to a calculation he earlier sent

him (13 Nov 1629, AT I 71–73); yet the law in that letter is significantly different. If we let $x(t)$ stand for the distance such a body falls in time t, then while according to Galileo $x(4) : x(3) = 16:9$, according to Descartes, as he explicitly writes in that earlier letter, it is 2:1. Descartes, the great mathematician, is either making an elementary mathematical mistake or displaying borrowed feathers. Lastly, Descartes read Galileo's last work, *Two New Sciences*, in the year it was published (1638), and wrote detailed comments on it to Mersenne (11 Oct 1638, AT II 380*ff*).

On 13 November 1629 Descartes writes to Mersenne (AT I 70) that he has decided that the work he is writing, which only one month earlier he thought would systematically deal with meteorology alone (to Mersenne, 8 Oct 1629, AT I 23), will explain the whole of physics. The work on meteorology, and even more so the work on physics generally, were bound to make Descartes interested in Galileo's writings on these subjects. Indeed, late in 1632, after Galileo's *World Systems* has already been published and about a year before suppressing *The World*, Descartes expresses his wish to know what Galileo had written there on tides, one of the things he had greatest troubles in fathoming (to Mersenne, AT I 261). And since he intended to write on comets too (*Light*, Chapter 9), it is likely that he would be similarly interested in *The Assayer*. When he works on comets, he asks Mersenne to inform him of any author who had collected the various accounts of comets (10 May 1632, AT I 250–251); this interest in *all* accounts would certainly lead him to Galileo's.

Unlike Galileo, Descartes correctly thinks that comets are not sublunary phenomena, and that they do not originate in atmospheric phenomena. By contrast, his opinions on the motion of heavenly bodies, found from *The World* (Chapter 9) on, are perhaps influenced by Galileo's in *The Assayer*. Galileo writes there (1957, pp. 264–265), as Descartes will later write, that the earth is suspended in a liquid, which orbits the sun in a year. This idea is found in Descartes' *World*, but not earlier.

Accordingly, Descartes' interest in various physical phenomena while working on *The World* would then make him interested in reading *The Assayer*. And this is supported by ideas similar to those of *The Assayer* that are found in *The World* but not in Descartes' earlier writings.

Moreover, Galileo's conception of body, according to which we should ascribe to bodies only those properties that we can conceive by reason alone, discarding the qualities for which the senses are responsible, appeals to the rationalist Descartes. Descartes thinks that clarity and distinctness of conception, the prerogative of reason, are the criterion of truth, while the ideas of the senses and imagination are essentially confused. This conception also agrees with his ideal of the

mathematization of science, an ideal which is also Galileo's. Descartes therefore accepts Galileo's rationalist argument for the geometrical conception of body, and adopts its conclusion: from *The World* on (AT XI 25–26), Descartes' conception of body is Galileo's, namely, purely geometrical.[12]

Galileo's attempts to explain various physical phenomena by means of mechanical-corpuscular models are similar to those found in Descartes' work, from *The World* on. Here is, for instance, how Descartes describes in *The World* the nature of one kind of fire:

> I conclude that the body of the flame which acts upon the wood is composed of minute parts, which move about independently of one another with a very rapid and very violent motion. (*Light*, Chapter 2, AT XI 8, CSM I 83)

And later he describes there the element of fire in general:

> I conceive the first [element], which may be called the element of fire, as the most subtle and penetrating fluid in the world. (Chapter 5, AT XI 24, Descartes 1998 p. 17)

We witness the correspondence with Galileo's thought of fire as consisting 'of a multitude of tiny particles' that penetrate our body 'by means of their extreme subtlety' (see above). Moreover, after this description of fire, Galileo and Descartes immediately proceed to the elimination of the quality of heat from bodies (Galileo 1968, p. 350; 1960, p. 31; Descartes, *Light*, Chapter 5, AT XI 25–26). Lastly, Galileo and Descartes explain in a similar way the manner in which the penetration of our body by the fire particles causes pleasant or unpleasant sensations (Galileo 1968, p. 350; 1960, p. 31; Descartes, *Light*, Chapter 2, AT XI 9–10).

Even if Descartes was influenced in his ideas on the nature of fire or other elements, already before reading *The Assayer*, by Beeckman or other thinkers[13] – but I am not familiar with any such ideas in his earlier writings – Galileo's ideas matched his and helped in their development.

The *World* thus demonstrates *The Assayer*'s influence in many respects. And this is true of Descartes' ideas of the sensory qualities as well. While in the *Rules* we do not find the claim that bodies do not have any quality that resembles our ideas of colour, heat and so on, this claim, taken from Galileo, opens *The World*.

We can convince ourselves that Galileo's words in *The Assayer* brought Descartes in *The World* to remove the sensory qualities from bodies and relocate them in the perceiving subject if we compare the general

structure of the argument in both writers. Galileo begins with presenting his position with respect to the qualities, and Descartes begins with presenting the possibility of *his* position. They both proceed by showing the plausibility of their respective positions by means of analogies: Galileo by means of an analogy with touch, Descartes by means of one with words, hearing and touch. Next, they present their views of the nature of particles that cause sensations, and especially the nature of heat and fire and that of light. And in the course of presenting their geometrico-corpuscularian views of the nature of bodies, they both claim that these views make the ascription of qualities to bodies redundant, and that therefore the qualities exist in the perceiving subject.

Finally, one of the examples both give, with minor modifications, is so extraordinary, that it is obvious Descartes must have borrowed it from Galileo. This is how it is stated in *The Assayer*:

> A piece of paper or a feather, when gently rubbed over any part of our body whatsoever, will in itself act everywhere in an identical manner; it will, namely, move and contact. But we, should we be touched between the eyes, on the tip of the nose, or under the nostrils, will feel an almost intolerable titillation – while if touched in other places, we will scarcely feel anything at all. Now this titillation is completely ours and not the feather's, so that if the living, sentient body [*corpo animato e sensitivo*] were removed, nothing would remain of the titillation but an empty name. And I believe that many other qualities, such as taste, odour, colour, and so on, often attributed to natural bodies, have a similar and no greater existence than this. (1968, p. 348; 1960, pp. 28–29)

And here is Descartes' variation on this example:

> Now, everyone knows that the ideas of tickling and of pain, which are formed in our mind on the occasion of our being touched by external bodies, bear no resemblance to these bodies. Suppose we pass a feather gently over the lips of a child who is falling asleep, and he feels himself being tickled. Do you think the idea of tickling which he conceives resembles anything present in this feather? …Now, I see no reason which compels us to believe that what it is in objects that gives rise to the sensation of light is any more like this sensation than the actions of a feather … are like a tickling sensation … (*Light*, Chapter 1, AT XI 5–6, CSM I 82; I omitted passages containing an additional example)

Descartes is again displaying a borrowed feather, which proves the origin of his position with regard to the sensory qualities.

Descartes reads, between the composition of the *Rules* and that of *The World*, Galileo's *The Assayer*, accepts, following his reading, Galileo's conception of matter, and consequently – using arguments and examples also influenced by Galileo's – removes the sensory qualities from the material world. If we return to the elements of Descartes' later theory of perception that were listed at the end of the previous section as still absent from the *Rules*, we see that under the influence of Galileo Descartes adopted the following one:

- The colour in seen things does not resemble the idea of colour in our mind.

In this way Descartes eliminated the sensory qualities from the material world.

But the differences between Descartes and Galileo are great and significant. First, Galileo ascribes the qualities to the animated or living, sentient body, the *corpo animato e sensitivo* (1968, p. 348; 1960, pp. 28 & 31); he also claims that the qualities are perceived by the sentient soul, *l'anima sensitiva* (1968, p. 352; 1960, p. 32). There is no mention of the qualities of which we are aware being determined by the brain state, or being instantiated in an immaterial mind; on the contrary, it seems the qualities are instantiated in the body or sense organs.

Galileo seems to be operating within a general Aristotelian conception of the soul. The living body is animated by the soul, and it is thus essentially different from a non-living body; the qualities can consequently be instantiated in its sense organs. The sentient soul, and not the intellect or mind, is aware of the qualities.

By contrast, Descartes thinks of the Aristotelian sentient soul as material in nature (*Man*, AT XI 202; I return to this in detail in the next chapter). Consequently, having removed the sensory qualities from matter, he cannot relocate them in the living body or in the sense organs. He therefore must move them into the intellect or mind; we find this position already in the first paragraph of *The World*, where the qualities are ideas we have in our thought, *idée que nous avons en notre pensée*.

The second significant difference between Galileo and Descartes is that Galileo, after distinguishing between the qualities instantiated in the perceiving subject and the primary geometrical attributes of the

bodies perceived, thinks of the qualities as mere names [*puri nomi*] with relation to the perceived material bodies themselves. For him, the name of the quality does not designate any reality in the bodies perceived. He writes, as we saw above, as follows:

> Now this titillation is completely ours and not the feather's, so that if the living, sentient body were removed, nothing would remain of the titillation but an empty name [*puro nome*]. And I believe that many other qualities, such as taste, odour, colour, and so on, often attributed to natural bodies, have a similar and no greater existence than this. (1968, p. 348; 1960, pp. 28–29)

Outside the living, sentient body, the qualities are empty names (as he repeats several times later in the book).

By contrast, Descartes distinguishes – again from *The World*'s first paragraph – between the idea of light in us and what it is in fire or the sun which we call by the name 'light'. And, later in the book, the names of colours, smells, tastes and all other qualities are no longer mere or empty names outside the perceiving subject, but they designate some objective reality. This remains Descartes' position in all later writings, and he elaborates it in the *Principles* (I 70, IV 198).

The thing that made it possible for Descartes to ascribe objective reality to colour, taste and all other qualities was his understanding that the representation does not have to *resemble* what it represents. And, as we saw in the previous section, this insight is found already in the *Rules*. Galileo, by contrast, still apparently takes it for granted that the representation has to resemble what it represents, and he therefore reaches his conclusion that, outside the perceiving subject, the names of the qualities designate nothing. An insight independent of Galileo's influence enabled Descartes to develop a more sophisticated theory of representation and, consequently, of perception.[14]

Galileo's position is unsatisfactory: if, outside us, qualities are but mere names, if nothing in bodies corresponds to these names and perceived qualities, we are driven to scepticism with regard to the material world. We know of the material world only by means of our sensations; but these do not represent the material world adequately; we therefore have no reliable acquaintance with the material world. The sarcastic retort of the senses to Reason or Mind which is found in Democritus's dialogue could be applied to Galileo's position as well. After the Democritean Reason has dismissed the evidence of the senses, claiming that colour,

sweetness, bitterness and so on exist by convention, while in reality there are atoms and void, the senses retort:

> Wretched mind, do you take your assurances from us and then overthrow us? Our overthrow is your downfall. (DK 68 B 125, translation taken from (Kirk et al. 1983, p. 412))[15]

Descartes' position, by contrast, saves us from this scepticism. Descartes understood that the representation need not resemble what it represents, and in this way, as was noted in the previous chapter, enabled the development of modern science without the latter leading to its own unreliability. Descartes' synthesis between Galileo's ideas of matter and sensory qualities and his own ideas of representation enabled the development of the representational theory of perception, necessary for modern science.

I therefore turn to examine how Descartes developed his ideas of representation.

3.3 Analytic geometry and representational perception

Descartes' greatest contribution to mathematics is his development of what later came to be called analytic geometry, which is contained principally in his *Geometry* (*La Géométrie*). The book was published in 1637, as the last essay of the three accompanying the *Discourse on Method*, but Descartes developed his geometry much earlier.[16]

From his letters to Beeckman from 1619 we learn that Descartes worked intensively on mathematics at that time and that he thought he had made significant discoveries. On 26 March he writes to Beeckman (AT X 154–158, CSMK 2–3), after having briefly described his work and recent mathematical achievements, that he intends to produce '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'. (By *discrete quantities* he means arithmetic, and by *continuous* geometry.) He proceeds to describe how, by means of various curves, any imaginable problem could be solved, 'so that almost nothing in geometry will remain to be discovered'. And he concludes:

> This is of course a gigantic task, and one hardly suitable for one person; indeed it is an incredibly ambitious project. But through the

> confusing darkness of this science I have caught a glimpse of some sort of light, and with the aid of this I think I shall be able to dispel even the thickest obscurities. (ibid.)

Similarly, on 23 April he writes to Beeckman (AT X 162–163, CSMK 4) that, if he should stop somewhere in his voyages, he promises to put his *Mechanics* or *Geometry* in order, and that he is thinking of writing a complete work on geometry, that 'will be novel and of some merit'.

An additional primary source from the same years is a notebook Descartes kept, probably during his travels in Europe in 1619–1622. The notebook, later lost, was copied by Leibniz and first published in 1859 under the title *Cogitationes Privatae* (*Private Thoughts*). In the notebook Descartes writes that in 1620 he 'began to understand the fundamental principles of a wonderful discovery' (AT X 216, CSM I 3). On 23 February 1620 he writes that he will take upon himself, before the end of November, a pilgrimage to Loreto (in northern Italy), walking there on foot from Venice, 'with all the devotion that anyone could normally be expected to show'. This he associates in his notebook with a treatise, which he intends to complete by Easter and then try to publish (AT X 218, CSM I 5).

From all this we learn that during these early years Descartes made what he took to be an extremely important breakthrough in mathematics, one that even justified a pilgrimage to the Virgin's shrine. Relying on his later publications and on the problems he mentions in his correspondence with Beeckman, this must be the development of the foundations of analytic geometry.[17]

Essential to analytic geometry is the solving of geometrical problems by algebraic means. We represent geometrical entities – lines, curves, lengths, and so on – by means of algebraic and arithmetical ones: numbers and algebraic expressions and equations. We then represent a geometrical problem by algebraic equations, which we proceed to manipulate until we solve them, and our solution represents a geometrical fact. And the process can be reversed as well: an equation is represented by a curve, and by means of a geometrical construction we find its solutions.

Although I shall later give examples of this procedure by means of problems Descartes solves in his *Geometry*, I do not start with these. This is because Descartes, after concisely presenting the principles of his approach, immediately tackles complex problems, the first problem he solves being one he (wrongly) thinks was left unsolved from antiquity

to his own day. As he wrote in the Preface to the first edition of the *Geometry*:

> In my previous writings [namely the *Discourse* and the two other essays], I have tried to make myself intelligible to everybody; but, as for this treatise, I believe it will be read only by those already familiar with what is found in the books on geometry. I therefore thought it superfluous to repeat demonstrations contained in them. (AT VI 368)

Similarly, in the same year (probably in late December) he writes to Mersenne:

> In the *Optics* and *Meteorology* I have only tried to persuade people that my method is better than the ordinary one, but I have proved this in my *Geometry*. For in the beginning I have solved a question which, according to Pappus, could not be solved by any of the ancient geometers.
>
> Moreover, what I have given in the second book on the nature and properties of curved lines, and the method of examining them is, it seems to me, as far beyond the treatment in the ordinary geometry, as the rhetoric of Cicero is beyond the a, b, c of children. …
>
> As to the suggestion that what I have written could easily have been got from Vieta, the very fact that my treatise is hard to understand is due to my attempt to put nothing in it that I believed to be known either by him or by anyone else. (AT I 479; Descartes 1954, p. 10)

Consequently, if I had demonstrated the technique of analytic geometry only by Descartes' own examples, it would have made the basic ideas of the approach unjustifiably difficult to follow. I shall therefore start with a very simple example, not found in his writings. I present this example according to the modern way of doing analytic geometry, which is different from Descartes' yet more accessible than his. After making the fundamentals of the approach clear, I shall give an example taken from Descartes' work.

Suppose two infinite straight lines, perpendicular to each other, are given in the plan (see Figure 3.2). Let their intersection point be O, let A be a point on one of them, and B a point on the other. We call these lines OA and OB. These are of course the famous Cartesian coordinates; Descartes never draws them in his *Geometry*, but as we shall see below he occasionally uses equivalent constructions in his book.[18]

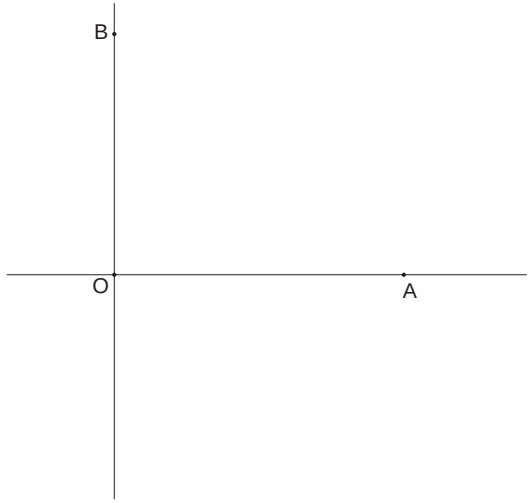

Figure 3.2 Cartesian coordinates

We are now asked to describe the lines or curves that consist of all the points whose distance from line OA equals their distance from line OB. Let us call the first distance of such a point *x*, and the second *y*:

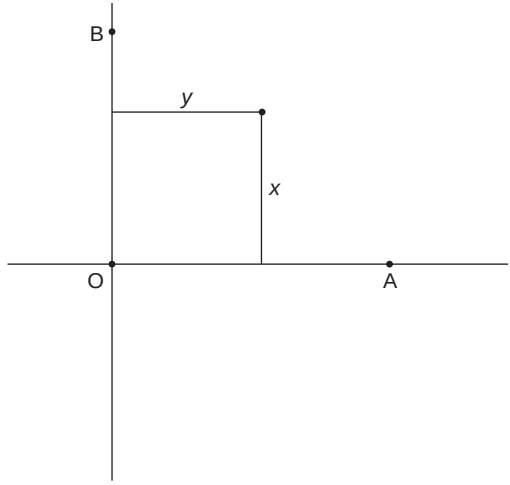

Figure 3.3 Cartesian coordinates with a point

We are thus asked to describe the lines or curves which are represented by the equation $x = y$. These can be shown to be two straight lines, intersecting at O, each creating an angle of 45° with OA:

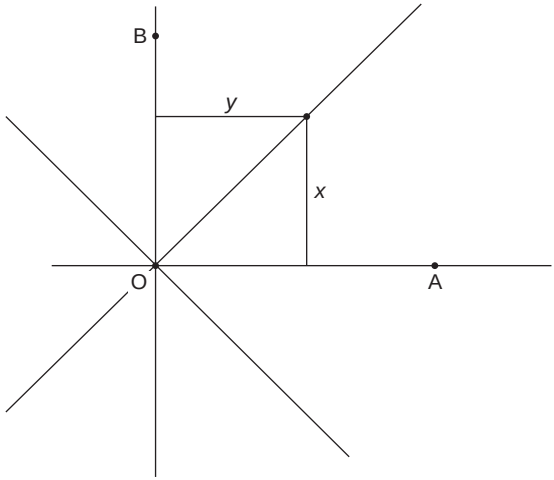

Figure 3.4 Cartesian coordinates with two lines

(I have not followed the conventions common today, according to which x and y may be *negative* numbers. First, Descartes did not use these in his book. Secondly, I defined x and y as *distances*, and these cannot be negative. This deviation from contemporary conventions does not affect my analysis below.)

In order to solve the problem, we represented distances of a point from two lines by numbers, x and y. We then wrote an algebraic equation $x = y$. This algebraic equation represents a geometrical entity: two specific straight lines in the plane. We thus have a correspondence, an isomorphism, between geometry and algebra. Entities of the latter domain represent those of the former and, as we have said, their manipulation enables us to obtain knowledge pertaining to the former domain.

This is a very powerful technique, which makes it possible to solve, by a mechanical procedure demanding little thought or originality, some problems that would otherwise be extremely difficult. It enabled

Descartes not only to solve Pappus's problem, but also to significantly extend our geometrical knowledge. And although he relied on some earlier recent work, especially Vieta's in algebra, its development was by and large his independent achievement. It is clear why he was elated by his discovery.

Let us present in some more detail Descartes' method in his *Geometry* (page references to first edition).[19] In order to solve a problem, Descartes designates (*designer*) every line by a letter (288–289). And then, he says (300), we should find the means to express (*exprimer*) the same quantity in two ways; we thus get an equation. Descartes expresses (*exprimer*) a line's length by means of an algebraic expression (he uses this word twice on page 303; cf. p. 299). For instance, when he sums up his calculation of lines' length while solving Pappus's problem, he shows that the length of each line can be expressed (*exprimer*) by three coefficients, $ax + by + c$. And when he in effect uses his Cartesian coordinates (319), he defines geometrical curves, namely those that enable precise and exact (*precise & exacte*) measurement, as those whose points bear a definite relation to all points of some straight line, a relation one can express (*exprimé*) by a single equation.

I provide one, comparatively simple example taken from Descartes' *Geometry* (pp. 342–348). Suppose we are given the ellipse CE, with GA as its axis, and we are required to draw through any point C on the ellipse a straight line CP that makes a right angle with CE (see Figure 3.5).

Suppose r is the ellipse's right side and q its transverse axis. Descartes designates AM and CB as y and CM and BA as x. He then writes the formula connecting x and y for the ellipse:

$$x^2 = ry - ry^2/q$$

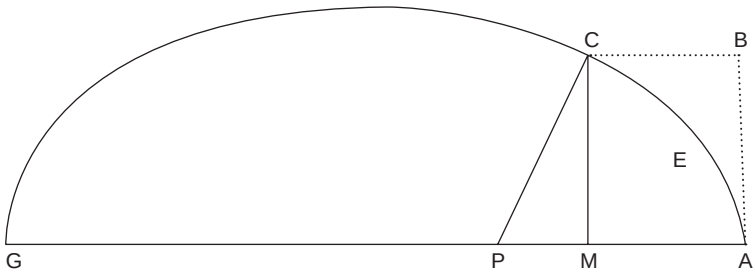

Figure 3.5 Ellipse CE with line CP at a right angle, taken from *Geometry*, page 343

Again, we have an algebraic formula representing a geometrical entity (here he effectively uses Cartesian coordinates). Descartes then designates AP as *v*. After much work, which need not be presented here, he arrives at the solution, which expresses *v* as a function of *y*:

$$v = y - ry/q + r/2$$

We thus obtain an algebraic formula which represents a geometrical relation.

Accordingly, in Descartes' analytic geometry we adequately represent geometrical entities and relations by arithmetical and algebraic ones, which do not resemble the former at all. And this is the first time in history in which a mathematical theory relating to two such isomorphic systems, and representing one of them by means of the other, was fully developed.[20]

Now in Descartes' theory of perception we again have such a representational relation: the representations – the ideas in the mind, as well as the mediating representations in the brain – do not resemble what they represent – geometrical properties of material objects; but nevertheless the representations are adequate. Is it possible that the idea of representation without resemblance of geometrical objects by algebraic expressions and vice versa made it possible for Descartes to conceive of representation without resemblance in the case of perception as well?

Nowhere in *The World*, *Optics* or any other work does Descartes give any analogy from his analytic geometry while discussing the nature of the relation between sensory ideas and perceived objects. His analogies are of the relation between words and their signification (*World*); of the relation between sensations of touch and things touched (*World*, *Optics* and *Principles*); and a few other analogies are given as well; yet there is none from his geometry. But, first, he might have avoided any such analogy because of the novelty of the idea in geometry as well: one unfamiliar innovation cannot be used to explain another. Secondly, he might not have used an analogy from analytic geometry also because of the difficulty in understanding his geometrical ideas. Descartes explicitly writes in the beginning of his *Optics* that he will try to make himself intelligible to everyone, even those who have 'little formal education' (AT VI 82–83, CSM I 152). For that reason, he writes there, he will try not 'to assume anything that requires knowledge of the other sciences'. In one of his letters (to Vatier, AT I 560, CSMK 86) he goes even further and writes that he 'wished to be intelligible in part even to women' (and he may even have succeeded in that!). His geometry definitely falls

short, given his standards of accessibility and clarity. Lastly, Descartes' analogies involve a *causal* relation, the representation being caused by what it stands for (light and idea of light, thing touched and sensation in the hand). And this is not the case in analytic geometry, where the algebraic formulas indeed stand in a relation of *structural* isomorphism to the geometrical figures, but no causal relation is involved. The lack of explicit comparison between representation in geometry and in perception therefore does not indicate lack of influence.

On the other hand, the possibility that representation in analytic geometry brought Descartes to think of representation in perception is supported by what we find in the early *Rules*. Although in that work Descartes does not claim that the mental representation need not resemble the material thing it represents, he suggests there, as we saw above, that we abstract from any other feature of colour apart from its having the character of shape or figure (*figura*; see note 3 on page 135) and conceive of the differences between colours as differences between figures. And this he suggests with regard to all other qualities, for

> the infinite multiplicity of figures is sufficient for the expression [*exprimendis*] of all differences in perceptible things. (AT X 413, CSM I 41)

Figure, he writes there, is most readily conceived by the senses, and its concept is most simple and common since it is involved in everything perceivable. Descartes relies here on the need, for the purpose of scientific investigation, of mathematicization, namely of a mathematical representation of nature (which for him means representation by geometrical entities), as the reason for the representation of sensory qualities, through abstraction, by geometrical figures.

Descartes' successes in analytic geometry, the ideal of the mathematicization of science, and the recognition of the possibility of representation by means of what does not resemble the represented, bring him in the *Rules* to represent the sensory quality by means of a formal property. Descartes suggests utilizing an isomorphism between geometrical properties and sensory qualities, driven by the possibility and fruitfulness of a different isomorphism in which geometrical properties were among the relata, the one at the basis of his analytic geometry. The isomorphism in geometry is the source of Descartes' idea of the corresponding isomorphism in perception. Moreover, while from *The World* on the representation in perception which he discusses involves a causal relation between the represented thing and the representation, this is not so in the *Rules*. In the earlier work an isomorphism between sensory qualities and figures

is supposed to be possible, just as it is also possible in analytic geometry between algebraic expressions and figures; yet the representation does not come about naturally, by means of some causal relation, but rather *we* are those who use one structure to represent the other, out of methodological considerations – again just as geometrical figures come to represent algebraic formulas in Descartes' analytic geometry.

We can also find support for the claim of influence if we examine Descartes' terminology in his discussions of geometry and of perception. First, as we saw above, when he writes in his *Geometry* that an algebraic expression stands for the length of a line, he captures this idea with the term *exprimer*, a term he also uses elsewhere in that work to express the same representational relation. And as we just saw, in the *Rules* he uses the same term in its Latin form, *exprimendis*, to capture the relation of figures to perceived things (AT X 413). In addition, later in the *Rules* he uses the same term to note that figures can express different relations or proportions (Rule 14, AT X 450); that letters can express magnitudes (Rule 16, AT X 455); and that dimensions of figures have been used to express proportions (Rule 16, AT X 456). Descartes uses the term only six times in the *Rules*, primarily to express the idea that one thing can represent another thing that does not resemble it. The fact that he uses the same term when he discusses representation both in geometry and in perception shows that he thinks of representation in the same way in both areas.

Next, the heading of the first section in the first book of the *Geometry* (297) is, *Comment le calcul d'Arithmetique* se rapporte *aux operations de Geometrie*, namely, How the calculations of Arithmetic *correspond* to the operations of Geometry (see also Table of Contents). And Descartes uses the same verb, *se rapporter*, in his *Optics* to express the relation between the images in the brain and the qualities of bodies. In the fourth discourse he writes:

> Now we must think of the images formed in our brain in just the same way, and note that the problem is to know how they can enable the soul to perceive all the various qualities of the objects *to which they correspond (auxquels elles se rapportent*) – not to know how they can resemble these objects. (AT VI 113, CSM I 166)

Descartes uses the verb *se rapporter* only four times in the first six discourses of the *Optics*; and although the other three uses are not invoked to designate the relation of representation and represented in perception, they also signify isomorphism (AT VI 83, 94, 104). The use of this verb is

thus in a very specific meaning, and is infrequent in Descartes' writings. Accordingly, the fact that he uses it to designate both the relation of algebra to geometry and of representation to the represented in perception reveals a parallelism between his thought in both cases.

We therefore have good reasons to assume that the development of analytic geometry, which relies on an isomorphism between algebraic characteristics and geometrical ones, enabled the development of a representational theory of perception in which the representation does not resemble the thing it represents but still represents it adequately. Descartes transfers the idea of adequate representation without resemblance from mathematics to perception, and in this way revolutionises the theory of perception and of representation more generally, and opens the way to new scientific theories. This possibility, which he was the first to realise, was adopted by modern science and culture, and permanently changed the way we understand perception and representation.

This contribution is also specifically philosophical. It does not involve any empirical discovery in physiology, on the nature of light or sound, of laws of energy transfer, or anything of this sort. It consists in the realisation of a conceptual possibility, and in this way it opens new horizons to empirical inquiry. It can therefore justly be classified as a philosophical contribution.

The significance of the idea of adequate representation without resemblance reaches beyond the theory of perception. It arose in mathematics, where it enabled not only the development of analytic geometry, but subsequently of the calculus as well. And it later became part and parcel of representation in science more generally.

Before we leave the subject I consider a difficulty that faces my claim on the origin in analytic geometry of Descartes' contribution to the theory of perception and representation. I maintained that Descartes' development of analytic geometry enabled him to conceive, for the first time, the possibility of the representation of one system by means of another without any relevant resemblance between the two. However, even if analytic geometry offered the first instance in mathematics or the sciences of representation without resemblance, surely all of us are familiar with this kind of representation from our everyday life: it holds between language and its objects.

In language we represent things and relations by means of words and sentences that do not resemble them at all. For instance, Jack and Jill are represented by the words 'Jack' and 'Jill'. And if Jack loves Jill, this relation between them is represented by writing or saying their names in that order, with the word 'loves' between them, 'Jack loves Jill'. So

we are all familiar with a system of representation without resemblance. It might seem analytic geometry was not needed to suggest the idea to Descartes or to anyone else.

Moreover, already in the first section of *The World*, where Descartes is interested in convincing his reader that it is possible that the idea in our thought does not resemble what causes it, the first example he gives is that of the relation of words to what they signify. I quote the two relevant paragraphs:

> Words, as you well know, bear no resemblance to the things they signify, and yet they make us conceive these things, frequently even without our paying attention to the sound of the words or to their syllables. Thus it may happen that we hear an utterance whose meaning we understand perfectly well, but afterwards we cannot say in what language it was spoken. Now if words, which signify nothing except by human convention [*qui ne signifient rien que par l'institution des homes*], suffice to make us conceive things to which they bear no resemblance, then why could nature not also have established some sign which would make us have the sensation of light, even if the sign contained nothing in itself which is similar to this sensation? …
>
> But perhaps you will say that our ears really cause us to perceive only the sound of the words … and that it is our mind which, having retained what these words … signify, represents this to us at the same time. I could reply that by the same token it is our mind which represents to us the idea of light each time our eye is affected by the action which signifies it. But rather than waste time debating the question, I prefer to bring forward another example. (AT XI 4, CSM I 81)

I omitted allusions to a different example, that between emotions and their expression.

The analogy between the relation word – significance and light – idea-of-light is different from what one might have expected: the word, the sign, is analogous to light, the objective property that is perceived, and not to the sensation, which stands for the objective property. The sensation, the idea of light, is analogous to the significance of the word, represented by the mind. Accordingly, light is said by Descartes to be the sign that signifies the sensation or idea of light, and not the other way round as we would think of the relation today. One might have expected that the word, which represents or stands for a thing or property, should be analogous to the idea, which represents the perceived property, namely

the action which is light, but that is not how Descartes considers the relations involved.[21]

But even if the direction of the analogy is surprising, it might seem we still have here an analogy between two systems that involve representation without resemblance. So language, it seems, was not only available to Descartes for the required analogy, but he even realised it as such. Why did he need analytic geometry?

The reason is, probably, the *conventionality* of language and the arbitrary correlation of words and meanings. The relations between words in a language do not contain anything that in itself bears any natural correspondence to what we can represent by language. Only through the use people make of language, only through the meaning *they* confer on its words, does such a correspondence come about. The sentence 'Jack loves Jill' in itself does not correspond to Jack's loving of Jill any more than it does to any other possible fact. Only through the use we make of it does a specific correspondence obtain.

The representation in perception, by contrast, does not involve any convention, explicit or otherwise. Our perception *naturally* represents what is perceived. This contrast of the conventional and the natural was central to philosophical thought from its earliest stages, as we witness in the contrast between *nomos* and *phusis* in early Greek philosophy. For this reason, conventional linguistic representation could not be seen as a model for natural perceptual representation.

This conventional aspect of language brings Descartes, who follows the approach predominant among his predecessors, to conceptualise the relations in which language stands in a way different from that in which he conceptualises representation in perception. He thinks of words not as *representing things*, but as *signifying ideas*, with signification construed as a causal relation between word and idea (this construal has its origins in Aristotle's *On Interpretation* 1). The conventionality of language brings Descartes to conceptualise it not as involving representation but as playing a causal role, while preserving the representational role for ideas. A system containing correspondence relations without resemblance *independently* of conventional use had to be discovered in order to infer from it the possibility of such a representation in perception as well. And analytic geometry supplied the first such instance.

As we saw above, Descartes compares the relation light – idea-of-light to that of word – signification, and not as we might have expected. We can now understand why. Descartes needed a *natural* relation to demonstrate his conception of the relation of light to its idea in our thought. The

conventional relation of word (analogous to the idea) to what it stands for (light) could not qualify, and indeed is not mentioned by Descartes. The natural relation that did occur to him is the *causal* relation between words and the ideas in our mind which they signify. The word causes the meaningful idea in the same way that light causes the idea of light. To be sure, unlike the causal relation between light and its idea, that between word and idea is established by means of teaching and practice; yet once established there is nothing conventional about it – rather, it is much like a conditioned reflex. That is why Descartes emphasises that we need not pay attention to the sound of the words, and that we may not even remember which words were spoken. Still, having brought this example, he is not entirely satisfied with it, for he realises it might draw him into debates; he therefore proceeds to different examples, this time from perception itself, from hearing and touch. It should also be noted that given the way he constructed the analogy with language and what it signifies, the representational relation between effect (idea in mind) and cause (word) is lost: all we have is dissimilarity between the idea in the mind and its cause; while the representational relation is preserved in his other examples from perception.

The language example is used only once more, in the *Optics*, condensed into a clause of less than twenty words (AT VI 112), by contrast to the elaborate and recurrent treatment of the other examples that follow it.[22] And there too, the most important fact about words is that they can *stimulate the mind* to have thoughts, and not that words represent things that they do not resemble – a fact which is not mentioned at all.

It seems that once we have reached the understanding that we can have representation without resemblance in perception, we can see the analogy with the conventional representation by means of language, and even re-conceptualise accordingly the relations in which language stands, conceiving words as representing things and not as bringing about ideas – a re-conceptualisation that was not carried out by Descartes. But we need to reach this understanding independently. What was needed was a non-conventional relation of representation without resemblance, and language could not provide it nor could it bring us to conceive of it.

4
Soul and Physiology

4.1 The living body according to Descartes

His work on *The World* brought Descartes to discuss physiology as well.[1] At the end of 1632 he writes to Mersenne:

> My discussion of man in *The World* will be a little fuller than I had intended, for I have undertaken to explain all the main functions in man. I have already written of the vital functions, such as digestion of food, the heartbeat, 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. (AT I 263, CSMK 40)

The part of Descartes' manuscript that survived and was later published under the title *René Descartes' Man* contains all the material Descartes says in this letter he intends to include in his work.

After suppressing *The World*, Descartes returned a few times to write on physiology. A summary of the material included in *Man* and a discussion of some of its subjects are contained in the fifth part of the *Discourse* (1637). Descartes also worked during the winter of 1647–1648 on a work, *The Description of the Human Body* (*Description* below),[2] which he left unfinished.[3] Some discussion of physiology can also be found in *The Passions of the Soul*, published in 1649, as well as in several letters and some excerpts preserved in a copy made by Leibniz (*Excerpta anatomica*, AT XI 549–634).

Descartes tried to ground his claims about physiology in observation. As we learn from the letter to Mersenne quoted above, he dissected animals for that purpose. In 1639 he writes to Mersenne

that he spent so much time on dissection since 1629 that he doubts whether any doctor has made such detailed observations as he had (20 Feb 1639, AT II 525). His writings indeed contain references to observations of, and experiments on the dissected bodies of animals, and he even performed vivisections. He describes, for instance, observations he made on the heart of a living rabbit on which he operated, while dissecting and tying its blood vessels (to Plempius, 15 Feb 1638, AT I 526–527; *Description*, AT XI 243); and also observations he made on a living eel's heart (to Plempius, 23 Mar 1638, AT II 66). We can also learn from his writings that he was present at posthumous dissections of humans. For example, he describes what one feels when one inserts a finger into a human heart, and what one sees when a human heart is cut open (*Description*, AT XI 228–230); and he also describes an autopsy of a woman in Leiden at which he was present (to Mersenne, 1 Apr 1640, AT III 49). (From this last letter it is implied that Descartes himself never performed dissections of humans, and it is indeed highly unlikely that he could have had the opportunity for that.) Descartes even writes that he hesitated to put in writing his opinions on the formation of the human body, for he has not been able to perform sufficient observations to confirm them (*Description*, AT XI 252–253); and that he will not finish his treatise on animals until he has made the many observations essential for that (to the Marquess of Newcastle, Oct 1645, AT IV 326). Similarly, his work on physics had to wait until the plants in his garden, which he needed for some experiments, had grown (to Chanut, 15 June 1646, AT IV 442).

Despite his many experiments and observations, Descartes' original physiological hypotheses are extremely speculative: he makes claims about the micro-physiology of the body that are devoid of any observational basis and which, as we shall see, are in general completely wrong, his usual confidence notwithstanding.

Descartes thinks of the human body, and of the animal body generally, as a hydraulic machine. The heart is a kind of boiler, which heats the blood that enters it and causes it to rarefy and expand, and in this way makes it flow into the arteries. Unlike Harvey, Descartes did not think of the heart as a muscle pump, and he even argues at length against Harvey on this point (*Description*, AT XI 241–245).

The heating in the heart is a result of a fermentation process:

> [God] kindled in [man's] 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. (*Discourse*, AT VI 46, CSM I 134)

Descartes also compares the heat generated, in his opinion, from the mixing of the seed of man and woman (whom he thought also has seed fluid) to that generated in the fermentation of new wine or wet hay (*Description*, AT XI 254). Another analogy used in the *Description* for the heart's heat and for that of the seed mixture is the heat generated when the yeast added to dough makes it swell (AT XI 228, 253). Descartes also compares the process of digestion to the fermentation of wet hay (*Man*, AT XI 121), and the alleged formation of blood from food particles in the liver he compares again to the fermentation of new wine (ibid., 123). From what he writes in a letter to Plempius (15 Feb 1638, AT I 530–531), it appears that these are more than similar processes, for blood, according to Descartes, is composed mainly of bread (and wine and beer?), to whose fermentation the swelling of the heart is compared.

Fermentation processes have, as we see, an important and basic role in the operation of the living body, according to Descartes. We can say that they are the main source of life energy. In this Descartes is influenced by Galen, Fernel and others, who also considered various processes in the body as fermentation processes and compared them to the fermentation of new wine.[4] Galen, for instance, wrote of the formation of blood in the liver as follows:

> To make a more vivid comparison, it would be better to liken the chyle carried up from the stomach to the liver by the veins ... to a fluid or humor, preconcocted and already elaborated, but still needing its concoction to be completed. Let us, then, compare the chyle to wine just pressed from the grapes and poured into casks, and still working, settling, fermenting, and bubbling with innate heat. ... In making this comparison, think of the chyle sent up from the stomach to the liver as bubbling and fermenting like new wine from the heat of the viscus and beginning to change into useful blood. (*De usu partium*, Bk. IV, Chapter 3; 1968, Vol. I, pp. 205–206)

The blood's main functions according to Descartes are, first, to heat the body, and in this way make possible the various processes that occur in it; and, secondly, to nourish the body. The function of breathing is to thicken the blood by cooling it, so that it can sustain the fire in the heart (*Man*, AT XI 124; *Discourse*, AT VI 53; *Description*, AT XI 236–237).

The most agitated and penetrating blood particles flow to the brain directly from the heart, and there they not only nourish the brain, but also form the animal spirits (*esprits animaux*). These are 'like a very fine wind, or rather a very pure and lively flame' (*Discourse*, AT VI 54, CSM I 138; cf. *Man*, AT XI 129; we should remember that for Descartes, as for all the naturalists up to his time, fire is a kind of matter, or even an element). From the brain, where they flow out from the pineal gland ('gland H' in *Man*), the animal spirits spread through the nerves. The nerves, like the blood vessels, are tubes; and they carry this gas-fire, the animal spirits.

The animal spirits cause the body to move, by changing the form of the muscles reached by the nerves in which they flow. The spirits open or close various valves, according to the strength and direction of their flow, and in this way inflate or deflate muscles, which move the parts of the body (*Man*, AT XI 130–141).

The nerves are also responsible for the reaction to external stimuli. When external bodies strike against a sense organ, nerves that originate in the brain and terminate at the sense organ are moved and immediately pull and open various tiny entrances to nerves in the internal parts of the brain. Consequently, animal spirits that emerge from the pineal gland flow into the opened nerves, and they can then bring about various kinds of response (*Man*, AT XI 141–142).

Descartes also gives physiological explanations of character traits (like generosity, liberality, curiosity and others) and moods (tranquillity, restlessness, courage – the distinction from character traits is not always clear); these are determined, among other things, by the abundance, coarseness, agitation and uniformity of animal spirits (*Man*, AT XI 166–167).[5]

The external bodies, perceived by our senses, are represented on the surface of the pineal gland. This representation is by the pattern of flow of animal spirits out of the gland. Let us clarify this by means of a description of how sight takes place, this being the sense discussed in most detail by Descartes.

The light originating at arrow ABC (see Figure 4.1) forms on each retina an image of the arrow. From each retina originate nerves – together they form the optic nerve – that go to the inner surface of the brain facing the pineal gland. Light being a form of pressure, the light rays originating at point A on the arrow press against the retinas at points (1). By this pressure they pull the nerves originating at these points, and increase the openings of the same nerves facing the pineal gland at points (2). Similarly, the light rays originating at points B and C

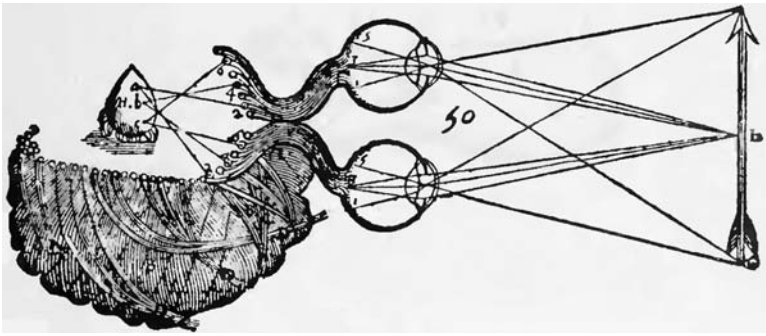

Figure 4.1 Descartes' physiology of vision, taken from *Man*, AT XI 747

increase, respectively, the openings of the nerves (4) and (6). In this way, in the same manner that a figure (*figure*) which corresponds (*se rapporte*) to the arrow is formed on each retina, figures that correspond to the arrow are formed on the internal surface of the brain facing the pineal gland. Next, the animal spirits flowing out of the pineal gland's surface at *a* tend to enter the opening of the nerve tubes (2), those flowing out at point *b* tend to enter (4), and *c* (6). And so, in the same manner that the opening of the nerve ends forms a figure that corresponds to the arrow ABC, the pattern in which the animal spirits flow from points *a*, *b* and *c* forms a figure corresponding to the same arrow on the surface of the pineal gland.

Descartes emphasises at this place (AT XI 176) that the figures represent (*representent*) not only lines and surfaces of bodies, but also motion, colour, sound, smell and such qualities; and in addition that they represent things that make the soul feel pleasure, pain, hunger, thirst, joy, sadness, and other passions. We see again that by representation and correspondence Descartes does not necessarily mean resemblance.

The figures formed on the surface of the pineal gland are the ideas (*idées*), namely, 'the forms or images that the rational soul will consider directly (*les formes ou images que l'Ame Raisonnable considerera immediatement*) when, united to this machine, it imagines or senses some object' (AT XI 177). We shall return to this union later, yet up till now, as well as to the end of *Man*, Descartes has not ascribed any function to this rational soul or mind. Moreover, the figures, images or ideas were characterised only *materially*: they were described as patterns of flow of animal spirits from the surface of the pineal gland.

The pineal gland is the seat of the common sense (which is, roughly, the faculty of sensation) or imagination. When the origin of the ideas formed on it is an external object, they should be attributed to sensation; when their origin is different, they belong to the imagination.

In addition, when the animal spirits flow in the brain area designated *B* in Figure 4.1, they shape in various ways the soft material of which it is made. And the more they flow in that area, the more they shape it according to their flow. In this way memory is formed: when several nerve tubes open again, because of a certain image *I*, other tubes, which were often opened with them, will be opened as well, and an image *J* will be formed, which is a memory of an image that often appeared together with *I* (AT XI 177–179). In his letters Descartes compares memory in the brain to the folds that remain in a paper or fabric after it had been folded and straightened back again, and which make it easier to fold the paper or fabric again the way it has been folded in the past (to Meyssonnier, 29 Jan 1640, AT III 20; to Mesland, 2 May 1644, AT IV 114). In a later letter he repeats the analogy, together with the following example:

> The objects which strike our senses move parts of our brain by means of the nerves, and there make as it were folds, which undo themselves when the object ceases to operate; but afterwards the place where they were made has a tendency to be folded in the same manner by another object resembling even incompletely the original object. For instance, when I was a child I loved a girl of my own age who had a slight squint. The impression made by sight in my brain when I looked at her cross-eyes became so closely connected to the simultaneous impression which aroused in me the passion of love that for a long time afterwards when I saw persons with a squint I felt a special inclination to love them simply because they had that defect. (to Chanut, 6 June 1647, AT V 57, CSMK 322)

This anecdote is of course an example of what has to be explained, and not a justification of Descartes' explanation of it.

We see that Descartes thinks of the structure of the brain as plastic and shaped by experience. This enables him to ascribe to material beings the ability to remember and learn (see also *Man*, AT XI 192).

The animal spirits flowing from the pineal gland are influenced by the perceived objects, but they, in their turn, break into additional nerves, according to their pattern of flow, and in this manner they can bring about movements, which are reactions to the perceived objects. In this way ideas cause us to move (AT XI 181). Descartes shows, in relative

detail, how our responses depend on the external objects, and also on the properties of the animal spirits and the position of the body organs when we sense anything (AT XI 179–197). He even explains there the limitations of attention (185–186).

Descartes concludes his physiological discussion by explaining sleeping and dreaming (AT XI 197–200). While asleep, the brain is slack or relaxed compared with the waking state, and in this way the nerve tubes connecting the brain to the sense organs are blocked, and consequently the latter cannot, apart from exceptional cases, influence the flow of animal spirits and through them the pineal gland. For the same reason, the animal spirits cannot reach the external bodily parts and move them. Dreaming depends on the power of the animal spirits and on memory. The images formed while dreaming are clearer and livelier than those formed in the imagination while awake, for the same power of animal spirits can open the slack nerve tube valves more than it can during the waking state, when the brain is firm.

Descartes describes the body as a hydraulic machine. Indeed, his explicit model for the living body is the hydraulic mechanisms that were built in his days in the gardens of kings and nobles:

> Similarly you may have observed in the grottos and fountains in the royal gardens that the mere force with which the water is driven as it emerges from its source is sufficient to move various machines, and even to make them play certain instruments or utter certain words depending on the various arrangements of the pipes through which the water is conducted.
>
> Indeed, one may compare the nerves of the machine I am describing with the pipes in the works of these fountains, its muscles and tendons with the various devices and springs which serve to set them in motion, its animal spirits with the water which drives them, the heart with the source of the water, and the cavities of the brain with the storage tanks. Moreover, breathing and other such activities which are normal and natural to this machine, and which depend on the flow of the spirits, are like the movements of a clock or mill, which the normal flow of water can render continuous. External objects, which by their mere presence stimulate its sense organs and thereby cause them to move in many different ways depending on how the parts of its brain are disposed, are like visitors who enter the grottos of these fountains and unwittingly cause the movements which take place before their eyes. For they cannot enter without stepping on

> certain tiles which are so arranged that if, for example, they approach a Diana who is bathing they will cause her to hide in the reeds, and if they move forward to pursue her they will cause a Neptune to advance and threaten them with his trident; or if they go in another direction they will cause a sea-monster to emerge and spew water onto their faces; or other such things according to the whim of the engineers who made the fountains. (*Man*, AT XI 130–131, CSM I 100–101)

The royal gardens which Descartes describes here are in essence those in Saint-Germain-en-Laye in Paris, which he probably visited.[6] These gardens were built between 1589 and 1609 and were a very impressive technological achievement of the age, as we can learn from contemporary writings. They contained not only machines that moved various figures, like those described here by Descartes, but also systems that imitated bird song.[7] A description of the gardens, which also includes a description of some of the mechanisms they contained, is found in Salomon de Caus's book, published in 1615, *Les raisons des forces mouvantes*,[8] a book that Descartes

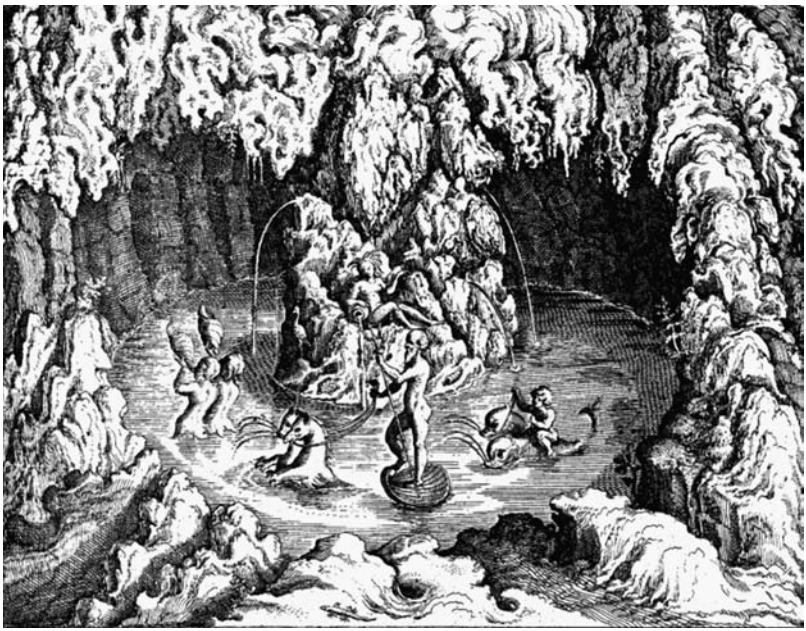

Figure 4.2 Salomon de Caus, *Les raisons des forces mouvantes*, illustration to problem 27

probably read.[9] One of the illustrations in the book even depicts Diana and Neptune in a way similar to the way in which Descartes describes them in the quotation from *Man* above (see Figure 4.2).

Descartes was familiar with the sophisticated hydraulic systems of his day and with their mechanisms. He adopts and adapts these mechanisms to prevalent physiological theories, and in this way creates his model of the living body.[10]

4.2 Life without soul, soul without life

Did Descartes make any important contribution to physiology? Many of the ideas that we find in his writings on the subject are derived from the theories of his predecessors, either from antiquity or the Renaissance. Hall, in the section 'Derivative Nature of Descartes's Physiology' in his essay preceding his edition and translation of *Man* (Descartes 1972, pp. xxxi–xxxiii), writes that his most important objective in his detailed commentary was 'to emphasize a central point about Descartes's biological endeavour, namely its highly derivative nature'. Hall specifies the sources with which Descartes was familiar and to which he is indebted, and remarks that, while Descartes declares 'his intention to discard traditional ideas and build a new image of man by proceeding deductively, as in geometry, from self evident axioms ... the actual result is far from the indicated purpose' (ibid., xxxi). Hall also notes there that Descartes makes very few allusions to the authors to whom he is indebted.[11]

Moreover, Descartes did not make any important physiological discovery.[12] Occasionally he even upholds the mistakes of his predecessors, relying on tradition in face of recent innovations and discoveries. Even his knowledge about the notorious pineal gland was partial compared with what was available in his day.[13] But the most glaring example are probably his arguments against Harvey, while relying on tradition (*sic*), arguments intended to show that unlike what Harvey claimed to be the case, the heart does not push the blood by its action as a muscle but by heating the blood (to Plempius, 15 Feb 1638, AT 527, 531; *Description*, AT XI 241–245).[14] And although Descartes enthusiastically accepted Harvey's discovery of the circulation of the blood and in this way helped its promulgation, he did not integrate it properly into his theory of the flow of the animal spirits in the nerves: this still preserves the older approach by having bidirectional flow in the same vessels (in this case, the nerves), which is hard to reconcile with the idea of circulation. For instance, Descartes does not provide an explanation of how the spirits, continuously flowing out of the pineal gland and into the brain cavities

and nerves, return to the circulation or are drained from the system so as not to flood it.

In addition, and again in contrast to Harvey, despite his ideal of the mathematization of science, quantitative considerations play no role in Descartes' actual physiology. We saw that Descartes thought of the living body as composed of particles that have only geometrical properties; moreover, these particles obey simple laws of motion. Consequently, the science discussing the properties of the living body can in principle be, in his opinion, a mathematical science. And accordingly he writes on the formation of the foetus:

> Now since the solid parts of the tiny filaments are composed, turned, folded, and intertwined in various ways, following the various routes of fluid and fine matters which surround them, and following the shapes of the places where they encounter one another, if one had good knowledge of all the parts of the seed of some species of a particular animal, man for example, one could deduce from this alone, *by entirely certain and mathematical arguments*, every shape and structure of each of its bodily parts. (*Description*, AT XI 276–277, Descartes 1998, p. 200; emphasis added)

But despite this ideal, Descartes' explanations are, as we have seen, extremely speculative, and they do not involve typical mathematical considerations, either from geometry or from arithmetic. The simple arithmetical considerations of Harvey, when estimating the quantity of blood that flows through the heart in half an hour (1628, Chapter IX), surpass anything found in Descartes' physiology.

Furthermore, Descartes' innovative physiological ideas, for instance his explanation of memory and imagination, were almost entirely devoid of observational support and were proven radically mistaken. Here as well we do not find any significant Cartesian contribution to physiology.

It is perhaps worth noting in this context that Descartes, with typical exaggerated self-confidence, was convinced of his ideas concerning the way the nerves move the bodily parts by means of animal spirits, although he knew that in some parts nerves have not even been observed:

> And you will have no difficulty in concluding from the foregoing that the animal spirits are able to cause movements in all bodily parts in which the nerves terminate, even though anatomists have failed to find any that are visible in parts such as the eye, the heart, the liver,

> the gall bladder, the spleen, and so on. (*Man*, AT XI 138, Descartes 1998, p. 114)

Later in *Man* Descartes argued for his ideas on the behaviour of animal spirits in the brain, in the face of lack of supporting observations, by claiming that they rely on mechanisms known from other parts of the body, and in organisms generally; and by claiming that they are very simple and small in number, and it is known that nature always acts by the simplest and easiest means (AT XI 200–201).

All these ideas of Descartes' were of course found mistaken: already in 1674, 24 years after Descartes' death, Antonius van Leeuwenhoek (1632–1723) published the results of his observations of nerves through the microscope:

> Some anatomists affirm'd the Optic Nerve to be hol'ow, and that themselves had seen the hollowness, through which they would have the Animal spirits, that convey the visible species, represented in the eye, pass into the Brain; I thereupon concluded with my self, that, if there were such a cavity visible in the Nerve, that it might also be seen by me, especially since, if it be so it must be pretty bigg, and the body pretty stiff, or else the circumjacent parts would press it together. And in order to this discovery, I sollicitously view'd three Optic Nerves of Cows; but I could find no hollowness in them; I only took notice, that they were made up of many filamentous particles, of a very soft substance, as if they only consisted of corpuscles of the Brain joined together, the threds were so very soft and loose: They were composed of conjoined globules, and wound about again with particles consisting of other transparent globules. (van Leeuwenhoek 1674, pp. 179–180)[15]

These observations brought about the gradual abandonment of the model of nerves as tubes conducting some refined liquid, gas or fire, a model that has been dominant for more than two millennia, since the time of Alcmaeon. A few years later, William Briggs (1650–1704) suggested that nerves transfer signals by means of vibrations, like a spider's web.[16] And Newton, in his 1704 *Opticks*, further developed the idea that the optic nerve, being made of solid fibres, transmits information by means of vibrations, to explain various characteristics of sight (Queries 12–16, pp. 135–137). Descartes' ideas of the structure and functioning of the nervous tissue were found fundamentally mistaken. A similar fate awaited his other specific physiological ideas.[17]

In fact, when Descartes' detailed physiological ideas were first published, posthumously, in 1662 (*Man*) and 1664 (*Description*), the leading physiologists of the period, who had been significantly influenced by Descartes' more programmatic *Discourse* of 1637 and other writings, were disappointed. Brown mentions the annoyance and disgust of Borelli and his associates, who have by then far surpassed these books by actual anatomical achievement (1968, p. 91). Nicolas Steno, deeply influenced by Descartes' mechanistic program, found it necessary to apologetically justify Descartes' mistaken physiology in his Paris lecture of 1665:

> Descartes was too clever in exposing the errors of current treatises on man to be willing to undertake the task of expounding the true structure of man. Therefore in his essay on man he does not attempt such a delineation, but is content to describe a machine capable of performing all the functions of which man is capable. And in this sense we may affirm without exaggeration that Descartes bears the palm over all other philosophers in this matter.[18]

Later in the seventeenth century, physiologists were dismissive when mentioning Descartes' physiology. Whether they accepted his general hydraulico-mechanical approach to physiology, as did Archibald Pitcairn (1652–1713) and Herman Boerhaave (1668–1738), or rejected it, as did Georg Ernst Stahl (1660–1734), they found no help or interest in his specific physiological ideas.[19]

Yet despite all these weaknesses, Descartes made a decisive contribution to physiology. This contribution, as was partly apparent in the quotation from Steno, lies not in his positive physiological explanations but in the kinds of explanation to which he limited physiology: explanations that do not involve the soul as a special principle of life. Descartes explained life, with the large variety of phenomena that characterise it, without any recourse to the soul as a special principle but only by reliance on the same principles and laws that apply to inorganic nature as well. In this way he set a model of physiological explanation and reshaped that science.[20] His contribution is not that of an experimentalist or of a theoretician who builds on accumulated empirical knowledge, but that of a philosopher who redefines our concepts or methods.

Descartes' aim in his physiology was to provide a mechanistic explanation of the phenomena he considered, namely an explanation by means of motions and collisions of particles of the same kind that he used to explain the structure of the inanimate universe, particles whose motion

obeys the same laws it obeys when occurring in inanimate nature. For that reason he tried to give a mechanistic explanation to the organic phenomena he discusses.

These attempts have, as a rule, failed. As we saw above, Descartes' original ideas about the micro-physiology of the body are by and large mistaken. Moreover, as we saw, Descartes explains by means of fermentation processes the formation of heat in the heart and accordingly its mode of operation, the formation of the foetus, digestion and the formation of blood. And these processes are at the basis of all organic processes according to him. Descartes indeed tried to explain fermentation by means of his particle mechanics (*Principles* IV 92), but he of course failed – the knowledge of chemistry at the time was far from sufficient for that purpose. So Descartes did not manage to explain even the basic processes of life by means of principles that also apply to inorganic nature.

But irrespective of all these failures, we find in Descartes' physiology only explanations that rely on forces and phenomena that exist in inorganic nature as well: mechanical, hydraulic and chemical explanations. There is no recourse to the soul as a special active agent in the phenomena of life. Descartes sees the living body as a natural machine.

Descartes emphasises time and again this aspect of his approach. Already in the opening paragraphs of *Man* he describes the human body as a statue or machine created by God, a machine that walks, eats, breathes and generally has 'all those of our functions which can be imagined to proceed from matter and to depend solely on the disposition of our organs' (AT XI 120, CSM I 99). And he continues:

> We see clocks [*des horloges*], artificial fountains, mills, and other such machines which, although only man-made, have the power to move themselves in many different ways. But I am supposing this machine to be made by the hands of God, and so I think you may reasonably think it capable of a greater variety of movements than I could possibly imagine in it, and of exhibiting more artistry than I could possibly ascribe to it. (ibid.)

The living creature moves itself, as do the artefacts Descartes mentions. And this ability of theirs is used by him in order to support the basic principle of his physiology: life should be explained only by forces and principles that exist in inanimate nature as well, and no recourse to a soul as a special principle should be made in the course of these explanations.

Accordingly, in the last paragraph of *Man*, after having mentioned all the functions of the living creature he explained in the book, Descartes concludes:

> I should like you to consider that these functions follow from the mere arrangement of the machine's organs every bit as naturally as the movements of a clock or other automaton follow from the arrangement of its counter-weights and wheels. In order to explain these functions, then, it is not necessary to conceive of this machine as having any other vegetative or sentient soul, or any other principle of movement and life, apart from its blood and its spirits, which are agitated by the heat of the fire burning continuously in its heart – a fire which has the same nature as all the fires that occur in inanimate bodies. (AT XI 202, CSM I 108)

Again, the comparison of the human body to automata, primarily to a clock, provides support to the claim that our body is a natural, God-made machine, a machine which 'operates', that is lives, without any need for a special principle or agent, namely a soul.

These idea and comparison return in the *Description of the Human Body*:

> I will now try ... to give such a full account of the entire bodily machine that we will have no more reason to think that it is our soul which produces in it the movements which we know by experience are not controlled by our will than we have reason to think that there is a soul in a clock which makes it tell the time. (AT XI 226, CSM I 315)

And the analogy between the living creature and an automaton or clock is also used by Descartes in order to explain the difference between the living and the dead without any need for a soul. 'A very serious error which many have fallen into' consists in supposing that the absence of the soul causes the cessation of movement and heat in dead bodies.

> So to avoid this error, let us note that death never occurs through the absence of the soul, but only because one of the principal parts of the body decays. And let us recognise 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. (*Passions* I 5–6, AT XI 330–331, CSM I 329–330)

We see how dominant in Descartes' thought and argument is the analogy between the living creature and the clock or clockwork automaton. This analogy is also found in the *Discourse*, Descartes' first published work, through which these ideas began to acquire their wide influence. Again, after mentioning all the functions of the living body he explained in *Man*, functions that do not necessitate seeing man as more than a machine, Descartes concludes:

> This will not seem at all strange to those who know how many kinds of automata, or moving machines [*divers* automates*, ou machines mouvantes*], the skill of man can construct with the use of very few parts, in comparison with the great multitude of bones, muscles, nerves, arteries, veins and all the other parts that are in the body of any animal. For they will regard this body as a machine which, having been made by the hands of God, is incomparably better ordered than any machine that can be devised by man, and contains in itself movements more wonderful than those in any such machine. (Part Five, AT VI 55–56, CSM I 139)

Descartes repeatedly uses the analogy between the living body and the automaton to justify and convince the reader of his position, that life does not necessitate a soul and that the body can be conceived as a natural machine in order to explain life. The importance of this analogy and its prevalence in his writings indicate that it helped Descartes himself reach this position. Some earlier philosophers and scientists have also compared some *aspects* of animal and human motion and life to the actions of automata, but Descartes was the first to think that a living yet mind-less creature is *nothing but* a natural automaton.

The earliest comparison of the motion of animals to that of automata is probably Aristotle's. In *On the Motion of Animals* he wrote:

> The movements of animals may be compared with those of automatic puppets, which are set going on the occasion of a tiny movement; the levers are released, and strike the twisted strings against one another; or with the toy wagon. For the child mounts on it and

> moves it straight forward, and then again it is moved in a circle owing to its wheels being of unequal diameter (the smaller acts like a centre on the same principle as the cylinders). Animals have parts of a similar kind, their organs, the sinewy tendons to wit and the bones; the bones are like the wooden levers in the automaton, and the iron; the tendons are like the strings, for when these are tightened or leased movement begins. (7, 701b1*f*)

Aristotle compares in this passage mechanical aspects of animal motion to those of 'automata', but the ability of automata to move on their own is irrelevant to him (and in fact that was not the case with the puppets he describes): he immediately continues to compare animal motion, in the same respect, to the motion of something which is moved by an *external* cause, namely the toy wagon. While Descartes' main reason for comparison concerned the principle of self-movement, what interested Aristotle were only some limited aspects of how motion is *transmitted* from some organs to others, how one kind of motion is transformed to another, and probably the principles that make small movements cause large ones (see de Groot 2008).

Moreover, even in this respect Aristotle thinks the analogy with mechanical motion is limited, as we read in the passage following the one quoted above:

> However, in the automata and the toy wagon there is no change of quality, though if the inner wheels became smaller and greater by turns there would be the same circular movement set up. In an animal the same part has the power of becoming now larger and now smaller, and changing its form, as the parts increase by warmth and again contract by cold and change their quality. This change of quality is caused by imaginations and sensations and by ideas.

The change of quality through psychological causes as what distinguishes the living creature from the automaton is far from what we find in Descartes.

Related ideas are found in Aristotle's *On the Generation of Animals* (II.1 734b*ff*): the male parent imparts motion to the semen, which by means of this motion forms the various parts of the embryo, and this transmission of motion proceeds 'as with the automatic machines shown as curiosities': A moves B which moves C. But Aristotle discusses in detail why the semen must have, in order to do that, a sentient soul, imparted to it by the male.[21]

A deeper influence of mechanical devices on physiological thought than that found in Aristotle is to be found in late antiquity, due primarily to the development of pneumatic and mechanical devices in Hellenistic times. Galen, when considering the formation of the foetus, follows the discussion of Aristotle in *On the Generation of Animals* and suggests the following possibility:

> What happens is like the case of those who engineer theatrical devices: they provide the first impetus of the motion and then depart, so that their devices continue to move – by design – for a short space of time. It could be that in the same way the gods, once they have constructed the seeds of plants or animals in such a way as to be able to perform this enormous transmission of motions, no longer act themselves. (*On the Formation of the Foetus*, 4.688–9)

Galen then rejects this idea, but we see that an automatic, mechanical process was recurrently considered as a possible model for at least the formation of the foetus by the seed: in this formation it is more difficult to ascribe activity to a soul, since the soul of the parents seems not to be present any longer while that of the offspring is not yet there.

At roughly the same time, Alexander of Aphrodisias, while also considering the generation of animals in the context of discussing Aristotle's work of that title, refers to the machine model in order to make plausible, as Berryman writes, the possibility 'that the organism can be designed so that the sequence of changes happens automatically within it, and yet it produces the intended result' (Berryman 2009, pp. 209–210).[22]

In these authors the comparison of physiological processes to the action of automata seems limited to the specific process of the generation of the foetus, following Aristotle's discussion in the *Generations of Animals*. But the comparison appears full-blown in Gregory of Nyssa (fourth century CE), who even suggests that humans have no *intelligent* essence but act in virtue of some kinetic power that resides in their elements, an idea at which he arrives from considering machines that skilfully imitate nature in appearance, motion and voice (*On the Soul and the Resurrection*, 46.36.36). As Descartes realised, the nature of such automata cannot support the hypothesis that rational behaviour, and not merely purposeful behaviour, is the product of mechanisms; and Gregory proceeds to reject the suggestion (although for different reasons than Descartes'). The hypothesis that all and *only* biological processes are due to automatic mechanisms is not considered by Gregory or by anyone else in late antiquity.

We do witness, however, the pressure exerted by the development of complex machinery and automata on physiological theory. In the late sixteenth century, with the revival of Greek pneumatic technology and the development of clockwork technology and clockwork automata, this pressure will be revived and amplified, eventually bringing Descartes to revolutionise physiological thought.[23]

A different kind of comparison of animals to clocks and other artefacts is found in Aquinas, who wrote:

> The power of the mover appears in the movement of that which it moves. Accordingly, in all things moved by reason, the order of reason which moves them is evident, although the things themselves are without reason: for an arrow through the motion of the archer goes straight towards the target, as though it were endowed with reason to direct its course. The same may be seen in the movements of clocks and all ingenious devices put together by the art of man. [*Et idem apparet in motibus horologiorum, et omnium ingeniorum humanorum, quae arte fiunt*.] Now as artificial things are in comparison to human art, so are all natural things in comparison to the Divine art. And accordingly order is to be seen in things moved by nature, just as in things moved by reason, as is stated in *Physics* ii. And thus it is that in the works of irrational animals we notice certain marks of sagacity, in so far as they have a natural inclination to set about their actions in a most orderly manner through being ordained by the Supreme art. (*Summa Theologica*, First Part of Part II, Question 13, Article 2, Reply to objection 3)

Indeed God is, here, the divine artist, whose relation to animals is like that of man to clocks, ingenious devices, *and flying arrows*, namely, to the things man makes or moves so that their motion has an end. But we are not told that animals are natural machines moved by mechanisms, any more than they are 'natural arrows' moved by impetus and gravity. What we are told is that the natural principle responsible for animal action and inclination reflects God's sagacity in its operations; and this natural principle can still be a soul that operates unlike anything in the inorganic world – as indeed it was for Aquinas.

The problem that confronted Aquinas is different than the issue that concerned Descartes. Aquinas, like Aristotle and Descartes, thought that animals do not have a mind, and he therefore tried to explain, by means of his analogies, why the marks of *wisdom* in animal behaviour do not

indicate that they have a mind. Descartes, by contrast, argues that their *life* does not indicate that they have an immaterial principle responsible for it. That is also the reason why Aquinas focuses on the *end* apparently pursued by human artefacts, while Descartes is interested in their *mechanism*. In fact, Aquinas's *horologium* is probably a water-clock or even a sun dial and need not signify anything with a complex mechanism, as reliable evidence for clocks moved by weights that contained an escapement does not exist prior to 1283 (The Annals of the Priory of Dunstable), a decade after Aquinas's death.[24]

To explain the origin of this analogy and its importance in the formation of Descartes' thought, I shall say a few things on the early development of these automata.[25]

Around the middle of the sixteenth century, clockwork automata in the form of humans and animals that operate by an internal source of energy, a spring, were first developed. One of the earliest descriptions of these automata is by Johann Neudörfer in 1547, who writes that Jakob Bülmann of Nuremberg made 'clockwork figures of men and women that walked around and struck their measure upon lutes and kettle drums'.[26] One such early automaton, of a woman who walks and plays the lute, survived and is found today in the Kunsthistorisches Museum in Vienna. The automaton moved forward or in circles, lifted its feet one after the other and turned its head (Hillier 1976, p. 21). Its ascription to Bülmann is uncertain, though, and it is often ascribed to Gianello della Torre.

Della Torre (Juanelo Turriano in Spanish) of Cremona (1500–1585), one of the greatest Renaissance engineers, is the most renowned early automata builder.[27] Della Torre moved to Spain to work mainly as a clockmaker for the emperor Charles the Fifth, and, after the latter's death (1558), mainly as architect and engineer for his son, Phillip the Second. Della Torre is reported to have built various automata to amuse Charles when the emperor retired to a convent, and he may have built some automata for Fillip as well. Very few automata that can be attributed to him survive.

One such automaton is of a monk, today at the Smithsonian Institution in Washington (Figure 4.3). The mechanism of this automaton has been repaired and one can see it operating. 'The monk walks in a square, striking his chest with his right arm, raising and lowering a small wooden cross and rosary in his left hand, turning and nodding his head, rolling his eyes, and mouthing silent obsequies' (King 2002). Watching the monk is impressive to this day.[28]

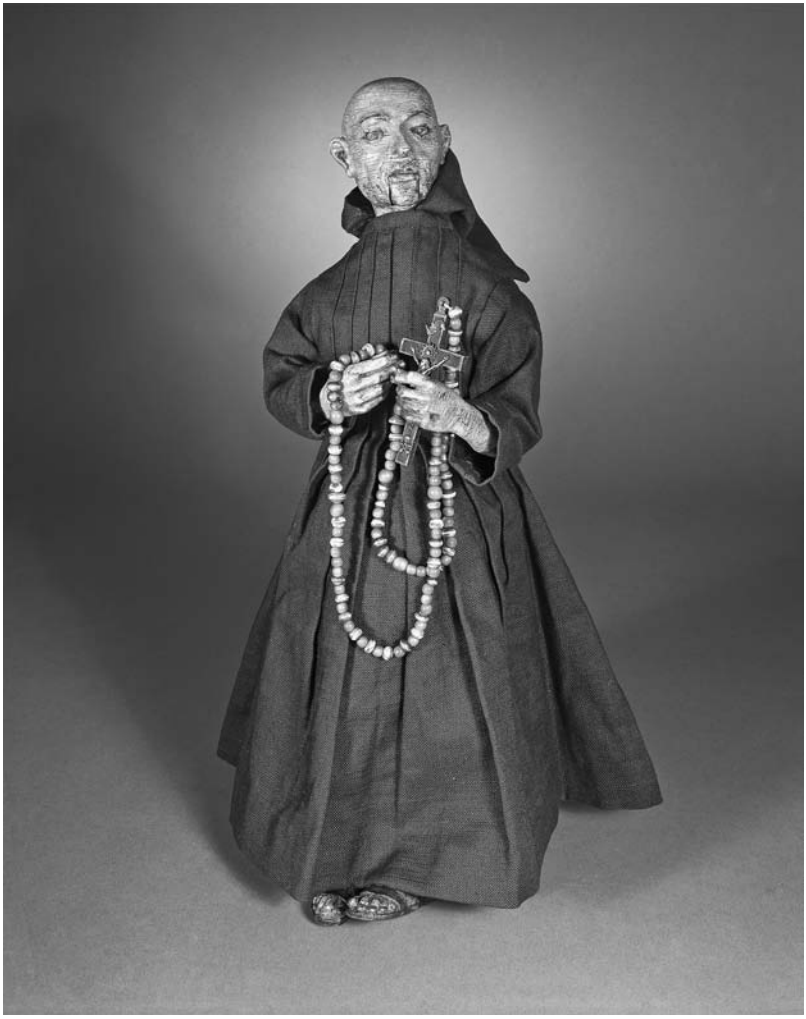

Figure 4.3 A sixteenth century automaton, attributed to della Torre, now at the Division of Work & Industry, National Museum of American History, Smithsonian Institution

Another important early automata builder was Hans Schlottheim (Naumburg an der Saale 1545, Augsburg 1625). A few clockwork automata by him of miniature ships have survived, which moved and had on their decks figures of people who moved and engaged in a variety of

Figure 4.4 A sixteen century automaton, attributed to Schlottheim (image copyright akg-images)

activities. Schlottheim also constructed automata imitating living creatures. The old woman automaton in Figure 4.4 may be his. This automaton moved, apparently leaning on its sticks and moving them.[29]

Della Torre's automata are described by Famianus Strada in a book published in 1632–1647. The paragraph relevant to our discussion is the following:

> For often, when the Cloth was taken away after dinner, he [della Torre] brought upon the board little armed figures of Horse and Foot, some beating Drums, others sounding Trumpets, and divers of them charging one another with their Pikes. Sometimes he sent wooden sparrows out of his chamber into the Emperour's Dining-room, that would flie round, and back again; the Superiour of the Monastery, who came in by accident, suspecting him for a Conjurer. (*De Bello Belgico*, Book I, p. 7)[30]

These words, written less than fifty years after della Torre's death, clearly mix reality with imagination. Della Torre could not have built the flying wooden birds that Strada describes; at most he built a bird automaton that moved its wings, yet nothing similar survived. It is much more likely that the legendry automaton of a flying dove, ascribed in antiquity to Archytas, managed somehow to fly into this passage.[31] The details of the automata given by Strada are unreliable.[32]

But Strada's account is interesting precisely because of its exaggerations. First, we see how the imagination of people at the time brought in the course of a few decades the ascription of impossibly complex automata to della Torre: it seems they thought there is no limit to the variety of motions automata could perform.

Secondly, Strada's passage is interesting also because of the response he ascribes to the Father Superior: the latter suspected that della Torre is a conjurer. Even if this anecdote is unreliable, it does describe what then seemed as a likely response to automata: the people of the time, even educated ones, could mistake automata for living creatures. Earlier in the century Paracelsus described how to create a homunculus; many believed in the existence of dwarfs and imps; and the very idea of an automaton, a self-moving machine, was not at all familiar. (This reaction would be analogous to that of the first cinema visitors, who fled from the theatre when the film showed a train moving towards them (The Arrival of a Train at La Ciotat Station, 1895).) To Descartes' contemporaries, the self-moving machine looked like a living creature; Descartes turned this around: to him, the living creature looked like a self-moving machine.

Descartes was familiar with these automata, as we learn from his writings. In his early *Cogitationes Privatae* he suggests in outline constructing

an automaton of a tightrope walker that is moved by magnets (AT X 231). According to Poisson, Descartes planned or tried to build automata himself: he describes writings by Descartes which he saw, and writes that Descartes 'invented a small machine that represents a man dancing on a rope' (this probably refers to the paragraph just mentioned of the *Cogitationes*). Poisson also mentions a description he saw there of a dove flying in the air (Descartes next mentions in his *Cogitationes Privatae* Archytas's flying dove (AT X 232); his words do not imply that he planned such a dove himself). And lastly, the 'most ingenious machine': a partridge lifted by a spaniel (we have no record resembling this in Descartes' extant writing). Poisson writes that he does not assert that Descartes indeed built these automata, but that to judge from the description he provides, he would not have had any difficulty building them had he so wished. According to Poisson's opinion, Descartes surpassed della Torre in his automata.[33] Although Poisson's exaggerations are typical of the hagiography of some of the early Cartesians, they do testify to an interest of Descartes in automata. A passage in Descartes' *The Search for Truth* (AT X 505) also possibly implies that he knew well the way these automata work.[34]

A passage in the *Meditations* (AT VII 26; CSM II 17–18) documents Descartes' initial surprise when he witnessed these automata, and confirms their influence on his thought. When describing what he formerly *thought* he knew distinctly about the nature of body, he first mentions shape, location, the fact that two bodies cannot occupy the same place, and the fact that they are perceptible. He then mentions that the body 'can be moved in various ways, not by itself but by whatever else comes into contact with it'. And he continues: 'according to my judgement, the power of self-movement, like the power of sensation or of thought, was quite foreign to the nature of body; indeed, it was a source of wonder to me that certain bodies were found to contain faculties of this kind.' The bodies that were found to be capable of self-movement, and that had been a source of wonder for Descartes, were of course the automata. All the other characteristics that he mentions in this passage as those he used to ascribe to bodies he continued to ascribe to them later as well; apart from being perceptible, they all follow from his identification of body with extension. But self-movement, which he had formerly seen as due to an immaterial soul, like sensation or thought, he came to ascribe also to bodies, following his acquaintance with automata. This inability to move itself is the only characteristic mentioned in this passage of those he formerly attributed to the body that he will reject, a rejection based on the existence of automata.

This interpretation of the text is supported by his response to Gassendi's objections. Descartes explains his meaning in this passage as follows:

> You also question my statements that I had no doubts about what the nature of the body consisted in, and that I attributed to it no power of self-movement, and that I imagined the soul to be like a wind or fire, and so on; but these were simply commonly held views which I was rehearsing so as to show in the appropriate place that they were false. (Fifth Replies, AT VII 351, CSM II 243)

The faculties formerly denied to the body but now ascribed to it are those of self-movement and sensation (ibid.). As we shall later see, some bodies – namely living ones – can indeed perceive things, but only in an 'organic' sense, not in a 'strict' one.

The automata convinced Descartes that self-movement, this essential characteristic of life, does not require any principle different from those found in inanimate nature. Self-movement, after all, is found in lifeless automata as well. And as we can see in the following passage, Descartes merged in his imagination the walking man and the automaton:

> But then if I look out of the window and see men crossing the square, as I just happen to have done, I normally say that I see the men themselves… Yet do I see any more than hats and coats, which could conceal automata? (*Meditations*, AT VII 32, CSM II 21)

I quoted here the translation of the original Latin. The French translator, perhaps with Descartes' approval, wrote, instead of 'automata', 'ghosts or artefacts in human form that move only by the power of springs' (*des spectres ou des hommes feints qui ne se remuent que par resorts*). Apparently the translator or Descartes was afraid that some of the readers of the French translation, who would have been less learned than those of the Latin original, would not know what 'automata' means; the translation therefore provides them both with a familiar alternative (ghosts) and an explicit description instead of a technical term (artefacts in human form that move only by the power of springs). This change in translation demonstrates that automata were at the time an innovation with which a significant part of the public was not familiar. The need for an explanation of what automata are could also be noticed in the quotations above from the *Discourse* (AT VI 55) and *Passions* (AT XI 331), two other works Descartes published in French.

The discussion in this section shows that in his mechanistic conception of life and in his rejection of a principle of life that does not exist in inanimate nature, Descartes was influenced by the automata of his time. The resulting revolutionary separation of soul from life, whose far-reaching consequences we shall consider in later chapters, stems from Descartes' acquaintance with automata, a technological development of his times.

Descartes was the first to claim that the soul is not the principle of life. (I deliberately use this somewhat vague phrase, 'principle of life', to describe the role formerly ascribed to the soul, since this phrase lends itself to the several, partially overlapping interpretations that were given to it by different philosophers.) But this was not merely a theoretical claim about the kind of forces to be found in organic nature; it involved a *conceptual* change as well. Let us see this in some detail.

In antiquity, the *meaning* of 'soul' was the principle of life, the thing that distinguishes what is alive from what is not. (I use 'soul' here for the Greek *psyche*, later translated by the Latin *anima* and then by the French *âme*.) The question, 'What is the soul?' was the same as the question, 'What is the principle of life?' This meaning of *psyche* has origins already in Homer, and it was fully developed by the sixth century BC. We find it in all ancient philosophers who discussed its nature.

I cannot of course provide here a comprehensive overview of this understanding of 'soul'. I shall instead concisely present the views of the most influential philosophers and schools.

Plato's point of departure in his discussions of the nature of the soul is its conception as the principle of life, and more generally, the principle of self-movement. In his *Phaedo*, the philosophical part of which is devoted mainly to the proof of the immortality of the soul, Socrates relies on the claim that the soul is the source of life in order to prove its immortality. Here is part of his dialogue with Cebes:

> Tell me, then, what is that of which the inherence will render the body alive?
>
> The soul, he replied.
>
> And is this always the case?
>
> Yes, he said, of course.
>
> Then whatever the soul possesses, to that she comes bearing life?
>
> Yes, certainly. (105cd; Plato 1937, Vol. 1, p. 490)

In a later dialogue, the *Phaedrus*, self-movement is the very idea and essence of the soul, which is the beginning of all motion; and a body which moves from within, namely a living body, has a soul (245c–246a). For Plato, to have a soul means to be alive and to be able to initiate motion. (Notice the change from Plato to Descartes: while Plato says that the soul brings life to the body, Descartes maintains that it can be in the body only because the body is alive – see *Passions* I 5, AT XI 330, quoted above.)

Aristotle, like the Greek tradition preceding him, also understood the soul as what characterises life. He defines the soul as 'the form of a natural body having life potentially within it' (*On the Soul* II 1, 412a20). By 'form' Aristotle means the essential characteristics of a thing, those by virtue of which it is what it is. Accordingly, by 'soul' he means what is essential to life; 'it is "the essential whatness" of the body of the character just assigned' (ibid., 412b12). As Aristotle's own analogy clarifies, 'suppose that the eye were an animal – sight would have been its soul', for sight makes it an eye; the eye of a statue, for instance, is an eye only by name (ibid., 412b18–22). Similarly, Aristotle later writes that 'what has soul in it differs from what has not in that the former displays life' (ibid., 413a22).

In Epicurus' surviving writings, in Lucretius' *De rerum Natura*, and in other ancient sources on Epicureanism (see Long and Sedley, § 14), the soul is again found performing all its traditional functions: it explains life and self-movement, it is the source of the body's heat and it is responsible for sensation. There is therefore no reason for thinking that the Epicureans did not understand as soul whatever it is that explains life. Still, I am not aware of any passage in Epicurus or Lucretius that is explicit about this understanding of the concept, in the way similar passages are found in Plato, Aristotle and, as we shall now see, the Stoics.

The Stoics also understood the soul as whatever is responsible for life and self-movement. The soul was for them a kind of breath, *pneuma*, characteristic of living creatures; unlike Plato and Aristotle, however, they distinguished plants from animals, only the latter having a soul. Animals were characterised not merely by growth, like plants, but also by self-movement due to impression followed by an impulse, for which the soul was responsible. Origen reports their position as follows:

> Of moving things, some have the cause of movement in themselves, while others are moved only from outside. ... Animals and plants have the cause of movement in themselves, and so, quite simply,

> does everything sustained by physique or soul, which they say also includes metals. ... Some things of this kind, they say, are moved 'out of' themselves, and others 'by' themselves: the former comprise soulless things, the latter ones which are ensouled [namely, animals and man]. Ensouled things are moved by themselves when an impression occurs within them which calls forth an impulse. (*On Principles* 3.1.2–3, SVF 2.988, Long and Sedley 53**A**)

While plants have only physique (*phusis*), animals have soul as well, which is a kind of a refined physique, formed at birth (Hierocles 1.5–33, 4.38–53, Long and Sedley 53**B**). The fact that for the Stoics this identification of the soul with the source of self-movement or life in animals was not an empirical claim but a conceptual matter is evident from the following argument of Chrysippus, intended to show that the soul is a kind of breath:

> It is certain that we breathe and live with one and the same thing. But we breathe by natural breath. Therefore we live as well with the same breath. But we live with the soul. Therefore the soul is found to be natural breath. (Calcidius *in Tim* 220, SVF 2.879, Long and Sedley 53**G**)

His assertion, 'we live by the soul', evidently plays the role of a conceptual principle. At the same place Calcidius reports that according to Zeno 'that thing at the departure of which from the body the animal dies is certainly the soul'. Zeno also used this definition of soul in order to prove that the soul is 'natural breath', for 'on the departure of the natural breath the animal dies'.[35]

This understanding of the concept of soul makes the separation of soul from life *incomprehensible*. Had we described to an ancient philosopher Descartes' physiology, he would have searched in it what is essential to life and *called* it 'soul'.

This is not a mere hypothetical exercise. What is primarily responsible for the ability of animals to move themselves in Descartes' physiology are the animal spirits. These are, as we saw, minute particles that move with great speed, a kind of 'very pure and lively flame' (*Discourse*, AT VI 54; *Man*, AT XI 129). Now these animal spirits are late descendants, mediated by Galen and others, of Democritus's fire particles, which were, according to Democritus, the source of heat and motion of the living creatures. As mentioned earlier, Democritus thought that fire is made of extremely minute, spherical and swift particles. His reason for identifying

the source of life with fire atoms was, according to Aristotle, the fact that 'atoms of that shape are most adapted to permeate everywhere, and to set all others moving by being themselves in movement' (*On the Soul* I 2, 404a1–16). When breathing, new fire atoms enter the body and preserve life by preventing the decrease in quantity of the fire atoms the body already contains; otherwise these fire atoms would escape from the body. This is presumably also the reason why dead animals become cold. (See also *On…Respiration*, Chapter 10, 471b30.)

Democritus's view of the relation of fire atoms to the animation of the body is far from identical with Descartes'. Democritus's fire does not flow in nerves, for instance; neither did he explain the way these atoms move our limbs, as did Descartes by making them inflate muscles; and more. But the affinity is clear, and again, this is the remote source of Descartes' theory.

Yet Democritus, unlike Descartes, *identified* the fire atoms that move the body with the soul; the soul is nothing but the totality of these atoms.[36] Since Democritus *understood* by 'soul' the principle of life, namely the source of self-movement in the living creature, he had of course to consider the fire atoms that are contained in the living creature as its soul. By contrast, Descartes' the animal spirits, although animating the body, are not the human *âme*.

What happened, then, in the period between antiquity and the seventeenth century? How did the concept of soul change its meaning? The answer lies in the fact that being the principle of life was not the *only* characteristic of the soul.

Already in antiquity, from Homer on, one of the most important characteristics of the soul was its survival of death. And at least from the time of the Orphic sects, from the sixth century BC on, reward and punishment after death, according to its former way of life, were also ascribed to the soul. Another most important characteristic was the identification of the soul with the person, at least after death: already in the Homeric epic we find the identification of the dead Agamemnon's soul with Agamemnon (*Odyssey* 11, lines 387 and 397); and in his early first *Alcibiades* dialogue Plato identified even the living human being with his soul (251–253). Later in the fourth century BC Plato integrated within his philosophical system, which has exerted immense influence on later civilization, all these ideas, also making the mind a part of the soul. This conception of the mind as part of the soul was adopted by Aristotle, notwithstanding his different conception of the soul, and it remained an integral part of all later philosophical systems. As we saw, the life-giving role still remained the essential characteristic of the soul

in Plato's system, as well as in other systems of thought; and various later philosophers rejected some of the soul's additional characteristics listed here, considering them contingent, unlike its role as the principle of life. Yet all the same, these characteristics of the soul were of at least equal importance in the eyes of those who believed in them.

With the rise of the Judeo-Christian culture, the essential role of the soul as the principle of life became culturally less important. By contrast, its survival of death, its identification (at least after death) with the person, and the reward or punishment awarded to it then, became central. The great monotheistic religions were much less interested in metaphysical or physical speculations about the nature of life. The almost exclusive focus of interest was the place of man before God and the reward awaiting him – namely, his soul – after death. This shift of interests and emphasis is demonstrated by the papal bull of the Fifth Lateran Council from 19 December 1513, mentioned by Descartes in his dedicatory letter to the Sorbonne in support of his *Meditations* project (AT VII 3), calling Christian philosophers to refute by the most persuasive and best arguments the claim of the soul's mortality and clarify the truth of the church's doctrine of immortality. This was the cultural background against which philosophers and scientists alike worked.

With this religious-eschatological conception of the soul becoming prominent, the *understanding* of the concept shifted as well. Its role as the principle of life was no longer taken as its sole essential characteristic. All those who discussed life or the soul in a philosophical context before Descartes indeed saw the latter as explaining the former;[37] yet this was no longer generally taken as an obvious conceptual truth. For something to be considered *soul*, it had now to be the thing in man that has a special status before God. The essential (principle of life) became contingent, and the contingent (identification with the person, immortality, and so on) essential.

Descartes, influenced by the automata and hydraulic systems of his times, sees life as a phenomenon due to powers and entities that exist in inanimate nature as well. But these powers and entities have no connection to the human mind, they cannot be identified with man, be rewarded or punished after death, and so on. Consequently, because of the change in the understanding of *soul* over the centuries, Descartes does not identify them with the soul. What was a conceptual truth for ancient philosophers is both a contingent claim and a *mistaken* one for Descartes. Descartes' animal spirits are essentially what the atomists considered as soul, but he no longer considers them as such. Descartes'

separation of soul from life is also a conclusion of a conceptual change that took place over the preceding centuries.

The quintessence of this conceptual development was that following Descartes' work, the mind was separated from the principle of life: mind and life became unrelated. Descartes still has a principle of life, as the ancient philosophers had; and he still identifies some constituent or factor in man as the source of thought and personal identity, which he also believes survives death and is then to be identified with the person. His main innovation is the total separation between these two entities or factors. As was noted above, already Plato considered the mind, the thinking principle, to be part of the soul, the life principle, and this structure was preserved in all future systems preceding Descartes'. The wide-ranging implications of Descartes' separation of these two principles will become apparent in the next chapter.

Descartes himself came to describe his re-conceptualisation in roughly this way, following Gassendi's critical remarks on his identification of himself with his mind. Gassendi commented sarcastically:

> I thought that I was addressing a human soul, or the internal principle by which a man lives, has sensations, moves around and understands. Instead I find I was addressing a mind alone, which has divested itself not just of the body but also of the very soul. (Fifth Objections, AT VII 263, CSM II 183)

Gassendi hit the nail on the head, but what he considered an absurdity was considered an achievement by Descartes. In his reply he writes:

> 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 other operations which we have in common with the brutes, and, on the other hand, the principle in virtue of which we think. He therefore used the single term 'soul' [*anima*] to apply to both; and when he subsequently noticed that thought was distinct from nutrition, he called the element which thinks 'mind' [*mens*], and believed it to be the principle part of the soul. I, by contrast, realising that the principle by which we are nourished is wholly different – different in kind – from that by virtue of which we think, have said that the term 'soul', when it is used to refer to both these principles, is ambiguous. If we are to take soul in its special sense, as meaning the first actuality or principal form of man [Scholastic distinctions, derived from Aristotle], then the term

> must be understood to apply only to the principle in virtue of which we think; and to avoid any ambiguity I have as far as possible used the term 'mind' for this. For I consider the mind not as part of the soul but as the thinking soul in its entirety. (Fifth Replies, AT VII 356, CSM II 246)

Descartes' putative history of human thought in this paragraph is probably mistaken; but it does show that he came to consider his claim as involving a distinction between two radically different principles that had not been adequately distinguished earlier, as indeed they were not in earlier philosophy or science: the principle of life and the principle of thought.

As for Descartes' terminology, his preferred use of 'mind' is true of the Latin version of the *Meditations*,[38] but he did not observe it throughout his writings. In the French version of the Synopsis to the *Meditations* he writes of 'the mind [*mens*, *esprit*] or the soul [*âme*] of man', and notes in parentheses that he does not distinguish between them (AT IX 10). Later he will usually use the French *âme* for what in Latin he would call *mens*, for instance throughout the *Description* and *Passions*. And he occasionally uses *mens* and *anima* interchangeably in Latin as well (e.g. *Principles* IV 196–198, *Comments on a Certain Broadsheet*, AT VIIIB 351). The aspects of the concept of the soul additional to its being the principle of life, aspects that (as was mentioned above) have come to dominate its conception by Descartes' time, make it natural for him to continue to designate by that term an entity that has no longer any role in the explanation of life. However, as we shall see below, sometimes he is more cautious in his choice of terms.

Descartes' separation of mind from the principle of life, and his conception of the latter as not transcending inorganic nature, also made his dualism possible. Before Descartes, the mind was conceived as the *superior part* of the soul, a soul which was itself different from matter. Consequently, before Descartes, the natural non-monist ontological view admitted a *hierarchy of beings*. The mind could not be, as far as its being was concerned, of exactly the same kind as the soul, for it survived death (unlike animal souls). Yet being part of the soul, namely the rational soul, the mind could not be considered as an unrelated kind of being. Therefore, mind and soul could not be considered separate substances in a Cartesian sense, that is, independent beings defined by their principle attributes. Moreover, the soul was itself a being different in kind from matter, and of course superior to it. It was therefore natural to conceive of being as having different degrees of perfection. Add to

this God, who is identified with perfect being, and possibly also things inferior to matter, like reflections or dreams, and we have a hierarchy of beings: God–mind–soul–matter–dreams–non-being. Consequently, pre-Cartesian philosophies, those who were not materialists and thus monists in their approach (as were the atomists) but distinguished between kinds of being, adopted an ontology of *degrees of being*, and not a dualistic position.[39]

By contrast, Descartes eliminated the soul as the principle of life as an entity different in its being from matter, while preserving the mind as a different kind of being.[40] The road to dualism was thus opened. There are only two kinds of finite, created beings, mind and matter, none a part of the other or dependent on the other for its existence, and we can therefore conceive of them as two different and independent substances, each defined by its own attribute (*Principles* I 53). Moreover, none need be conceived as superior in its being to the other: all finite Cartesian substances have the same degree of reality or being (Second Replies, Axiom VI, AT VII 165).[41] God is then conceived as a divine infinite mind, a substance in a different sense of the term, and in this way the dualism of created, finite beings is not questioned by His existence (*Principles* I 51, 54). Descartes' substitution of substance dualism for degrees of being is thus a result of his elimination of the soul as a special principle of life transcending inorganic nature, an elimination which in its turn was a result of his considerations on the capacities and limitations of automata.

4.3 The physiologists' reception of Descartes' conception of life

When we come to assess the reception of Descartes' separation of the soul-mind from life, we should distinguish between several questions. We should ask at least the following three different ones:

1. Did *physiologists* accept Descartes' claim, that life involves no principle or power that does not exist in inorganic nature as well?
2. In case physiologists rejected the former claim, did they maintain that the additional factor involved in life is the soul?
3. Did *philosophers* accept Descartes' claim, that the soul-mind is not the principle of life?

The answers to questions (1) and (3) are not independent, for occasionally the same person engaged both in physiology and in philosophy – as

did Robert Boyle, for instance. Yet usually these fields of inquiry engaged different people.

In philosophy, the adoption of Descartes' separation of soul from life and its identification with the mind was immediate. Almost none of the great philosophers that followed him – Malebranche, Spinoza, Locke and later ones – none of these ascribed to the soul or mind the role of animating the body. This possibility, if mentioned at all, is mentioned only to be rejected.[42] And like Descartes in his response to Gassendi which was quoted above (AT VII 356), they all identified soul and mind (and preferred to use the latter term). While before Descartes philosophers wrote treatises on the soul, from Descartes on we have philosophy of mind. The espousal of Descartes' position was so general that to contemporary philosophers, brought up in the tradition originating with the Rationalists and Empiricists of Early Modern philosophy, the very idea that the soul is the principle of life sounds foreign, something belonging to an obsolete world of ideas, a world far removed from ours.

The history of these Cartesian ideas in physiology, by contrast, is much more complex. In the rest of this section I provide a short survey of the physiologists' reaction to Descartes' claims. The concise sampling below of highlights from the rich history of physiology after Descartes is intended to show the deep and immediate influence of his conception of the living creature as a natural automaton and of his dissociation of life from the soul-mind. But I shall also try to give a sense of the opposition that Descartes' ideas later generated, before achieving their final triumph.[43]

Although today we know that Descartes was right and that the basic principles that life involves are also found in inanimate nature, his position was premature for his age. Digestion, growth, generation and, in fact, any process specific to life are markedly different from anything that can be found in inorganic nature. And the knowledge of chemistry and biochemistry at the time was very far from sufficient for understanding how these processes can involve only principles that act in inorganic nature as well. Moreover, none of the processes or materials characteristic of life could be reproduced in the laboratory by bringing together in appropriate conditions inorganic materials alone. There was, therefore, no real empirical support for Descartes' claim. If physiologists accepted it – as many did – they did so for theoretical reasons, and because they had not yet been disillusioned by the inability of mechanical explanations to account for central life processes. As we shall see, the comparison of the living creature to a clockwork automaton played a key role in converting physiologists to the Cartesian mechanistic view of life. This

also explains why Descartes succeeded where earlier materialist theories failed: on the one hand he applied his materialist-mechanistic claim to life alone and not to the mind, which made it less ambitious and more plausible; on the other, he had the new technology to support his view. All the same, many physiologists rejected his ideas, and not until the late nineteenth- and early twentieth century, when the understanding of physiology, chemistry and biochemistry has greatly advanced, did Descartes' materialist physiology establish itself in biology.

Yet his claim that the soul or mind – namely, the thing that thinks and desires, is conscious, is identical with the person and is said to have a special moral and eschatological status – his claim that this entity has no role in the explanation of life was accepted much more widely and rapidly. Apart from a few early eighteenth century attempts to resist it, even those who did think that life requires some special principle did not seek it in the soul-mind. The soul-mind had been eliminated from the list of possible factors explaining life before Descartes' reductive materialist physiology was eventually established.

Sir Kenelm Digby was probably the first to publish these Cartesian ideas in English. In his *Two Treatises* of 1644 he describes living creatures, namely those organised bodies that contain within themselves the principle of their own motion, as natural engines (pp. 204–205). God is compared to a clockmaker, who, once he has laid 'the foundations of his designed machine', namely the living organism, lets it operate on its own according to mechanical principles, he being 'an improvident clockmaker, that should have cast his worke so, as when it were wound up and going, it would require the masters hand att every houre to make the hammer strike upon the bell' (pp. 226–227). And Digby tries to clarify his conception of engine or machine and convince his readers in the validity of his comparison of living creatures to automata (a term he does not use) by describing two engines he saw in Spain (pp. 205*ff*). The first of these is the Artifico di Juanelo in Toledo, which lifted water from the river Tagus to the royal palace of the Alcázar, a height of almost 100 metres, driven by the river alone. Like many of the automata that so impressed Descartes and his generation, this mechanism, which was one of the greatest engineering achievements of the Renaissance, was built by della Torre, and we again witness how the technological developments of the time were essential for the formation of the new conceptions of life and, derivatively, soul and man.[44]

Gassendi has been an Epicurean materialist about life already before he read Descartes, but having read him he uses the latter's clockwork and automaton analogy to argue that living creatures are machines, in a

passage that also resembles Descartes in style (see, for instance, Descartes to Reneri for Pollot, Apr or May 1638, AT II 39–41):

> For just as a man born in the forest and ignorant of all human arts, if shown a clock enclosed in the setting of a ring, would only wonder at the delicacy and elegance of its structure, and the long duration, regularity, and spontaneity of its motions and would never guess how the little machine could be made so perfect, so too do our powers fail completely when we are confronted by these achievements of Nature, at the elaboration of which we were present neither as spectators nor as participants, and like untutored woodsmen we can only be struck with wonder but cannot divine or conceive by what artifice they have been accomplished; for, indeed, each one of them is a little machine within which are enclosed in a way impossible to comprehend almost innumerable [other] little machines, each with its own little motions.[45]

The confessed ignorance about the structure of these natural machines is of course un-Cartesian in character; but this only shows the power of the automaton analogy over researchers of very different intellectual temperament.

I quoted above a passage from Steno's 1665 lecture on the brain, in which he praises Descartes' mechanisation of physiology. It would shed more light on Descartes' influence on Steno, and on physiology more generally, to continue the quotation here:

> For [Descartes] was the first who dared to explain all the functions of man, and especially of the brain, in a mechanical manner. Other authors describe man; Descartes puts before us merely a machine, but by means of this he very clearly exposed the ignorance of others who have treated of man, and opened up for us a way by which to investigate the use of other parts of the human body with the same clarity he shows us in the parts of his man-machine, which no one before him attempted. It is therefore necessary not to condemn Descartes if his account of the brain is not found entirely conformable to experience; the excellence of his genius, which appears principally in the *Traite de l'Homme*, covers the errors of his hypotheses. (Foster 1901, p. 62; continued in Brown 1968, p. 94)

This ambivalent praise shows clearly both the deep influence of Descartes' principles and the insignificant influence of his specific physiological ideas.

We similarly find Giovanni Borelli (1608–1679), in his posthumous *On Animal Movement* (*De motu animalium*, 1680–1681), endeavouring to explain mechanically all the phenomena of life that do not involve perception or volition. Echoing Descartes, with whose work he was well familiar,[46] he compares living creatures to automata in arguing for the mechanization of life phenomena:

> An automaton seems to present some shadowy resemblance [*umbratilem similitudinem*] with animals in that both are organic self-moving bodies which comply with the laws of mechanics, and both are moved by natural faculties. Let us, then, see whether it is possible to investigate the properties of natural [living] things in some way by using our knowledge of artificial ones. (2.8, Proposition 116)[47]

We next find the Cartesian comparison of the living creature to a clock (ibid.). Earlier in the book Descartes' influence (as well as Galileo's) can also be seen in Borelli's claim that 'Geometry and Mechanics are the ladders by which we ascend to the wonderful science of the movements of animals'. (1.10, p. 36) Borelli *did* think that animals have a soul: 'animals live through their soul [*animantia per animam vivant*]' (1.1, p. 7); and it seems he thought this life-soul is immaterial. But his animating soul influences only voluntary movements. Consequently, after powerfully arguing that the motion of the heart – the source of life – is involuntary, he concludes that 'the movement of the heart can result from an organic necessity, as an automaton is moved' (2.6, Propositions 78–79). And thus Borelli thinks, following Descartes, that life may basically be a mechanical phenomenon. Yet he also thinks it possible that the heart's motion is not due to purely mechanical causes but to the soul's unconscious habitual action, a habit acquired during the embryonic stage (2.6, Proposition 80). We thus find in Borelli a deep influence of Descartes' mechanisation of life, which does not indeed encompass his opinions on voluntary action, but does include the possibility that the processes essential to life occur as if the living creature were an automaton.[48]

Overlapping with Borelli's years of activity, the generation of the great Oxonian naturalists were also deeply influenced by Descartes' ideas. Robert Boyle (1627–1691) mentions Descartes, 'so Great a Man' and 'that excellent philosopher' (1688, Preface and p. 4), as one of the only three authors from whom he has learnt and of whom he thinks highly (the other two being Gassendi and Bacon).[49] For Robert Hooke (1635–1703)

he is 'the most incomparable *Des Cartes*', as well as 'the most Ingenious' and 'the most Acute and excellent Philosopher' (*Micrographia*). And his ideas influence and are discussed by Thomas Willis (1621–1675), Richard Lower (1631–1691) and others of their *Virtuosi* circle. All these scientists accepted, at least to a substantial degree, Descartes' mechanization of life, inspired by his automaton analogy.[50]

For Boyle, 'the world we live in is not a moveless or indigested mass of matter, but an *Automaton*, or self-moving *engine*'; and he similarly considers 'the body of a living man, not as a rude heap of limbs and liquors, but as an engine consisting of several parts so set together that there is a strange and conspiring communication betwixt them'. Like Descartes, Boyle thinks of the human body as a hydraulic machine: 'I look not on a human body, as on a watch or a hand-mill, *i.e.* as a machine made up only of solid, or at least consistent parts; but as an hydraulo-pneumatical engine, that consists not only of solid and stable parts, but of fluids, and those in organical motion.'[51] To man's body he refers as 'this *automaton*', and proceeds to describe how it was constructed by God, 'the great mechanist, for the welfare of the animal' – the construction including, as in Descartes' theory, memory and imagination. Even the purposeful reactions of the body during disease do not demonstrate the presence of an intelligent principle in the living body, but are the result of God's construction of a sophisticated mechanical engine. And we can again hear Descartes echoing in Boyle's declaration of his mechanistic conviction:

> And the indefinite divisibility of matter, the wonderful efficacy of motion, and the almost infinite variety of coalitions and structures, that may be made of minute and insensible corpuscles, being duly weighted, I see not, why a philosopher should think it impossible, to make out, by this help, the mechanical possibility of any corporeal agent, how subtle, or diffused, or active soever it be, that can be solidly proved to be really existent in nature, by what name soever it be called or disguised.

Moreover, Boyle adopts Descartes' mind–body dualism, man being a union – 'permistion' – between an immaterial, rational and immortal soul and a bodily engine.[52] The rest of the world is for him 'meerly Corporeal', and animals are but 'living *Automata*'. And Boyle compares not only the mechanical working of the particular things in the world towards their own goals, but also the way they 'Conspire to the General

Ends of the Universe', to the working of an automaton, this time one consisting of many smaller automata:

> I have seen ... with pleasure, a great Engine, wherein the Works of I know not how many Trades, and a great many other Motions, were performed by little Puppets, that manag'd the Tools of the Artifficers; and all these were set up a work by one Spring, which communicated Motions that were regulated and determined by the particular structure of the little Statues and Bodies.

The automaton Boyle describes resembles in conception the mechanical galleons made by Schlottheim in the late sixteenth century, which can still be seen in the Kunsthistorisches Museum in Vienna and in the British Museum.[53]

Hooke's conception of life was as thoroughly mechanistic as Boyle's. In his *Micrographia* (1665), in which he described his observations of various phenomena by means of the microscope, he time and again considers plants and insects as God-made automata:

> And indeed, so various, and seemingly irregular are the generations or productions of Insects, that he that shall carefully and diligently observe the several methods of Nature therein, will have infinitely cause further to admire the wisdom and providence of the Creator; for not onely the same kind of creature may be produc'd from several kinds of ways, but the very same creature may produce several kinds: For, as divers Watches may be made out of several materials, which may yet have all the same appearance, and move after the same manner, that is, shew the hour equally true, the one as the other, and out of the same kind of matter, like Watches, may be wrought differing ways; and, as one and the same Watch may, by being diversly agitated, or mov'd, by this or that agent, or after this or that manner, produce a quite contrary effect: So may it be with these most curious Engines of Insect's bodies; the All-wise God of Nature, may have so ordered and disposed the little *Automatons*, that when nourished, acted, or enlivened by this cause, they produce one kind of effect, or animate shape, when by another they act quite another way, and another Animal is produc'd. So may he so order several materials, as to make them, by several kinds of methods, produce similar *Automatons*. (*Micrographia*, Observation XLIV; cf. Observations XXI & XLIII)

Descartes' conception of the living organism as a God-made automaton, analogous to a clock, shapes Hooke's approach to nature. When it comes to simpler forms of life, such as moulds, plants and insects, Hooke could not 'find the least probable argument to perswade [him] there is any other concurrent cause then such as is purely Mechanical' (ibid., Observation XX; cf. Observation XIX). And the mechanical ladder beginning with inanimate nature and the most primitive forms of life may lead to the highest forms of animal life, as we learn from the only place in *Micrographia* in which Hooke mentions the soul:

> Nor do I imagine that the skips from the one to another will be found very great, if beginning from fluidity, or body without any form, we descend gradually, till we arrive at the highest form of a bruite Animal's Soul, making the steps or foundations of our Enquiry, *Fluidity*, *Orbiculation*, *Fixation*, *Angulization*, or *Crystallization Germination* or *Ebullition*, *Vegetation*, *Plantanimation*, *Animation*, *Sensation*, *Imagination*. (Observation XX)[54]

The influence of Descartes' physiology on Willis's was wide and deep; we are interested here, however, only in its aspects relating to the nature of life and the role of the soul. In this Willis is thoroughly Cartesian, as is seen in his *On the Soul of Brutes* of 1672.[55] Man is the only living creature who has an immaterial, immortal, rational soul. Animals, by contrast, have a mortal, corporeal or material (and extended) soul, responsible for life, feeling and movement, which they share with man; this soul is identified by Willis with the blood and animal spirits (Preface). In all this he follows in the footsteps of 'the most illustrious Cartesius' (p. 3). The soul of brutes, for Willis, is 'corporeal and fiery', as it was for Descartes; and for him too it is governed by the same laws that govern other bodies, 'in this respect it seems most like to Common Flame, and only like it' (p. 6).[56] Against those who would have the sentient soul of animals be from immaterial substance he maintains that

> there needs no other Argument, than that any one may consider truly in every Brute or Man, the Organs of the Animal Faculties, than which certainly nothing in the whole nature of things, can be made more Mechanically, and with a more neat Artifice. (p. 23)

Willis himself thinks that this soul is 'meerly Organical' (p. 27). Turning a page, we hear another Cartesian echo, when we read that God, the

Great Workman, made the souls of living creatures in such a way that, due to 'the Excellent structure of the Organs, most Exquisitly laboured', these creatures go 'beyond the Workmanship and artificialness of any other Machine' (p. 24). And finally, animals are compared to a hydraulic automaton – 'a self moving musical Organ to which the soul of the Brute is like' – and contrasted with man, in whom the rational soul controls the machine; moreover, we find in this analogy the Cartesian contrast between finite and infinite number of actions, which characterises the difference between mechanical and rational (see next chapter):

> Further, although the Musical Organ very much requires the labour of him playing on it, by whose direction, the spirit or wind being admitted, now into these, anon into those, and into other Pipes, causes the manifold harmony, and almost infinite Varieties of Tunes; yet sometimes I have seen such an Instrument do prepared, that without any Musitian directing, the little doors being shut up, by a certain law and order, by the mere Course of a Water, almost the same harmony is made, and the same tunes, equal with those Composed by Art. And indeed Man, seems like to the former, in which the rational Soul, sustains the part of the Musitian playing on it, which governing and directing the animal spirits, disposes and orders at its pleasure, the Faculties of the inferior Soul: But the Soul of the Brute, being scarce moderatrix [=moderator] of its self, or of its Faculties, Institutes, for Ends necessary for it self, many series of Actions, but those (as it were tunes of harmony produced by a water Organ, of another Kind) regularly prescribed by a certain Rule or Law, and almost always determinated to the same thing. (p. 34)

Unlike Borelli, Boyle and Hooke, Willis also investigated the functioning of the brain, to the understanding of which he made some of the most important contributions in history. Like Descartes before him, he tried to understand through dissection and speculation how the animal brain determines animal perception and memory. This research forced on him, as it did on Descartes, methodological materialism with regard to animal cognition and volition. For these reasons he may have put greater emphasis on his commitment to Descartes' view of life and soul regarding animal cognition and volition as well (although neither Boyle nor Hooke denied it).[57]

We see how Descartes' conception of the living creature as a God-made automaton was adopted by some of the prominent physiologists of the generation following his. While the comparison of living creatures to

automata is absent, to the best of my knowledge, from the literature preceding Descartes, it occurs time and again in the writings of later physiologists. This comparison convinced many of them that life does not require any principle of action that does not exist in inanimate nature (although some, like Borelli, still maintained that additional features of non-human animals do require such a principle). Recent technological developments were responsible both for the development of Descartes' ideas and for their rapid spread. Descartes was the first to draw the natural conclusions from these developments, and in doing so changed the course of physiology.

The depth and spread of the conviction in Descartes' view of life in the generations following his is demonstrated by a satirical pamphlet, published anonymously in Edinburgh in 1695, which ridiculed and criticised Pitcairn's attempt to imitate Newtonian methodology in medicine. The author writes:

> Who doubts but the Body of Man, in some sense, may be called a *Machine*? Yet, it is of such a wonderful structure and curious Contrivance (for we are wonderfully made) has so many small Parts and Springs, such a variety of Motions, &c. that none either knows, or can know, but the Great Artificer that first made it, and set it a going. (Brown 1968, p. 235)

About half a century after Descartes published his works, even a satirist, intent on ridiculing his target, seems to take for granted the claim that life is a mechanical phenomenon.[58]

The conception of living creatures as God-made automata is again found in the works of the Dutch physiologist and teacher, Herman Boerhaave (1668–1738), of Leiden University. Boerhaave was highly critical of Descartes' speculative physiology, which according to him relied too little on observation and experiment. 'As to Des Cartes', he wrote, 'it is hardly credible, that such excellent mathematical treatises, as those on geometry and dioptrics, and so different performances on physics should proceed from one and the same author.'[59] This disparaging attitude will reoccur in the writings of many eighteenth century physiologists. On the other hand, Boerhaave accepted Descartes' metaphysical conception of man as a union of mind and body, of whose natures he held a Cartesian position. His student, the physiologist Albrecht von Haller (1708–1777), who commentated on his teacher's widely read and translated *Academical Lectures*, wrote in his commentary that Boerhaave wishes physiology to consider man 'not as a metaphysical Entity, nor

as a mind, but as a living and animated Machine'. Mental phenomena such as 'memory, Understanding, Reason, and the Knowledge of past and future Appearances' were excluded by Boerhaave from the purview of his mechanistic and chemical explanations, and relegated to an immaterial mind, whose essence is to think. Like Descartes, Boerhaave maintained that the interaction of mind and body is a fact obvious from experience, yet incomprehensible: 'we cannot understand or explain the Manner in which the Body and Mind reciprocally *act upon each other* from any consideration of their Nature separate; we can only remark by Observation their Effects upon each other, without explaining them'.[60] By contrast, the living body's nature is clear: it is partly a hydraulic machine, partly clockwork:

> The human body is a mechanism, the solid parts of which are either vessels, capable of encompassing, directing, changing, separating, collecting and secreting liquids, – or mechanical instruments which through their form, firmness, and through the way in which they are joined, are able to sustain other parts, or to produce certain movements.[61]

Later in the same treatise (p. 111) we find Boerhaave using Descartes' comparison of the body to a clock: the physician cures the body of its diseases in the same way that the one who knows the working of a clock's inner mechanism can correct the clock's structure and repair its defects.[62]

Boerhaave's students helped spread Cartesianism further. For Haller, the body is an 'artifice ... worthy to be admired by all Mortals, and is not to be matched in any other machine whatsoever'.[63] Like his teacher's, his framework was also a Cartesian dualist one, and he even attempted to determine the locations in the brain where soul interacts with body. Arguing against Stahl (see below) and other animists or vitalists of his time, he searched for 'the efficient causes of this beautiful animal machine'.[64]

Another student of Boerhaave, the philosopher and physician Julien Offray de la Mettrie (1709–1751), who translated Boerhaave's writings into French, carried materialism, in a sense, even further. His *L'Homme Machine* (1747) describes man as a material being, denying him any immaterial soul or mind. La Mettrie is a junction of two traditions of reflection on the nature of the soul: a philosophical one, originating in the *Meditations*; and a physiological one, whose point of departure was Descartes' physiological ideas, as expounded primarily in Part Five of the

Discourse. He thus mentions in his works not only Malebranche, Locke and the subsequent philosophical tradition, but also Perrault, Willis, Boerhaave and other physiologists. In fact, he recommends the ideas of the latter group, based on experiment and observation, over the 'prejudices' of the former (1747, pp. 4–5). Man is again compared to a clock (ibid., pp. 31, 37), and Descartes' demonstration that animals are mere machines is deemed 'an important discovery which implies so much wisdom'. Descartes' dualism, by contrast, 'was only a trick, a cunning device to make the theologians swallow the poison hidden behind the analogy' which they did not notice between animals and man (ibid., p. 35).

But La Mettrie's bark is worse than his bite. Despite his opposition to Stahl's animism (ibid., pp. 31–32), it seems he was influenced by the latter's criticism of the mechanistic conception of life, and his machine-man is no longer merely mechanical. La Mettrie endows organised matter with a principle of motion, which exists in almost every part of the organised body (pp. 28, 33); in his *Treatise on the Soul* he even makes this motive power or force an essential attribute of matter, together with extension (1750, Chapter V).[65] In addition, La Mettrie endows his matter with a *sentient* faculty (ibid., Chapter VI); and he contrasts himself with Descartes on this issue:

> Descartes refused all sensation, all faculty of sensation, to his machines, or to the matter which, he supposed, alone composed animals; while I prove clearly, unless I am very much mistaken, that if there is a being, so to speak, steeped in sensation, it is the animal. ... That is the difference between the famous Modern I have just mentioned and the author of this work. (ibid., Chapter VII, p. 52)

This sentient faculty seems to La Mettrie to reside in matter potentially, and to express itself only in organised bodies (ibid., Chapter VI, p. 51). He admits he cannot conceive how matter can have sensations or think, but this is because of our cognitive limitations; experience, he claims, forces us to identify the soul with the bodily organs (probably with part of the medulla) (ibid., Chapter X, § IX). Finally, the faculty of thought is reduced by La Mettrie, in the tradition of the philosophical theories of thought as association of ideas, to the faculty of sensation: 'the rational soul acts only as sensitive, even when it thinks and works to arrange its ideas' (ibid., Chapter XIII, p. 186). Descartes notwithstanding, our soul is as material as that of animals, and it is superior to theirs only as a result of its superior organisation (*Man as Plant*, Chapter III, p. 87). In

this way thought becomes one of the properties of organised matter, 'like electricity, motive power, impenetrability, extension, etc.' (1747, p. 35)

La Mettrie's brand of materialism is questionable; yet unlike Descartes, he is definitely a monist: 'there is in the whole universe only one diversely modified substance', he insists (1747, p. 39; see also 1750, Chapter X, § IX).[66] In the history of physiology we are surveying he occupies a transitional position, evincing at the same time both a strong and direct Cartesian influence, and a move away from Descartes' mechanistic physiology towards a vitalist position that admits some life force and faculty of sensation inherent in living matter, which distinguish it from the inorganic. By the mid-eighteenth century, the promise of Descartes' mechanistic conception of life had failed, and even materialistically minded physiologists were seeking other sources for explaining the teleology apparent in the phenomena of life. I now turn to survey the relation of these attempts to Descartes' ideas.

Through the influence of the naturalists, physiologists and philosophers we have mentioned, as well as that of others, Descartes' claim that the living body is a natural machine that does not involve any principle not existing in inanimate nature spread rapidly and established itself as a dominant view of life in the scientific community and popular culture. But, as was claimed above, the empirical knowledge of the time was insufficient to confirm it. Objections were soon to emerge, and these took Descartes and his clockwork automaton analogy as their primary targets.

We have encountered above Borelli's only partial acceptance of Descartes' views of life. Another prominent seventeenth century physiologist, who like Borelli made use of mechanistic explanations of bodily functions yet nevertheless did not eliminate the soul from his physiology, was Charles Perrault (1613–1688). In 1680 he wrote that it is time to challenge 'the opinions of the new sect, ... where it is believed that by means of mechanics we can know and explain everything that belongs to animals'.[67] Although the organs of the body are, he maintained, 'true machines, ... still the entire machine has need of being moved and driven by the soul'.[68] Unlike Borelli, Perrault maintained that not only voluntary movements require the influence of a non-mechanical soul, but that so does all bodily motion. All activity, the heart's included, proceeds from the thinking soul, which often operates without attention, and then we do not have apperception of its thought.[69]

But the banner of anti-Cartesianism in physiology was more influentially raised by the German chemist and physician, Georg Ernst Stahl

(1660–1734). Stahl, the main developer of the phlogiston theory, nevertheless disparaged the value of chemistry for the understanding of life. His reason was that 'the matter he studied *in vitro* behaved differently from the matter he studied *in vivo*'[70] – we are reminded of the lack of empirical support for Descartes' claim that the same principles govern both inanimate and animate. This distinctiveness of organic material was to be an argument employed by a variety of vitalists for more than a century to come, until the epoch-making synthesis of urea by Wöhler in 1828 and of acetic acid by Kolbe (1843–1845). To Stahl, not only intelligent behaviour seemed to involve some power that cannot be found in inanimate nature: so did all specifically organic processes. Unlike inanimate matter and mere mechanisms, living matter is characterised by equilibrium between processes of decomposition and reconstitution, by being motile and sentient, and by teleological causation more generally. This teleological causation, characteristic of organisms, is used by Stahl to criticise Descartes' clock analogy: unlike organisms, if some failure prevents the clock from fulfilling its purpose of showing the time, it continues to work according to the laws of external necessity, lacking the power of recruiting efficient causes to accomplish its predetermined end.[71] Stahl himself explained the goal-directed processes characteristic of the organism by means of a rational, immaterial and immortal soul, which imparts life to the organism – his *anima biomedica*. This rational soul is responsible not only for our conscious life, but for non-conscious biological processes as well, in man and animal (which is no longer a natural machine), processes that include even digestion and assimilation. The rational soul can act either unconsciously, as *ratio* or *logos*, when it controls, for instance, digestion and aspects of movement; or – only in man – consciously, drawing conclusions from premises, as *ratiocinato* or *logismos*.[72]

Stahl was right in his diagnosis that the Cartesian materialism in the physiology of the second half of the seventeenth century failed to make substantial advances in the explanation of organic teleology (Westfall 1971, p. 104). He therefore reverted to the soul for explaining it. However, for him too the soul was Descartes' soul, namely the mind. The ancient Greek soul, which animated the body and contained the mind as its rational *part*, was not a live option any longer. Descartes' identification of soul and mind has by then become a widespread presupposition, generally taken for granted. To avoid the absurdity of ascribing conscious rationality to animals or to digestion, Stahl therefore had to make use of the unconscious, apparently influenced by Perrault[73] and perhaps by the ideas of the Cambridge Platonists as well, primarily Cudworth.

Stahl's *rational* soul as life force was an unacceptable exaggeration for most eighteenth century physiologists; those who accepted it were few, many of them Stahl's students, none an influential figure. By contrast, his criticism of Descartes' ideas persuaded many; and half a century with little if any progress in the reduction of life phenomena to mechanisms was a strong argument against Cartesianism in physiology. A few consequently tried to return to something closer to the Aristotelian *psyche* (Sauvages de la Croix, 1706–1767; Robert Whytt, 1714–1766); but the days of this soul had passed, and they had few followers. Other physiologists developed instead a notion of a vital principle or power, distinct from the mind, inexistent in inorganic nature, and, instead of being carried by any soul-like entity, present in every living part of the body (Théophile de Brodeu, 1722–1776; John Hunter, 1728–1793; Paul Joseph Barthez, 1734–1806; as we saw, La Mettrie is a transitional figure in this movement). Animism was rejected, and *vitalism* gradually developed to replace it.

The history of vitalism from its emergence during the eighteenth century until its final demise in the late nineteenth century is not among the subjects of this book. Descartes is no longer an active participant, through his writings, in the debates on vitalism. However, his ideas, and primarily the clockwork automaton analogy, were still directly addressed by some early physiologists involved in the rise of vitalism. The power of this comparison was so great that it had to be undermined if a new conception of life were to be established. Whytt, for instance, complains that 'with some, the Cartesian principles still continue', or that 'it is surprising to find Descartes and his followers seriously maintaining [animals] to be mere machines formed entirely of matter, and, as it were, so many curious pieces of clockwork wound up and set a-going' (1751, pp. 145 & 153). Like Stahl, Whytt also criticises Descartes' clock analogy of the living animal: as long as life lasts an animal is a *perpetuum mobile*,[74] he maintains, and this is 'above the powers of mechanism' (ibid., p. 142). But within a few decades the breakthroughs in chemistry and the enormous increase in physiological knowledge will make Descartes' systems obsolete. The debate on whether principles that explain inorganic phenomena can also explain the chemical processes in the living body or the behaviour of cells will involve considerations foreign to Descartes' world. I shall therefore stop at this place my survey of the influence of Descartes' ideas on physiology.

Descartes grew up within the Aristotelian tradition, which saw self-movement as distinctive of life and made the *psyche* its principle. Yet automata convinced him that self-movement demanded no special

principle inexistent in inorganic nature. Thus, rejecting the soul as a special principle of self-movement, no principled distinction was left for him between the living and the non-living. In this respect Descartes still belongs to the Aristotelian tradition, which determines the alternatives he considers: having reduced self-movement to inorganic principles, everything else for which the animal soul stood had to be similarly reduced. However, life is also characterised by many kinds of teleological processes that occur in each and every tissue. Consequently, Stahl and his followers focused upon these, and not upon self-movement (which they no longer claim to be distinctive of life), as the characteristics that distinguish the organic from the inorganic and as something that necessitates a special inorganic principle – accounting for these processes was beyond the horizons of the mechanics and chemistry of their age. But neither the mind nor the Aristotelian soul was appropriate for this function, and thus vitalism was developed to dominate the biological scene in the century to come.

All the same, Descartes' lasting achievement in this area was more than the elimination of the Aristotelian soul; his ideals of explanation, together with the achievements of his contemporaries, established a standard of clarity and exactness that made vitalist explanations seem inevitably obscure and unsatisfactory, and helped pave the way to the final triumph of materialist physiology. Far in the future (15 May 1875), when vitalism will be irrevocably rejected, Claude Bernard (1813–1878), admitting only mechanical, physical and chemical forces to the explanation of life, will state at the conclusion of his 'Definition of Life':

> We state together with Descartes: one thinks metaphysically, but lives and acts physically.[75]

5
Mind, Machine, Sensation

5.1 Mind and automaton

Descartes, we saw, thought that he had managed to explain not only movement, breathing, digestion and other processes mechanically, by corpuscularian-hydraulic means, but also mental features such as memory and imagination, and even character traits and moods. And all these, according to him, do not involve any immaterial soul. Why, then, does he ascribe such a soul or mind to man? Why isn't Descartes' man just a biological machine?

Descartes was a devout Catholic, and so his faith should have brought him to ascribe a soul to man, a soul that carries man's personality, survives death, and so on. But faith, according to Descartes, is not a sufficient justification, as he writes in the dedicatory letter to the Sorbonne that opens his *Meditations*:

> I have always thought that two topics – namely God and the soul – are prime examples of subjects where demonstrative proofs ought to be given with the aid of philosophy rather than theology. For us who are believers, it is enough to accept on faith that the human soul does not die with the body, and that God exists; but in the case of unbelievers, it seems that there is no religion, and practically no moral virtue, that they can be persuaded to adopt until these two truths are proved to them by natural reason. ... It is of course quite true that we must believe in the existence of God because it is a doctrine of the Holy Scripture, and conversely, that we must believe Holy Scripture because it comes from God. ... But this argument cannot be put to unbelievers because they would judge it to be circular.[1] (AT VII 1–2, CSM II 3)

It is possible that in this passage Descartes deliberately exaggerates, for tactical reasons, the authority he ascribes to faith. But this would only strengthen the claim that he thinks the existence of the human soul should be established by philosophical argument. What, then, is the philosophical justification Descartes gives in order to establish the ascription of an immaterial soul to man?

There is, of course, the argument found in the Second Meditation, in Part Four of the *Discourse*, and in a few other places: the argument that starts with the hyperbolic doubt and the *cogito*, and proves the existence of an immaterial soul or mind. But this proof can be valid only for the meditating person: the one who knows that he exists but does not know whether the material world exists can infer, according to Descartes, that *he* is or has an immaterial mind or soul, whose essence is thought. But that person *cannot* infer in this way that other people, or any other creature, have or do not have such a soul; the scope of the creatures that have a soul cannot be determined through the *cogito*.

And indeed, Descartes never gives this justification in the context of his physiological discussions, in order to justify his position that not all mental abilities are explainable physiologically. In no place in which he discusses the distinction between man and machine, the limitations of physiological explanations, or how to determine which creatures have a soul, does he mention the *cogito* arguments. These arguments are not the ones that Descartes considered as explaining the limits of physiology or as justifying the necessity of the ascription of an immaterial soul to *all and only* men. Moreover, in his responses to Gassendi he explicitly maintains that by the private meditations responsible to the *cogito* and related arguments it cannot be determined whether animals think, but that this question must be tackled by a posteriori investigation of animal behaviour (AT VII 358). It is implied that in general, the ascription of a mind to other creatures depends on such a posteriori considerations of their behaviour.

Descartes' arguments for ascribing an immaterial soul or mind to man are found in Part Five of the *Discourse*. He justifies the ascription of an immaterial mind to man by reference to the essential limitations he thought automata have, compared to the abilities of man. I quote this important passage in full:

> If any such machines [natural machines, of the kind he described in *The World*] bore a resemblance to our bodies and imitated our actions as closely as possible for all practical purposes, we should still have two very certain means of recognising that they were not real men.

> The first is that they could never use words, or put together other signs, as we do in order to declare our thoughts to others. For we can certainly conceive of a machine so constructed that it utters words, and even utters words which correspond to bodily actions causing a change in its organs (e.g. if you touch it in one spot it asks what you want of it, if you touch it in another it cries out that you are hurting it, and so on). But it is not conceivable that such a machine should produce different arrangements of words so as to give an appropriately meaningful answer to whatever is said in its presence, as the dullest of men can do.
>
> Secondly, even though such machines might do some things as well as we do them, or perhaps even better, they would inevitably fail in others, which would reveal that they were acting not through understanding but only from the disposition of their organs. For whereas reason is a universal instrument [*la raison est un instrument universel*] which can be used in all kinds of situations, these organs need some particular disposition for each particular action; hence it is for all practical purposes impossible for a machine to have enough different organs to make it act in all the contingencies of life in the way in which our reason makes us act.
>
> Now in just these two ways we can also know the difference between men and beast. For it is quite remarkable that there are no men so dull-witted or stupid – and this includes even madmen – that they are incapable of arranging various words together and forming an utterance from them in order to make their thought understood. (AT VI 56–57, CSM I 139–140)

Every man can express his thoughts in language and give an appropriately meaningful answer to whatever is said in his presence; no possible machine can do that; therefore, no man is a machine. Moreover, man can act appropriately in all circumstances of life; no possible machine can do that; therefore, again, man is not a machine. Human linguistic and behavioural capacities depend on man's having a thinking immaterial part, namely a soul or mind.

Descartes deliberately mentions in this passage 'the dullest of men', the 'stupid' and the 'madmen': *every* man – be he clever or stupid, sane or insane – can express thoughts by words, and hence, *every* man has an immaterial mind. *No* man is a mere machine. Because of the significance of these considerations, Descartes recurrently emphasises in the letters in which he discusses the difference between man and machine

the ability of fools and madmen to express thought in language (to the Marquess of Newcastle, 23 Nov 1646, AT IV 574; to More, 5 Feb 1649, AT V 278). The fact that 'the dullest of men' can give an appropriate, meaningful answer to whatever is said in his presence shows that an immaterial mind is not only necessary for this ability but that it is also practically sufficient: physiologically, very little is required for a creature with a mind to be able to express thoughts in words.[2]

But why does Descartes think that machines could never use language the way we use it to express our thought? And why does he think that, in contrast to the human mind, which is a universal instrument, machines 'need some particular disposition for each particular action'? The reason lies in the comparative primitiveness of the automata of his time.

The automata with which Descartes was familiar, and which convinced him that the varieties of self-movement characteristic of life can be given a mechanical explanation, were rather primitive. As we saw above, what they could do was limited to a very narrow repertoire of simple movements. They rolled on wheels while moving their arms and head, and similar things. And most importantly, each of their motions indeed required a dedicated mechanism or organisation of parts, constructed specifically for the purpose. Consequently, since any automaton has a finite number of mechanisms, such automata could not be given the humanlike ability to act appropriately in infinitely many circumstances. A universal machine or instrument, as the mind is according to Descartes, could not be built on the basis of the contemporary principles of automata construction. And this observation is valid with regard to the hydraulic machines of his time as well, whose mechanisms were used by Descartes as a model for the physiology of the living creature. Generalising from the principled limitations of the automata *of his day*, Descartes concludes that man has an immaterial mind.

Moreover, the mechanisms of the automata with which Descartes was familiar did not make it conceivable that some elaboration should make it possible for an automaton to give an appropriately meaningful answer to whatever is said in its presence. Language as a kind of reflex in these automata was clearly conceivable, and as we saw in the above quotation, Descartes indeed describes such possible automata. But this kind of language-use does not include the ability to reply appropriately to questions according to their meaning. This distinction between kinds of language-use is essential to Descartes, and he will specify again in the future as distinctive of man the ability to use language not in order to express emotions but to relate to different subjects (to the Marquess of Newcastle, 23 Nov 1646, AT IV 574). This ability was far beyond

anything conceivable *at the time* as reproducible by sheer mechanisms. This impossibility is so obvious to Descartes that he simply asserts that 'it is not conceivable' that machines should have this linguistic capacity, without any attempt to justify his assertion.

In this way the automata of his time influenced Descartes not only in his conception of life as a material phenomenon, but also in his ascription of reason to an immaterial mind or soul alone. Descartes determined the nature of the soul according to the possibilities of these automata. His dualistic conception of man, as a natural, living machine with an immaterial mind, a conception that was adopted by much of modern civilisation, was a result of his ideas on the possibilities of mechanisms, ideas that were based on the advances and limitations of the technology of his age. Descartes replaced the soul–body contrast, in which the soul is conceived as the principle of life, inexistent in non-organic nature and containing the thinking mind as a proper part, by a mind–body dualism, in which thought is the essence of mind. And this revolutionary change was the result of conclusions he drew from the technology of his age.[3]

5.1.1 Aristotle, Descartes, Turing

Descartes could not conceive of an intelligent machine, an artefact that adjusts its responses to indefinitely many circumstances and replies meaningfully to whatever is said in its presence. Reason, he concluded, needs a principle different than those to be found in inanimate, material nature. Man can behave and respond intelligently in infinitely many circumstances, for there is in man something that does not exist in inanimate nature, namely an immaterial soul or mind. Man is not a machine, claims Descartes, because of his reason. In this lies man's pre-eminence above the machine.

In these ideas Descartes continues, in important respects, the Aristotelian tradition. Yet because of his conception of the possibilities of the mechanical, what is distinctive of reason is expressed in his system in a new way.

As we saw above, the mind or reason, according to Descartes, 'is a universal instrument which can be used in all kinds of situations' (*Discourse*, AT VI 57). The idea of the universality of mind existed in the philosophical tradition preceding Descartes. Already Aristotle maintained that the mind can think of everything – in his terms, it can receive every form (*On the Soul* III 4). This view ascribes universality to the mind, which, in contrast to the sense organs, is not limited to objects of specific kinds (colour and light, for instance, for vision). This

universality of the mind, in which Descartes follows Aristotle, acquires a new aspect in Descartes' philosophy. According to Descartes a machine or a purely material being, which needs 'some particular disposition for each particular action', is incapable of displaying the universality of appropriate behaviour that a rational creature exhibits. The distinction between non-rational and rational beings thus coincides in his system with that between the mechanical, material creature and a creature that is more than a machine.

This change in the conception of what universality involves is also expressed in the logical status of the claim. For Aristotle, the claim was partly descriptive and partly conceptual. Descriptive, in that he saw that man is endowed with a kind of intelligence that cannot be found in the rest of the animal kingdom, and in that sense he characterised man as a creature that has a mind; conceptual, in that for him the universality, namely the ability to think of everything, follows from an analysis of the nature of thought. In Descartes' system the claim acquires two additional aspects, a theoretical aspect and an ontological or metaphysical one. It is theoretical in that it involves a theory about the nature of the machine, from which Descartes infers what the limitations of the mechanical are. It is ontological, for according to the mechanistic conception of material nature it involves the claim that man, who is not a machine, is not merely a material being either.

The conception of man as a creature that uses language underwent a similar change. The fact that man is the only creature that expresses thought in language is of course evident. Aristotle's definition of man as a rational animal, *zoon logon echon*, is, literally, a definition of man as the language-using animal. Other animals indeed produce sounds, but for Aristotle these are, as they are according to Descartes, just the expression of enjoyment or pain (*Politics* 1.2, 1253a9–1253a10; 7.13, 1332b5). Descartes preserves this characterisation of man, but again it now also involves additional theoretical and ontological claims. The theoretical claim is that no machine that can use language the way we do to express thought can be built; the resulting ontological one is that intelligent use of language demonstrates that man has an immaterial constituent. Aristotle's descriptive claim again acquires a theoretic-metaphysical aspect.

In this way, the characterisation of man and rationality according to Aristotle is kept in Descartes' philosophy, but also acquires a theoretic-metaphysical aspect. After Descartes, man is characterised by having an immaterial constituent, demonstrated by his universal mind and intelligent speech, which a machine *cannot* have.[4]

This conception of man versus machine was shaken in the twentieth century with the development of the digital computer. Once again, technological developments were responsible to a transformation of our conception of man. And the ideas challenged in the process were strikingly close to Descartes' criteria for separating machine from mind. Alan Turing (1912–1954) developed the idea of the computer as a universal machine, echoing Descartes' conception of the mind as a universal instrument. And he also claimed that a machine whose linguistic abilities are indistinguishable from those of man will be constructible. With this, the Cartesian conception of the uniqueness of man was challenged.

Turing described the Universal Turing Machine, which is a computer that can run not only a specific program for 'each particular action', but *any* program. In this respect it is universal (Turing 1936, § 6). Turing machines or digital computers can perform an exceedingly large variety of calculations; in fact, calculation is often *defined* as an operation a Turing machine can perform. Moreover, these machines have a variety of additional intelligent capacities. They are capable, for instance, of learning from their earlier experiences. And when they are used as a robot's brain, equipped with sensors and appropriate means of motion and action, the robot can behave in a complex, purposeful way.

The distance between the abilities of these machines or artefacts and human intelligence is, however, still huge. Discoveries in science, the writing of even a mediocre novel, or the understanding of a simple conversation with all its implications and allusions: all these, and much less, are still unique to man, far beyond the abilities of any machine or computer. We still do not have any *technological* justification for claiming that all modes of thinking characteristic of man are realisable by an artefact as well, either a Turing machine or some other kind of artefact. If we are justified in holding that we are biological thinking 'machines' this is because of reasons of other kinds and because we do not have sufficient reasons for maintaining that artefacts cannot have such abilities.

However, the *theoretical* justification that convinced Descartes that human intelligence proves man to be more than a machine has been refuted. There are now machines that do not require 'some particular disposition for each particular action'. The universal Turing machine is a paradigm of a machine whose structure enables it to run an indefinite number of programs and thus tackle successfully an indefinite number of tasks. For all we know, artefacts might still turn out to be limited in

a variety of ways; but it is not the case that any particular action they can perform requires a particular arrangement, a dedicated mechanism. About that Descartes was wrong.

Descartes' conception of the limits of the machine, as we saw, was influenced by the comparatively primitive automata of his age. And Turing indeed mentions as an important reason for the conviction that machinery cannot show intelligent behaviour

> the very limited character of the machinery which has been used until recent times (e.g. up to 1940). This encouraged the belief that machinery was necessarily limited to extremely straightforward, possibly even to repetitive, jobs. (1948, p. 410)

To this conviction or objection Turing responds by saying that

> in its crudest form it is refuted at once by the actual existence of machinery (ENIAC etc.) which can go on through immense numbers (e.g. $10^{60,000}$ about for ACE) of operations without repetition, assuming no breakdown. (ibid., p. 411)

New technology refuted old arguments. The limits of artefact intelligence turned into an empirical question. One cannot any longer reject, as did Descartes, the possibility that a material creature has a mind by reference to the mind's being 'a universal instrument', for we are familiar with universal Turing machines.

Turing also challenged Descartes' claim, that the human ability of intelligent speech demonstrates that man is more than a machine.[5] He opens his 1950 paper, 'Computing Machinery and Intelligence', with the question, can machines think? – a question to which Descartes' reply was negative. In order to answer this question he replaces it with another one, which he considers 'closely related': can a machine conduct a conversation so that it will be indistinguishable from a man? Descartes also asked whether a machine could 'produce different arrangements of words so as to give an appropriately meaningful answer to whatever is said in its presence' (*Discourse*, Part V, AT VI 56–57, CSM I 140), his reply to this question being negative as well, and on it he grounded his negative reply to the former question. Since it is hard to determine what is to count as a machine, Turing mentions the digital computer as an example of an instrument he considers such (Section 3); and he characterises the digital computer as universal, in the sense that it can imitate

any discrete machine (Section 5). Here is what he writes on the chances of the computer to succeed in this 'imitation game':

> I believe that in about fifty years' time [namely, about 2000] it will be possible to programme computers, with a storage capacity of about 10^9, to make them play the imitation game so well that an average interrogator will not have more than 70 per cent. chance of making the right identification after five minutes of questioning. The original question, 'Can machines think?' I believe to be too meaningless to deserve discussion. Nevertheless I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted. (p. 442)

Turing's Test is an operationalized rendering of Descartes', to which Turing ventured a different answer, inspired by recent technological breakthroughs. And Turing continues there to refute arguments against the adequacy of his Cartesian test and against the ability of machines to succeed in such a game. While old technology made a machine with human linguistic capacities inconceivable for Descartes, new technology made Turing *believe* it is a possibility.

Turing was right in his prognoses in the quotation above. And although it has not yet been technologically decided whether computers, or artefacts more generally, can use speech as intelligently as man can, it is evident that Descartes' claim is not acceptable any longer. In the passage from the *Discourse* just quoted Descartes claimed that 'it is not conceivable that…a machine should produce different arrangements of words so as to give an appropriately meaningful answer to whatever is said in its presence'. But computers nowadays can, to some degree, respond meaningfully to questions put to them. The limits of the linguistic capacities of artefacts are, today, from a technological point of view, an open question. Descartes' second argument for the difference between man and machine is also unacceptable.

We thus witness two significant transformations in the conception of what is unique and special in man, both a consequence of technological breakthroughs. Aristotle contrasted man with the rest of the animal kingdom: man alone has mind and language, and man's mind is universal in being capable of thinking about anything. This is a descriptive-analytic account of what is unique in man. In the seventeenth century, following the development of automata, Descartes adds a theoretic-metaphysical aspect to this conception of the uniqueness

of man. Man, having mind and language, is now contrasted with the *machine*. The mind is still thought of as universal, and it demonstrates the existence of an immaterial element in man. In the twentieth century, following the development of the digital computer and Turing's considerations on the possibilities of intelligent machinery, we witness the development of the conception of the machine as universal and as capable in principle of intelligent speech. Man's uniqueness as an intelligent creature might now be only a temporary matter of fact, and he has lost his metaphysical distinctiveness relative to the rest of nature; his linguistic and intellectual abilities are unique to him only until we succeed in building a sufficiently sophisticated artefact.

Both transformations in the conception of man, Descartes' and the one that has emerged following Turing's work, were primarily the result of *technological* developments. The new technological possibilities of his age convinced Descartes that while the rest of nature is merely material and mechanical, man has an immaterial mind: a conception of man and nature that has been dominant well into the twentieth century. While the new technological possibilities realised or suggested by the development of the digital computer convinced Turing that human intelligence can be realised by material artefacts. Man might therefore be a natural computer, so to say – a conception that quickly emerged and spread, and was responsible for the rise of materialism in the second half of the twentieth century.[6] Turing and his followers succeeded where la Mettrie failed two centuries earlier with his *L'Homme Machine* (1747) because, unlike la Mettrie, they had new technology to support their new conception of man.

5.2 Animals without a mind

Towards the end of the quotation from the *Discourse* above (AT VI 57), Descartes emphasises the distinction between man and animals in their linguistic abilities. While man can express thought in language, no animal can do that. I quote that passage again, this time together with what Descartes says of animals in the final part of its last sentence:

> Now in just these two ways we can also know the difference between men and beast. For it is quite remarkable that there are no men so dull-witted or stupid – and this includes even madmen – that they are incapable of arranging various words together and forming an utterance from them in order to make their thought understood; whereas

> there is no other animal, however perfect and well-endowed it may be, that can do the like. (CSM I 140)

The ability to express thought in language is one indication that man is not merely a machine but has a mind as well. And as we saw, it is also a *necessary* condition for having a mind: even the dull-witted, stupid or mad can say what they think. For this reason, Descartes concludes that *animals have no mind*:

> This shows not merely that the beasts have less reason [*raison*] than men, but that they have no reason at all. For it patently requires very little reason to be able to speak; and since as much inequality can be observed among the animals of a given species as among human beings, and some animals are more easily trained than others, it would be incredible that a superior specimen of the monkey or parrot species should not be able to speak as well as the stupidest child – or at least as well as a child with a defective brain – if their souls [*âme*] were not completely different from ours. (AT VI 58, CSM I 140)

Since animals cannot express thought in language, they have no reason or mind (*raison*, *esprit*). Descartes continued to hold this view throughout his life: on 5 February 1649, a year before his death, he writes to More that the main reason for denying mind or thought to animals is their inability to express thought in language (AT V 278).

Apart from the ability to express thought in language, Descartes had another reason for ascribing a mind to man: while the mind is a 'universal instrument', a machine requires a special arrangement of parts for every kind of activity, and it can therefore react properly only in a finite number of circumstances. And Descartes indeed claims that the case of animals is like that of the machine:

> It is also a very remarkable fact that although many animals show more skill than we do in some of their actions, yet the same animals show none at all in many others; so what they do better does not prove that they have any reason [*esprit*], for if it did then they would have more than any of us and would excel us in everything. (AT VI 58–59, CSM I 141)

If these animals' skill (*industrie*) in the actions in which they excel us was due to mind or reason, this would show that their mind is superior to ours. But since the mind is a universal instrument, they would then

surpass us in *all* actions. But this is not the case, and therefore their skill is not due to a mind. And from this it again follows that animals do not have mind or intelligence:

> It proves rather that they have no reason [*esprit*] at all, and that it is nature which acts in them according to the disposition of their organs. In the same way a clock, consisting only of wheels and springs, can count the hours and measure the time more accurately than we can with all our wisdom. (ibid.)

The analogy of the clock or automaton is again used by Descartes, this time to support the claim that sophisticated purposeful behaviour as such does not require reason, and in this way his view that animals have no mind. Animals are natural machines, devoid of any immaterial soul or mind of the kind man possesses.

The reference to skill in this argument is not necessary. The argument relies on the fact that animals cannot behave intelligently in many circumstances. The reference to animals' skill is because this skill is the reason for our tendency to ascribe a mind to animals. When we see, for instance, a nest that a bird has built with much skill, one that we 'with all our wisdom' could never build, we are tempted to think that the bird is intelligent. But, Descartes claims, the fact that the bird shows no skill in other actions proves that we are wrong.

In this way Descartes justifies his position, that animals have no mind. His argument for his position is explicitly a posteriori, relying on animal behaviour (Fifth Replies, AT VII 358). This is a position which he held, in some form, from a very early stage of his thought: already in the *Rules* he wrote that animals, unlike man, do not understand (*cognoscere*) in the true sense of the word (Rule 12, AT X 415).

The claim that animals have no mind is equivalent to the claim that their soul is of a nature completely different from that of man: while man's soul is nothing but his mind, animals have no soul in this sense. Animals are natural material automata, of the kind Descartes describes in *Man*, while man's soul is immaterial. Occasionally Descartes even simply writes that the natural machine has no soul (*Man*, AT XI 185). The use of 'soul' with reference to animals, writes Descartes to Regius, is with a different meaning than its use with reference to man and therefore this is an inappropriate equivocation:

> I do not admit that the powers of growth and sensation in animals deserve the name 'soul', as does the mind in human beings. This

> common view is based on ignorance of the fact that animals lack a mind. So the term 'soul' is ambiguous as used of animals and of human beings. (May 1641, AT III 370, CSMK 181)

Yet more often Descartes does not write that animals have no soul, but rather that unlike man – whose soul is the mind or thinking thing, which is immaterial – the soul of animals is material.[7] Following the scriptures (*Leviticus* 17.14, *Deuteronomy* 12.23), Descartes even writes that animals' soul is their blood (to Plempius for Fromondus, 3 Oct 1637, AT I 414–415).

It is therefore a mistake to think that later philosophers who ascribed a material soul to animals departed from Descartes in this respect. Garber, for instance, writes of Gassendi:

> Unlike Descartes, however, Gassendi posited a material soul as the source of vital functions in both animals and humans, an *anima*, a particularly subtle collection of atoms spread through the living body, what he sometimes calls the most noble part, or flower of matter (*flos materiae*), and which he considers a variety of fire. (1998, p. 771)

But apart from the fact that Gassendi's material soul is spread *throughout* the body, this doctrine is identical with Descartes', who sees the animal spirits as such an animating variety of fire. Garber is therefore also wrong when he writes that an 'important difference' between Gassendi and Descartes is that 'strictly speaking, for Gassendi the human soul is bipartite, consisting of a non-rational and material vital soul, an *anima*, united with a rational and incorporeal *animus*.' (p. 772) Gassendi follows Descartes in this respect not only in ideas but even in terminology – Descartes explained the ambiguity in the term 'soul' to Gassendi in his replies to Gassendi's objections (AT VII 356), and while Descartes often, but not always, restricts the term 'soul' to the mind, Gassendi consistently applies it to Descartes' 'corporeal soul' (Sixth Replies, AT VII 426).

Animals are thus, according to Descartes, material beings, a natural machine or automaton, devoid of mind or reason. Man, by contrast, is a composite of a material body and an immaterial soul-mind, who can think.

As was remarked above, the special characteristic that Descartes ascribes to man, which distinguishes him from all other animals, namely his having reason or mind, is not his innovation. The source of this characterisation is Aristotle. Aristotle ascribed to all animals a soul (*psyche*) that can sense and can move the body, while ascribing a mind (*nous*) only

to man. The mind distinguishes man from all other animals. Unlike all other animals, man is a rational creature, a creature with logos; and, among other things, this means that man is the only creature with a language (*Politics* 1.2, 1253a9–1253a10).

Descartes accepts this division: man, but no other animal, has a mind. As in many of his other views, he is deeply committed at this place to the philosophical tradition preceding him. With his arguments in the *Discourse* he is in fact *defending* the philosophical tradition against the recent view of Montaigne and his followers, who claimed on the basis of the resemblance of animal behaviour to ours and its sophistication that animals *are* intelligent.[8] But since Descartes has innovative views on the nature of life, a new theoretical conclusion follows from that old claim: animals, unlike man, are a natural *machine*. Moreover, as we shall see in the next section, when combined with his views on perception, a new understanding of animal perception emerges as well.

Was Descartes justified in denying animals a mind? When we come to assess his claim, we should distinguish between it and the argument he gives to show that man has a mind. His claim with regard to animals follows from this argument only with an additional, double claim: that animals cannot express thought in language, and that they can act appropriately only in a finite number of circumstances. One can in principle accept Descartes' criteria for having a mind, reject his additional double claim about animal capacities, and conclude that some animals do have a mind. Here I shall not examine the validity of Descartes' criteria for having a mind but whether he was justified in holding this additional, double claim about animals.

I start with his claim concerning language. It is often claimed today that some developed animals can master a primitive form of language that also has rudimentary grammar, at least in the sense of responding to orders according to their grammatical structure as well (for instance, 'Take A to B' versus 'Take B to A'). If this is indeed the case, then although the distance between the linguistic abilities of man and animals is huge, it might not be categorical in the way Aristotle and Descartes thought. But whether or not this is so, in Descartes' times his claim *was* empirically justified: there was no evidence to support the view that any animal might be able to master even such a rudimentary form of language.

By contrast, Descartes' second reason or argument for denying animals a mind was problematic already for him – and perhaps even especially for him – because of internal tensions within his system.

Descartes denied machines, natural ones included, intellectual abilities, which he ascribed to the immaterial mind or soul alone. This denial

was based on the necessary limitations of machines: while the mind is a universal instrument, the machine needs for each particular action a dedicated mechanism. In contrast to the mind's abilities, Descartes tried to provide a mechanistic explanation for all other abilities living creatures have. And, following both the Aristotelian tradition and what is evident in animal behaviour, these abilities included not only self-movement and sensation, but also memory and the ability to learn; and therefore Descartes developed a mechanical-physiological explanation of these abilities as well. But in this way, as we shall now see, he introduces a kind of universality into soulless physiology and cuts the ground from under his own argument.

We saw in the previous chapter that Descartes' explanation of memory, learning, responses to sensations and dreaming are physiological explanations of psychological phenomena; and Descartes does not refer there to any immaterial soul. Descartes even emphasises that aspect of his physiology; while discussing memory in *Man*, for instance, he writes:

> But the effect of memory that seems to me to be most worthy of consideration here is 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. (AT XI 185, Descartes 1998 p. 157)

The physiological ability to learn is expressed in the brain's being shaped by experiences that have often occurred together, so that one experience will remind the creature – whether man or animal – of the others. In this way conditioned reflexes can be acquired as well; for instance, if A often occurs with B, and B naturally causes reaction C, then later the occurrence of A alone will also cause reaction C.

How many responses can be acquired in this way? Their number is practically unlimited. Descartes does not specify how many nerve openings face the pineal gland, but it is reasonable to assume that he thinks of them at least in their ten-thousands. And so, the number of combinations of excitations that can shape the brain in different ways is huge, and cannot be exhausted in the lifespan of one creature. That is, we can train or teach animals, if their brain is sufficiently complex (and this is probably the case with advanced animals), to respond appropriately in a practically unlimited number of circumstances. And even if *in fact* there is no animal capable of this, the thing is possible *in principle*. Accordingly, the ability to respond appropriately in a practically unlimited number

of circumstances does not justify the ascription of an immaterial mind. And conversely, even if animals are merely natural machines, perhaps the more 'perfect and well-endowed' among them do have the ability to learn to respond appropriately in indefinitely many circumstances.

On the one hand, Descartes argues that a machine needs 'some particular disposition for each particular action' (*Discourse*, AT VI 57); on the other hand, he himself describes a physiological machine, the brain, which can be modified in such a way that it can be used, over time, for a practically unlimited number of actions. We find inconsistency in Descartes' ideas about the possibilities of the mechanical: a machine cannot perform indefinitely many actions; some machines (brains) can practically perform indefinitely many actions. A claim and its contradictory are used to ground two aspects of the Aristotelian tradition regarding animals: animals have no mind; animals can learn.

In distinguishing man from animals – having a mind versus being devoid of mind – Descartes is influenced by the Aristotelian tradition more than by experience and observation. Aristotle ascribed to both man and animals the ability to move and to sense or perceive but only to man mind and language, and Descartes accepts this distinction. Like any revolution, the Cartesian one continues in many ways the tradition it partly rejects. But the application of the Aristotelian distinction between man and animals within Descartes' system involves a metaphysics different from the Aristotelian one, which brings about inconsistency, or at least inner tensions, in Descartes' opinions on physiology and technology.

At a later stage Descartes himself may have become uncertain of the soundness of his second argument against the possibility that animals have a mind, the argument relying on the claim that they can react appropriately only in a finite number of circumstances. In the *Discourse* (AT VI 57–59), published in 1637, this argument is presented next to the language argument, as having a status equal to it: together they constitute 'two very certain means' to distinguish man from machine. One year later, in a letter to Reneri for Pollot (Apr or May 1638), Descartes still gives both arguments an equal status when claiming that animals do not have a mind (AT II 39–41). By contrast, eight years later, in a letter to the Marquess of Newcastle (23 Nov 1646), Descartes writes that *only* the use we make of language proves that our body contains a thinking soul (AT IV 574). The argument relying on the unlimited action abilities is not mentioned at all. And this is not a result of negligence of some sort: a year before his death, on 5 February 1649, Descartes writes to More that the language argument is the main reason for denying animals a mind, and that the expression of thought in language is the only certain sign

that thought is hidden in the body (AT V 278). Descartes indeed writes there that for brevity's sake he omits other reasons for denying thought to animals, but what he does write does not accord well with the equal status the two arguments had for him in the past. And moreover, two months later, on 15 April, he again writes to More that only speech shows that thought is hidden in the body (AT V 344–345).

Descartes does not explain anywhere why he does not use any longer at this later period the argument from the ability to act. It is possible that he noticed the inner tension in his opinions on the subject, but perhaps the change had a different reason.

More generally, in this later period Descartes is less decisive in his denial of thought or mind to animals. In a letter to More he even writes that one cannot prove that animals do not think, for our mind cannot penetrate their heart (AT V 276, 5 Feb 1649). In addition, in letters to the Marquess of Newcastle and to More he writes that the structural similarity of man and animals lets one conjecture that some thought, of a much less perfect kind than ours, is attached to their organs (to the Marquess of Newcastle, 23 Nov 1646); or that they have sensation like us, and this includes thoughts (to More, 5 Feb 1649, AT V 277). (Descartes mentions the last argument as a plausible one already in the Sixth Replies, AT VI 427.) This ascription of a mind seems to him there highly problematic, since it will force us to ascribe an immaterial soul to far too imperfect animals such as oysters, sponges, worms, flies and caterpillars, and this is highly unlikely. And the contrary arguments, primarily the language argument, seem to him much more powerful. But this critical tone is absent from his writings of the previous decade.

5.3 Painless pain, blind sight

Descartes' claim that animals are purely material creatures that have no immaterial mind, together with his claim that the sensory qualities of which we are directly aware do not exist in the purely material world, brought him to an exceptional position regarding the nature of animal sensation, which involved a new and highly influential conception of sensation and of the relation of sensation to what came to be called consciousness.

According to Descartes, physical objects act on our sense organs, these affect the flow of the animal spirits in our nerves, and in this way a representation of these physical objects is formed on the inner surfaces in the brain facing the pineal gland, and consequently in the pattern of flow of animal spirits out of the pineal gland. This is a representation of shape,

place, colour, sound, smell and, more generally, of properties of the perceived physical objects. The nerves also respond to various internal events and represent these in a way that generates pleasure, pain, hunger, joy, sadness and other passions (*Man*, AT XI 176). But we know that the physical world in itself does not contain anything resembling our ideas of colour, sound, pleasure, pain or any other sensory quality. These exist at the interface of the immaterial soul or mind and the body. Moreover, animals have no immaterial soul or mind. It follows that animals have sensation or perception in one sense, but not in another: they indeed have representations of physical objects in their brains, they respond to properties of physical objects and to internal bodily processes, and they can even attend to them in a sense; but they are not aware of any quality resembling those of which we are immediately aware in perception. Unlike us, animals are not aware of any sensory idea; indeed, they are not aware of anything at all. Animals have, we may say, *functional* sensation, but no *conscious* sensation.

This position is not only derivable from Descartes' claims but also explicitly found in his writings. On 11 July 1640 he writes to Mersenne:

> I do not explain the feeling of pain without reference to the soul. For in my view pain exists only in the understanding [*entendement*]. What I do explain are 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 [*la douleur proprement dite*]. (AT III 85, CSMK 148)

Descartes explains the movements that *accompany* pain *in the strict sense* or *properly so called* without referring to the immaterial soul – the understanding or mind. Pain in the strict sense involves the sensation of pain, which exists in the mind. Animals do not have a mind, and therefore they do not have pain in the strict sense.

Similar ideas, this time regarding sight, are found in Descartes' response to Fromondus, who claimed that it is impossible that the cause of sight is heat:

> Concerning pages 46 and 47 [of the *Discourse*; AT VI 46] he [Fromondus] comments that 'noble actions like sight cannot result from so ignoble and brutish a cause as heat'. He supposes that I think that animals see just as we do, i.e. sensing or thinking they see [*sentiendo sive cogitando se videre*], which is said to have been Epicurus' view and is still almost universal. But in the whole of that part up to page 60 [AT VI 60] I

> explain quite explicitly that my view is that animals do not see as we do when we sense that we see, but only as we do when our mind is elsewhere. In such a case the images of external objects are depicted on our retinas, and perhaps the impressions they make in the optic nerves cause our limbs to make various movements, although we do not sense them. In such a case we too move just like automata, and nobody thinks that the force of heat is insufficient to cause their movements. (to Plempius for Fromondus, 3 Oct 1637, AT I 413–414, CSMK 61–62)

Animals see without having sensations in the strict sense, which are modes of thought. The objects of the senses, by means of their physical representations in the animal's brain, cause the animal's movements; but its movements, and so its 'sensations', are like the movements and 'sensations' of automata. We may say that it is sensation without awareness or consciousness (a term Descartes does not use at these places, and which acquired a meaning closer to its current one only later). If we were used to seeing automata that perfectly imitate all our movements that they can imitate, Descartes writes to Mersenne, and we knew these were automata, we would have no doubt that the non-rational animals are also automata; and in this way we would get rid of the thought that animals have sensations like ours (30 July 1640, AT III 121).

And again, in a letter to Gibieuf:

> We observe in animals movements similar to those which result from our imaginations and sensations; but that does not mean that we observe imaginations and sensations in them. On the contrary, these same movements can take place without imagination, and we have arguments to prove that they do so take place in animals … (19 Jan 1642, AT III 479, CSMK 203–204)

Animals do not have imagination, and accordingly they do not have sensations either, in the sense we have them. In us, they are the result of the union of mind and body, since an intellectual act is involved in their very essence (*Meditations*, Sixth Meditation, AT VII 73, 78).

In his Sixth Replies Descartes distinguished three aspects or levels in human perception (AT VII 436–438). The first level is purely physiological: the effects on bodily organs by the perceived object, which include the formation of a representation of the object by patterns of motion of the animal spirits in the brain. This is the only level common to man and animals (ibid. 437). This level of perception suffices for some kinds

of human response and for all kinds of animal response. For instance, when a falling man sticks out his hands to protect his head, it is not reason that instructs him to do this; 'it is simply that the sight of the impending fall reaches the brain and sends the animal spirits into the nerves in the manner necessary to produce this movement even without any mental volition, just as it would be produced in a machine.' Today we would describe such behaviour as reflex behaviour (which might also be an acquired reflex). In a similar way, 'light reflected from the body of a wolf onto the eyes of a sheep [is] capable of arousing the movements of flight in the sheep' (Fourth Replies, AT VII 230, CSM II 161; this sheep has been fleeing from the wolf already in Avicenna's writings). Such perceptions or sensations are merely *functional*, without any interference of a mental element.

The second level of perception comprises the sensory qualities: perceptions of pain, pleasure, thirst, hunger, colours, sound, taste, smell, heat, cold and so on. These are formed in the mind because it is very closely joined, or even, so to speak, mixed (*quasi permixtum*) with a body.[9] As we saw above, according to *Man* the sensory qualities are instantiated on the surface of the pineal gland. Descartes explicitly says there that the figures formed on the surface of the pineal gland are the ideas [*idées*] that the rational soul considers directly when, united with the body, it senses or imagines an object (AT XI 177). And Descartes reaffirms this position years later, in his Conversations with Burman (16 Apr 1648, Question 42, AT V 162–163; see also *Meditations* VI, AT VII 75). We have here accordingly a special kind of mode (*Principles* I 64), the subjective sensory quality, which is instantiated only in a 'mixture' of mind and body. And Descartes writes in his *Principles*:

> We also experience within ourselves certain other things which must not be referred either to the mind alone or to the body alone. These arise ... from the close and intimate union of our mind with the body. This list includes, first, appetites like hunger and thirst; secondly, the emotions or passions of the mind which do not consist of thought alone, such as the emotions of anger, joy, sadness and love; and finally, all the sensations, such as those of pain, pleasure, light, colours, sounds, smells, tastes, heat, hardness and the other tactile qualities. (I 48, CSM I 209)

A little earlier Descartes wrote to Regius that the ideas of sensation are 'confused perceptions of a mind really united to a body' (Jan 1642, AT III 493, CSMK 206). To Burman he says that they are a special mode of

thought (Question 42, AT V 162). Every specific sensory quality is not instantiated, it seems, either purely in the mind or purely in the body, but it is rather instantiated in the union of the immaterial mind and a body (the pineal gland). Descartes' thought here is easier to understand if we note that according to him, 'what is a passion with regard to one subject is always an action in some other regard' (*Passions* I 1, AT XI 327, CSM I 328). Sensations are actions of the body but passions of the soul, while imaginings are actions of the soul and passions of the body (*Passions* I 20–25). We do not have here any disagreement with Descartes' mind–body dualism, for no third kind of *substance* is involved; yet his dualism has a kind of complexity that is not always noticed.[10]

The third level of sensation already belongs to the mind alone. It includes the judgements we make on the physical objects according to the way they activate our senses: their size, shape, distance from us, colour and so on (Sixth Replies, AT VII 437–438). These judgements as well do not exist in the case of animals, which do not have a mind.

Costa (1983) justly emphasised the materiality of the ideas of sensation that the mind directly considers.[11] However, maintaining that 'it goes without saying that for Descartes no mental state was identical with any brain state' (p. 545), he then had to make these ideas into non-mental entities. Descartes indeed occasionally, although rarely, called merely material representations 'ideas'.[12] His considered view, however, is that an idea is the form of a thought, and that the images depicted in some part of the brain are ideas only in so far as they give form to the mind itself (Second Replies, AT VII 160–161, CSM II 113). Descartes also explicitly refers to the ideas of sense and imagination as being thoughts, or in the mind, in the *Meditations* (AT VII 37), and this at a stage where it is still possible, as far as he knows, that he has no body at all. So a purely material interpretation of the ideas of sense and imagination is implausible. Again, once we allow mixed modes into the Cartesian system, these difficulties disappear.

Descartes' thought of the immaterial mind as, so to speak, mixed or intermingled (*quasi permixtum*) with a body (*Meditations* VI, AT VII 81) might sound odd to our modern ears, and perhaps even in tension with his dualism. Clarifying his ideas on this issue would also shed light on an additional shift in philosophical thought that he brought about. Unlike us, Descartes' contemporaries were familiar with the idea that the soul, which is radically unlike the body, can still be intimately mixed with it. It is found already in Plato, who in the *Phaedo* describes the relation between the polluted soul and the body in similar terms

(81c). Augustine, a major influence on Descartes and the *Meditations*,[13] also writes on the soul (*anima*) as being mixed, *commixta*, with the body (*On the Trinity* 11.1.2). Similarly, I noted above how, according to Roger Bacon, the rational soul is united directly with the cogitative faculty in 'the middle cell' of the brain.[14]

The way the extensionless mind can be 'scattered' throughout the part of our body with which it is united is demonstrated, according to Descartes, by the way the Scholastics thought of a body's heaviness or gravity as a real quality scattered throughout the heavy body (Sixth Replies, AT VII 442) – a confusion which, he claims, is a projection of our primitive notion of mind–body union to a mistaken conception of gravity.[15] What in fact occurs here is of course Descartes adapting the way some Scholastics thought of the union of an abstract entity – a substantial form – with a body to his conception of the union of soul and body. This also helps explain why his 'mixture' of soul and body would not have appeared unfamiliar or unacceptable to his contemporaries.

For Descartes, the notion of the union of the soul and body was among our few primitive notions, inexplicable through any other notion but understood only through itself, and on which depended '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' (to Elizabeth, 21 May 1643, AT III 665–666, CSMK 218). The fact that it is a primitive notion is probably responsible for his writing to Arnauld that any attempt to explain by other terms how the incorporeal mind can set the body in motion only obscures things (29 July 1648, AT V 222, CSMK 358).

Yet as Radner noted (1971, p. 167), there is a tension between different claims of Descartes' on these issues. He remarks in the *Principles* IV 198 that we cannot understand how substantial forms or real qualities – as the Scholastics took gravity to be – could have the power to produce local motions in other bodies, and vice versa (CSM I 285; cf. to Regius, Jan 1642, AT III 506–507). But since this unintelligible causal relation is according to him a projection of the mind–body causal relation, his claim here should have committed him to maintaining that we cannot understand how the mind and body interact either.

As remarked above (p. 105), earlier non-monist philosophies tended to introduce a hierarchy of beings, the mind being superior to the soul, which is itself superior to the body. This approach has no reason not to allow a superior being to affect an inferior one, and also an inferior being to affect, to some limited extent, a superior one. Accordingly, on an ontology of degrees-of-being, an interaction in the direction from

mind or soul to body, and to a limited degree also from body to soul or mind, do not pose a problem. But when Descartes replaced the hierarchy of beings by two distinct substances, having no attribute in common, the question of the possibility or manner of their interaction immediately emerged, to concern philosophers from then on.

Descartes' way of conceiving the relation and interaction of immaterial mind and body is a vestige of Scholastic and earlier ideas. But his own philosophy brought about the unacceptability of these very ideas (as is apparent in his own remarks about them in the *Principles*). Ironically, Descartes' attempt to have his own philosophy replace the Scholastic one was so successful that it made inadmissible these elements of the previous system that he retained in his own (see also Hoffman 2008, pp. 400–401). The occasionalists, Spinoza, Leibniz and others will therefore develop, in the generations following his, extravagant metaphysical systems in order to eliminate this very element from philosophy.

A related question is, how can an immaterial substance be mixed with a body that has *volume*? Being a property of *material* beings, it seems no immaterial substance can have volume. Accordingly, Seager, for instance, being convinced that the mind cannot participate in any spatial relations, took it as obvious that the mind must operate at a single point in the body, and that 'point interactionism' is 'the official Cartesian doctrine' (1988, pp. 122–123). But the textual evidence he adduces in support of his claim (pp. 127–128) merely shows that, according to Descartes, the mind interacts with the body at the pineal gland. Yet the pineal gland is an extended body like any other body, and this is its nature according to Descartes as well. Moreover, in his Sixth Replies Descartes carefully demonstrates how it was thought that 'gravity, while remaining coextensive with the heavy body, could exercise all its force in any one part of the body'. Since this mistaken conception of gravity is according to him a projection of the mind–body relation, he then writes that this is exactly the way in which he now understands the mind to be coextensive with the body. (AT VII 442, CSM II 298)

Despite the fact that the mind is coextensive with a body (the pineal gland), the mind does not have extension, because unlike a body it is wholly present at every point. It is a mistake to think that since for Descartes the mind is immaterial it cannot be located in space. His way of conceiving the spatial presence of the immaterial was common in Scholastic philosophy as well. It goes back probably to Socrates' comparison in Plato's *Parmenides* of the way the Form is as a whole in each of

the many particulars that partake in it to the way one and the same day is simultaneously in many places without having separate spatial parts (131b). The idea was first applied to the soul's presence in the body by Plotinus:

> The nature, at once divisible and indivisible, which we affirm to be soul has not the unity of an extended thing: It does not consist of separate sections; its divisibility lies in its presence at every point of the recipient, but it is indivisible as dwelling entire in the total and entire in any part.[16] (*Enneads* IV 2 1)

Reid thought that the spatial presence of the mind in the body should be understood only as operational presence, unlike the substantial presence of God in nature (2008, p. 108). But he arrived at this conclusion only because he did not consider Descartes' talk of mixture and intimate conjunction. Taking into consideration these descriptions of the union, Descartes is as explicit of this presence as he can be. Moreover, had it been his position that the mind is not present in space he would probably have emphasised it, for one of his main explicit goals in the *Meditations* was to stress the distinction between the extended body and the immaterial mind.

Allen (2008, pp. 289–290) thought that a union of mind and body of the kind Descartes advocates, of which we have a primitive notion the way we have of extension, thought, and 'the most general [notions] – those of being, number, duration, etc. – which apply to everything we can conceive' (To Elizabeth, 21 May 1643, AT III 665, CSMK 218),[17] would violate Descartes' commitment to substance dualism. But it is hard to see why this should be so. Descartes does not suggest a third kind of substance but a 'mixture' of two substances (whether this idea of mixture is coherent does not concern us here). And an additional 'primitive notion' need not commit Descartes to an additional substance: the additional primitive notions of number and duration certainly do not commit him to any additional kind of substance. Consequently, the difficulty Allen sees in Descartes' attempt to accommodate the distinctive nature of the sensory qualities by making them modes of the mind–body union seems to be spurious.[18]

Of all living beings, Descartes' man is the only one who is aware of sensory qualities, as these are mixed modes, instantiated in a mind closely united with a body. According to this reasoning, the human mind, once it has left the body with death, will have no sensation,

for it will not be able to instantiate any sensory qualities. And indeed Descartes writes to More:

> The human mind separated from the body does not have sensation strictly so called [*sensum propriè dictum*]. (Aug 1649, AT V 402, CSMK 380)

This is true of imagination as well: as was mentioned above, the difference between ideas of sensation and those of imagination is that while the former are sensory ideas originating in an external body, the latter's source is different.

Confusion is also essential to sensory ideas. Descartes writes to Regius:

> Sensations such as pain are not pure thoughts of a mind distinct from a body, but confused perceptions of a mind really united to a body. For if an angel were in a human body, he would not have sensations as we do, but would simply perceive the motions which are caused by external objects, and in this way would differ from a real man ... (Jan 1642, AT III 493, CSMK 206)

And the same applies to imagination. Again, angels, not being liable to any confusion, neither sense nor imagine (Conversations with Burman, Question 41, AT V 162).

This central aspect of our sensation and existence, the 'colour' of our world, is completely absent from animal sensation, which is only functional. That is why Descartes could write to Mersenne that animals do not have pain in the strict sense.

The distinction between sensation in the behavioural or functional sense (Descartes' first level) and sensation in the sense of awareness or consciousness of sensory qualities (Descartes' second level) is new with Descartes. It results from two new claims he made: (1) the elimination of the sensory qualities from the purely physical world, and their relocation in the immaterial soul or mind; (2) the denial of an immaterial soul or mind to animals. Since no one held both opinions before Descartes, functional sensation without consciousness of sensory qualities was not a possibility before him. In fact, there was no need for distinct terms to distinguish between these two kinds of sensation. The term 'consciousness', in its contemporary sense of awareness of sensory qualities in contrast to responses to perceived objects, came into being only after Descartes, because of the possibility created by Cartesian metaphysics.

Descartes himself, who does not use the term 'functional sensation', introduced the term 'organic sensation' – the only mode of sensation that animals have – in order to distinguish animal sensation from human sensation (Sixth Replies, AT VII 426).[19]

Few in Descartes' time were convinced by his claim that animals do not feel in the strict sense, that they are not aware of any ideas of sensation. The doubts come up time and again in his correspondence and in the objections to the *Meditations*. Later generations were not any more inclined to adopt these Cartesian ideas.[20] However, even if, unlike Descartes, few of us think that there is such a contrast in sensation between man and animals, the very *distinction* between, on the one hand, man and whatever else has consciousness, and, on the other, the automaton; and in addition to it, the removal of the sensory qualities from material nature; these together bring many today as well to believe in the *possibility* of functional 'blind' sensation, sensation with no consciousness of qualities.

The Cartesian development of the ideas of unconscious sensation ('unconscious' in the sense of involving no consciousness or awareness of sensory qualities) and of the contrast between the mental and the automatic, brought with it a change in what is conceived as the most fundamental thing about the mind. The Cartesian mind is contrasted with the mechanical, or more generally, with what can be brought about by relying only on principles that operate in inanimate nature as well. For Descartes, the latter did not include thought, understanding, and other mental capacities or characteristics. But with the rejection of his ideas on the limitations of the machine, especially following the development of the computer, a creature that operates only in accordance with principles found in inanimate nature as well, whether an artefact or a 'natural automaton', and yet as intelligent as we are, is considered possible. However, the sensory qualities were left where Descartes had last placed them, namely in non-physical reality, in the immaterial mind. The most fundamental characteristic of the non-physical has thus become awareness of sensory qualities (*qualia*, as they are often called today), and no longer thought. Although the mind as the immaterial principle started its life as the thing responsible for the latter, it has now become the thing responsible for awareness of qualities, a consciousness. A creature which, on any behavioural or functional criterion, is as intelligent as us, might still be without any mind in a Cartesian 'strict' sense, namely without consciousness of qualities. The ancient soul, that elaborate entity that had distinguished its possessor from the inanimate as something involving irreducible principles, first shrank under

Descartes' hands to a mind, and then, in the twentieth century, has further dwindled into a mere consciousness, an epiphenomenon that adds no special power to a creature endowed with it.

The fact that no behavioural or functional criterion can guarantee the presence of mind in this 'strict' sense gave rise to 'the problem of other minds': how can we know that other creatures, whether human or not, are conscious, that they have a mind which is aware of sensory qualities (or of any other qualities accessible to consciousness, if there are any)? Each one of us is aware, in his own case, of these sensory qualities, so the problem does not arise from the first person's point of view; but this mode of awareness is unavailable with regard to other minds. So are we doomed to scepticism about the existence of other minds?

Descartes had a ready answer: in case a creature can 'use words, or put together other signs, as we do in order to declare our thoughts to others', and just in this case, it has a mind and is thus conscious. Accordingly, animals have no conscious mind and no sensations or perceptions in the strict sense either. Human beings, by contrast, even the most stupid or mad, can express thought in language, and they do therefore have a conscious mind. But the fact that they live and have sensations in a functional sense is not enough to establish that they are conscious; the question of consciousness is not trivial and it can be answered only together with a theory on the limitations of the machine (*Discourse* AT VI 56–57; to Reneri for Pollot, Apr or May 1638, AT II 39–41).

The problem of other minds thus results from special theoretical or metaphysical developments within Cartesian philosophy. And the problem is indeed not found prior to Descartes. The ancient and Renaissance sceptics, with all their ingenuity, did not see any difficulty here. The closest we get to the problem before Descartes is Augustine's straightforward account in *On the Trinity* of why we ascribe a soul to other people and animals. Augustine, like Descartes, thought that we know of our own soul and mind through self-awareness:

> And as regards the mind [*animus*], we not unfittingly say that we, therefore, know what a mind is because we also have a mind. We have never seen it with our eyes, nor formed a general or special idea of it from any similarity with other minds that we have seen, but rather, as I said, because we, too, have a mind. For what is so intimately known, and what knows itself to be itself, than that through which all other things are likewise known, that is, the mind itself? (8.6.9, pp. 13–14)

However, we do not have this access to others' mind or soul. Rather, the knowledge that others have a soul is acquired through observation of their behaviour and inference from it:

> For we also recognise, from a likeness to us, the movements of bodies by which we perceive that others besides us live. Just as we move our body in living, so, we notice, those bodies are moved. For when a living body is moved, there is no way opened to our eyes to see the mind, a thing which cannot be seen with the eyes. But we perceive something present in that bulk, such as is present in us to move our bulk in a similar way; it is life and the soul [*anima*]. Nor is such perception something peculiar to, as it were, human prudence and reason. For indeed beasts perceive as living, not only themselves, but also each other and one another, and us as well. Nor do they see our souls except through the movements of our bodies, and that at once and very easily by a sort of natural agreement. Therefore, we know the mind of anyone at all from our own, and from our own case we believe in that which we do not know. (ibid.; see also ibid. 13.1.3, p. 105)[21]

For Augustine, if one is alive then one has a soul, the soul being the principle of life. Therefore, since we can see that others live, we know they have a soul. No scepticism about other minds or souls, for either man or animal, is possible. And Augustine's attitude is the general one before Descartes.

Descartes' criteria suffice in order to ascertain that humans have a mind, and thus also sensation in the strict sense, namely conscious sensation, as long as his conception of the machine is accepted. But we saw that this conception was later rejected and that the possibility of machines that reproduce human intelligent behaviour has in principle been accepted. The problem of other minds (in the sense of consciousness) has thus become a central philosophical problem, or even predicament.

Contemporary philosophers, accepting Descartes' distinction between functional and conscious sensation, think that functional sensation with no consciousness is conceivable. We can conceive of a creature that behaves like us in every respect while in fact 'there is darkness inside': no awareness of anything (the philosopher's zombie, which lacks any *qualia*). This notion is claimed to be something intuitive, not a result of any theory.[22] But it is nothing of the sort. It is a conclusion drawn

from the following claims, which are far from intuitive or even plausible: (i) appearances notwithstanding, there are no sensory qualities in the material world; (ii) the sensory qualities are in consciousness; (iii) unconscious human-like behaviour is possible. Descartes was the first to hold all these metaphysical views, and he was also the first to think that a kind of zombie is possible, and in fact real: animals, according to Descartes, are such zombies, behaving as if they have sensations like us while in fact they have none, lacking awareness or sensation properly so called.[23]

We thus witness again Descartes' deep, revolutionary influence on philosophy (and as we shall soon see, on culture more generally): his understanding of life, sensation and consciousness, an understanding which is a result of considerations on the limitations of technology and of a geometrical conception of material nature, shaped the space of problems of later philosophy of mind. His idea of functional sensation devoid of consciousness even seems today to many a pre-theoretical intuition, despite its paradoxical consequences: a creature that responds to physical damage and other stimuli painful to us the way we do, cries then the way we cry of pain, describes its feelings the way we do, tries to avoid what we try to avoid, yet is unaware of any pain, or of anything whatsoever.

Apart from distinguishing between functional and conscious sensation, Descartes was also a mind–body dualist. This made it possible for him to remove the sensory qualities from material nature and relocate them in the mind. Contemporary materialists, however, do not admit an immaterial mind, although they distinguish functional from conscious sensation and share Descartes' view that there are no sensory qualities in material nature. They therefore face a difficulty that did not face Descartes: they have no immaterial entity in which to relocate the sensory qualities. Contemporary materialists therefore face a dilemma. The sensory qualities are either created by the brain in some mysterious incomprehensible way – what is known today as 'The Problem of Consciousness'; or they do not exist at all – and we are saddled with an absurd eliminativist position. Philosophers, ignorant of history, became its victims.

Moreover, even if one is a materialist of sorts and thinks of consciousness as a special, mysterious kind of higher-order emergent phenomenon brought about by specific brain structures in some incomprehensible way, one has not yet resolved the problem of zombies. There is still the question, *which* brain structures are necessary for pain to be not only behavioural but conscious as well, to be *real* pain? How do we know

when pain responses stop being mere mechanical reflexes (whether innate or acquired) and start being responses to, or accompanied by, real sensation of pain?

This is not a merely a theoretical question. The apparent possibility had real, tragic consequences:

> In 1872, Paul Emil Flechsig [1847–1929], working in a laboratory in Leipzig, noted that the myelination of nerve fibres occurred at different rates during development and that in the newborn baby both myelinated and nonmyelinated fibres were present with only myelinated fibres believed to be fully functional. The conclusion was that, biologically, newborns were not completely "wired," and thus, their experience of sensory input such as pain was likewise less than completely functional. (Cope 1998)

These scientific views had far-reaching practical results. Relying on them, it was common to hold that newborns do not 'really' feel pain but just exhibit pain behaviour. Consequently, surgeons often did not use analgesics when operating on newborns, and this even when performing operations that, in adults, are accompanied by agony if performed in this way and in newborns are accompanied by behaviour which expresses the same sensations:

> It was quite common, even up until the 1950s, to perform antrotomies in the auditory canal, paracenteses, connect spermatic-cord torsions, or even perform abdominal surgery without any anaesthesia. (ibid.)

As late as the late 1980s, an open heart surgery was performed on newborns with only a curare to paralyse them (Anand et al. 1987). Only during the eighties, with the accumulation of evidence on the influence of noxious stimuli on oxygen saturation in the blood, their hormonal effects (cortisol level), their effects on metabolism and other physiological parameters, and later on long-term influences on the nervous system of such stimuli, have theory and surgical practice changed.

Yet doctors still do not consider pain behaviour sufficient evidence for pain, and the debate still goes on, this time concerning an earlier stage of life: can foetuses feel pain, and consequently, how should we conduct, on foetuses, operations that cause pain, and even excruciating pain, to children and adults? The psychologist Stuart Derbyshire, for instance, has called the notion of foetal pain a 'moral blunder', and arguments assuming it 'shoddy' and 'sentimental'. Perfect Cartesian

logic reverberates in his words when he struggles in vain with the question of whether one-year old babies can feel pain:

> Derbyshire has declared that babies cannot feel pain until they are 1 year old. His claim has become notorious in pain-research circles, and even Derbyshire says he thinks he may have overstepped. 'I sometimes regret that I pushed it out quite that far', he concedes. 'But really, who knows when the light finally switches on?' (Murphy Paul 2008)

In his case it evidently has not.

The view that newborn and animal pain behaviour is insufficient evidence for pain is meaningless outside a Cartesian theory on the nature of pain and sensation. Flechsig and his followers did not claim that babies behave like an actor who *imitates* pain behaviour: imitative behaviour is different from genuine pain behaviour in, among other things, its causes and the ways to stop it, while babies' pain behaviour *was* held to be genuine. Only if one distinguishes, following Descartes, between functional and conscious pain, can one hold the aforementioned view.

In this way Descartes' theory of sensation contributed to the justification of an appalling practice in the history of medicine. His influence reached so far as to have practical consequences in fields far removed from metaphysics.

6
Descartes and the Metaphysical Project

6.1 Bérulle and Descartes

In 1625 Descartes returns to Paris from his journey to Italy. There he meets Mersenne, to whom he was very close from that time on, and others of his circle. He soon becomes well-known among them for his works in optics and mathematics and for the scientific method he is developing (during this time he works on the *Rules*). For instance, on 16 March 1626 Cornier writes to Mersenne, asking him about the work on the refraction of light of that brilliant mathematician he mentioned, and on the 22nd of that month he asks Mersenne to inform him of the excellent method and inventions of Descartes (Rodis-Lewis 1995, p. 63). Descartes' name begins to spread, and other philosophers-scientists are interested in his theories and opinions.

Some of the subjects that preoccupied Mersenne and other philosophers at the time were proofs of the existence of God and the immortality of the soul, and a refutation of scepticism. Mersenne himself published during this period or shortly earlier the following books: *The Most Famous Questions on Genesis* (1623), in which he advanced 35 arguments for the existence of God; *The Impiety of the Deists* (1624); and, in 1625, *The Truth of the Sciences: Against the Sceptics and Pyrrhonists*. Jean de Silhon, another person with whom Descartes associates, published in 1626 his book, *The Two Verities: The one of God and his Providence, the other of the Immortality of the Soul*.[1] These subjects were thus widely discussed among Descartes' associates, and he was probably exposed to them and participated in the discussions.

In November 1628, according to Baillet (1691, Vol. 1, pp. 160–166), a meeting took place at the house of the pope's representative, the nuncio, in Paris.[2] In this meeting a lecture was delivered by one de

Chandoux, who, Baillet reports, was well known as a speaker. In his talk de Chandoux presented an allegedly new philosophical system, which he tried to establish. Several scholars and intellectuals were invited to the talk, and also a few dignitaries. Because of the name Descartes must have acquired by then in learned circles, it is not surprising that he too was among the invitees, and with him Mersenne and Villebressieu.

The most distinguished guest at the meeting was Cardinal Pierre de Bérulle (1575–1629). Bérulle was an influential figure in the religious life and politics of France during the first quarter of the century. He had been the chaplain of King Henry the Fourth (Henry of Navarre), and since his early days he was active in the attempt to convert the Huguenots, the French Protestants, to Catholicism. He had also introduced to France in 1603, together with his cousin Madame Acarie (1566–1618, née Barbe-Jeanne Avrillot, later Mary of the Incarnation, beatified in 1791), the order of the Carmelite Nuns of the Reform of St. Teresa. In 1611 Bérulle had founded in France the Congregation of the Oratory (*Congrégation de l'Oratoire*), an institution that was responsible for the reform of the clergy of France and was considered an important contribution to Catholicism. During Bérulle's lifetime more than 50 houses were established by the Oratory or joined it. Bérulle was appointed a cardinal in 1627, a year before the meeting took place.

Bérulle was active in French politics as well. He was among those who arranged the marriage of the English King, Charles I, with Henrietta of France, daughter of King Henry IV and Marie de Médici and sister of King Louis XIII. For some time he was Councillor of State, until he had to retire, as his policy did not agree with that of Cardinal Richelieu.

Bérulle was thought of highly by some of the most important personages of the French Catholic institution, for instance, his pupil St. Vincent de Paul and his friend St. Francis de Sales; and similarly by Pope Urban the Eighth, who called Bérulle 'the apostle of the Incarnate Word'. He also authored several theological books, which were highly regarded and had deep influence on the spiritual life in France.

We return to Chandoux' lecture. This impressed all people present, who praised it, apart from Descartes. When Bérulle noticed Descartes' silence, he urged him to relate his opinion of the lecture to those present. Although Descartes declined at first, Bérulle insisted and was joined in his request by other notables, and so Descartes eventually agreed to explain his response. He first praised Chandoux' rhetoric and his wish to free philosophy from the Aristotelians; but then he criticised the preference probability (*vrai-semblance*) had over truth (the formulation is Baillet's) among the learned, as was manifest in that lecture. Descartes

then demonstrated, after soliciting an example of an evident truth and evident falsehood from his audience, how he could summon a dozen probable arguments to show that the truth is false, and yet another dozen to show that the falsehood is true.

The much-impressed audience asked Descartes whether he knew any method to avoid 'sophisms'. Descartes replied that the only one he knew was the one he extracted from mathematics, his natural method (*méthode naturelle*), which he believed could be used to examine any problem, to determine with mathematical certainty whether it was solvable, and then, if it was, to solve it.

Bérulle was also much impressed by all that happened and asked Descartes to meet him again in private. Descartes visited him a few days later and informed him of his first thoughts in philosophy. Descartes also emphasised, or so Baillet tells us, the utility that should arise if his philosophy were to be applied to medicine and mechanics.

> [Bérulle] had no difficulty in perceiving the importance of the plan: and judging [Descartes] most appropriate to execute it, he made use of the authority he had over his spirit to induce him to undertake this great work. Indeed he made it an obligation of conscience for him, in that having received from God a force and penetration of spirit, with insights [*lumieres*] into things that He had not given to others, he [Descartes] would have to give an exact accounting of the use of his talents, and would be responsible before the sovereign Judge of men for the wrong he would have done the human race in withholding from it the fruit of his meditations. He went so far as to assure him that with intentions as pure and a capacity of spirit as vast as he recognised in him, God would not fail to bless his labour and to supply all the success that he could hope for.[3]

It is hard to believe that a man like Bérulle, who devoted his life to the reform and revival of Catholicism in France, should be so impressed by a method whose purpose was to improve medicine and mechanics. It is more likely that Baillet, or one of his sources, has added to the account he had, relying on his acquaintance with other writings of Descartes' (e.g. *Discourse*, AT VI 62; *Principles*, Preface to the French Edition, AT IXB 14). The whole account in fact smacks of hagiography, and one should be cautious in relying on it. Still, the general picture Baillet draws is probably reliable. He had before him a letter Descartes wrote to Villebressieu from Amsterdam in 1631 (see fragments in AT I 212–217), in which Descartes recounted what had occurred. Villebressieu, according to

Baillet, attended the event at the nuncio's house himself; but even if he did not, he could verify Descartes' account by asking Mersenne about the event. So the letter must be reliable in these respects; and Descartes should be reliable in the rest of the information he provided to a close friend. Much of the scene at the nuncio's is also recounted in Descartes' earlier biography, *Vitae Cartesii Compendium*, by Pierre Borel (1656, pp. 4–5; see AT I 217), first published in 1653, when some of the people attending the event were still alive. And lastly, Baillet would not have invented such detailed and powerful events or expressions, so he must have found most of them in his sources.

Bérulle probably exerted his authority over Descartes' spirit to induce him to undertake a *metaphysical* project. The 'obligation of conscience' for Descartes would be to use his method and talent to prove what Catholicism most needed proved: some of its central dogmas that had recently been powerfully challenged.

It is not hard to imagine the impact these exhortations must have made on Descartes. We have already seen that Descartes was a devout Catholic, who took upon himself a pilgrimage to thank God for blessing him with a mathematical or scientific discovery. And now a man, who was then the highest religious-spiritual authority in France in the eyes of many, who was famous for his devoutness and pure ways, and who was one of the most influential persons in French politics, makes it Descartes' responsibility 'before the sovereign Judge of men' to develop a metaphysics. The 32 year-old Descartes, who has not published anything yet, meets the 53 year-old Cardinal, one of the most admired and famous men of his time, and the latter declares it Descartes' duty to write a metaphysical work to support his religion and faith. And indeed, immediately after this meeting Descartes retires to the Netherlands – a retirement he has probably been planning for some time already – and begins working on a book on metaphysics.

Another support for the claim that Descartes started working on the metaphysical project under Bérulle's influence can be gathered from the following fact. When he lived in Paris, Descartes worked on the *Rules*, a mainly methodological composition, which he abandoned unfinished when he moved to the Netherlands in 1628. Why did he abandon this work? The question of scientific method continued to interest him, and he returned to it later, in the *Discourse* (1637). It is indeed possible that the *Rules* had reached a dead-end in some respects, but this would have brought Descartes to revise the work rather than abandon it, as we learn from the discussion in the *Discourse*. Discarding of the project and not only the specific manuscript is explained if we ascribe it to Bérulle's

influence, which brought Descartes to embark immediately on the new metaphysical project.

An additional support for this claim is found in the way Descartes justified the metaphysical project in an early letter to Mersenne:

> I think that all those to whom God has given the use of [human] reason have an obligation to employ it principally in the endeavour to know him and to know themselves. That is the task with which I began my studies. (15 Apr 1630, AT I 144, CSMK 22)

These words, written shortly before Descartes' report to Villebressieu of his meeting with Bérulle as recorded by Baillet, echo the cardinal's words there.

Yet another support for the influence of Bérulle can be found in the quick abandonment of the metaphysical project. Already in 1629, less than a year after he had started working on his metaphysical treatise, Descartes abandons it for a wide-ranging scientific project. On 8 October 1629 he writes to Mersenne that he has decided to write on meteorology, following a question he was asked a little more than two months earlier, about the parhelia (bright spots on the sun's halo) that were observed in Italy. He also writes there, in the same context, that he cannot work on many tasks at once, but that he should devote himself wholly to a subject when he wishes to investigate a particular aspect of it. For that reason, he reports, he interrupted his earlier work – namely, the metaphysical project – apparently following the mentioned question (AT I 22–23). It thus seems that the metaphysical project was abandoned after a few months in favour of the scientific work (which eventually developed into *The World*). In a letter to Mersenne from 15 Apr 1630 (AT I 144) Descartes writes that he worked on the metaphysical treatise for nine months, but from a letter to Gibieuf, from 18 July 1629 (AT I 17), it appears that he had started working on it shortly before writing that letter. Accordingly, it seems that, at first, Descartes worked on his metaphysical project, which eventually grew into the *Meditations*, a little more than six months at the most.

Metaphysics attracted Descartes less than did science (more on this below) and he apparently needed strong motivation in order to work on his metaphysical project. Bérulle's encouragement and influence, as described by Baillet, could well have provided this motivation. But such initial enthusiasm gradually wanes. And a week after Bérulle's death, on 2 October 1629, Descartes writes to Mersenne announcing his abandonment of the metaphysical project in favour of the scientific one.

Bérulle influenced Descartes to take upon himself the metaphysical project; but did he also have any influence on the *content* of Descartes' metaphysics? I shall argue that he probably did. To assess this additional influence, we should look at Bérulle's theology and religious activity.

Bérulle was the founder of the French School of Spirituality. He based his theology on Neo-Platonic writings and on the writings of the Church Fathers, especially Augustine's. These traditions have significant overlap, mainly due to the Neo-Platonic influence on Augustine. One of the aims of his Oratory was to revive the study of Augustine's theology and philosophy. Following Augustine, the Oratory promoted the project of a Christian philosophy.

Under the influence of Pseudo-Dionysus – a Christian Neo-Platonic theologian active at the late fifth- and early sixth centuries – mystical experiences had a central role in the thought of the Spiritual School. The Neo-Platonic influence is apparent, for instance, when Bérulle uses, while describing the Christian mystical experience, the Platonic imagery of coming out of the cave and looking at the sun (Bérulle 1989, pp. 114*f*). In addition, under Augustine's influence, the Spiritual School gave an important role to the contemplation of the crucified Jesus in these experiences. The meditations on the nature of the trinity acquired in this way an important place in Bérulle's thought; and this bestowed on Augustine's *On the Trinity* a special importance in his system.[4]

The Spiritual School, and thus the Oratory, had a strong commitment to missionary activity; this kind of activity characterised Bérulle throughout his life. As we saw above, Bérulle probably considered his meeting with Descartes as having a potential to make an important contribution to religion. It is therefore likely that he should also try to influence Descartes' *philosophy* during their conversation.

What did they discuss? Their discussion continued the one in the nuncio's house and brought about Descartes' metaphysical work, so it apparently was on the subjects that were discussed at the nuncio's and later appear in Descartes' metaphysics. And these are primarily the refutation of scepticism, the nature of the soul, and the existence of God.

Augustine of course discusses these issues time and again in his writings, and his arguments and conclusions, as we shall see, are very close, and sometimes identical, to those found in Descartes' writings, from the *Discourse* on. And these Cartesian ideas were developed, according to Descartes (*Discourse*, Part IV, AT VI 31), during the beginning of his stay in the Netherlands in 1629; namely, immediately after his meeting with Bérulle. In a letter to Mersenne from 25 November 1630 he also mentions that he tried in this metaphysical treatise 'to prove the existence of God

and of our souls when they are separate from the body, from which their immortality follows' (AT I 182, CSMK 29). A discussion of these ideas is not found in earlier writings of Descartes.

By contrast, in his writings that antedate his move to the Netherlands – primarily the *Rules* – we do find ideas that are close in various ways to the later, familiar Augustinian-Cartesian ones, yet also significantly different from them in important respects. For instance, in Rule 3 Descartes writes as follows about intuition, our most certain source of knowledge:

> Everyone can intuit with his mind that he exists [*existere*], that he is thinking, that a triangle is bounded by just three lines, and a sphere by a single surface, and the like. (AT X 368, CSM I 14)

We witness here an early precursor of the claim that our existence is our first certainty – the '*ego sum, ego existo*' of the *Meditations* (AT VII 25). And here too, this knowledge is mentioned together with the knowledge that we think (although in reverse order). However, unlike the later Augustinian ideas, we do not reach the knowledge that we exist through the knowledge that we think, but both are intuitively on a par. Moreover, again unlike the later Augustinian train of thought, we do not reach these certainties from a state of doubt.

Furthermore, Descartes tries in the *Rules*, as he does in his later philosophy, to show that the universal doubt defeats itself:

> If, for example, Socrates says that he doubts everything, it necessarily follows that he understands that he doubts, and hence that he knows that something can be true or false, etc.; for there is a necessary connection between these facts and the nature of doubt. (Rule 12, AT X 421, CSM I 46)

Yet here again, in contrast to the later *cogito* argument, the refutation is not done from the first-person point of view. Moreover, the certain proposition extracted from the doubt, unlike the later *I exist*, is neither the existence of the one who doubts everything nor an existence claim at all. It is knowledge that something can be either true or false, namely, a logical or conceptual truth. In the *Principles*, however, Descartes emphasises that the significance of 'I exist' over all such 'simple notions' is specifically in that it is knowledge of existence (I 10). Lastly, in the *Rules* Descartes does not present the truths that survive the universal doubt as the basis for the whole construction of certain scientific knowledge.

Finally, later in the same paragraph Descartes gives two examples of a necessary connection that many fail to realise: 'I am, therefore God exists' and 'I understand, therefore I have a mind distinct from my body'. These again are similar to what can be found in his later writings. Regrettably, Descartes does not explain anywhere in the *Rules* why these are necessary propositions. However, we do not find in the *Rules* the analysis of the origin of concepts and the relation of their objective reality to the formal reality of their origin, nor the claim that temporal existence requires continuous creation, which were later used to prove the first proposition. Neither do we find the doubt in the existence of the material world, which is later used to prove the distinction of mind from body. So despite the similarity in *conclusions*, we do not have good reasons for assuming similarity in *arguments*.

Accordingly, even before his meeting with Bérulle there is already some general affinity between Descartes' and Augustine's thought. Perhaps Descartes was indirectly influenced by Augustine, adopting some of his ideas modified in various ways. But whichever way this affinity came about, Descartes was ripe, when he met Bérulle, for absorbing more detailed and deeper Augustinian influences into his metaphysical project.

All this strongly supports the claim that during their meeting Bérulle directed Descartes to Augustine's writings, as writings that could assist him in the project which Bérulle encouraged him to take upon himself, and that Descartes indeed found in them a source which was of considerable help to him. Under Bérulle's influence, Descartes turns to Augustine in his project of finding a foundation for knowledge which is immune to doubt, investigating the nature of the soul and proving the existence of God. And indeed, until the meeting with Bérulle we have just the scattered thoughts of the *Rules*, while already a few months after it, according to Descartes' account in the *Discourse* and his letters, his heavily Augustinian metaphysics had been formed.

Additional support for the claim that under the influence of Bérulle Descartes begins his metaphysical project assisted by Augustine's writings, can be found in his correspondence with Guillaume Gibieuf (1591–1650). Gibieuf was a French philosopher and theologian, a member of the Sorbonne and among the founders of the Oratory with Bérulle. He himself wrote a book on the freedom of the will (*De Libertate Dei et Creaturae*, 1630), and his thought is strongly Bérullean in character. Gibieuf was among those who took care of the posthumous publication of Bérulle's complete writings in 1644.

On 18 July 1629 Descartes writes from the Netherlands to Gibieuf (AT I 17, CSMK 5) and notes that he is starting to write a little treatise. As we saw above, according to Part Four of the *Discourse* and other sources, this treatise contained the earliest formulation of the metaphysical thoughts that were first published there. And Descartes reminds Gibieuf that the latter promised 'to correct it and give it the finishing touches'. As Descartes left France shortly after meeting Bérulle, and as he decided to write his metaphysical treatise in consequence of this meeting, he must have approached Gibieuf concerning his treatise following the meeting. Bérulle apparently advised Descartes to use Augustine's writings and referred him to Gibieuf, a philosopher and theologian close to Bérulle and an expert on the thought of Augustine, so that Gibieuf might help Descartes with Augustine's thought and writings. Descartes accepted Bérulle's advice and approached Gibieuf seeking advice. A year later, when Descartes heard from Mersenne that Gibieuf had published a book on the liberty of God, he writes to Mersenne that he will try to get it as soon as possible (27 May 1630, AT I 153). Later he will write to Mersenne that his ideas on the freedom of the will are in accord with those of Gibieuf in his book (21 Apr 1641, AT III 360).

The question of course arises, if Descartes took upon himself the metaphysical project under Bérulle's influence and guidance, why didn't he mention it explicitly anywhere in his published writings? The closest he gets to that in his publications is in a passage in his Dedicatory Letter to the Sorbonne, which opens the *Meditations*:

> I was strongly pressed to undertake this task [namely, proving the existence of God and that the human mind is distinct from the body] by several people who knew that I had developed a method for resolving certain difficulties in the sciences …, one which they had seen me use with some success in other areas; and I therefore thought it my duty to make some attempt to apply it to the matter in hand. (AT VII 3, CSM II 4)

The mentioning of his being pressed following a successful demonstration of his method and the reference to the project being his duty are reminiscent of the description of his meeting with Bérulle found in Baillet's biography; and we do not know of any other such event that Descartes could have had in mind. Yet even here Bérulle is not mentioned by name.

This lack of explicit mentioning may have several related reasons. Bérulle had died more than a decade before the *Meditations* was

published, and it is doubtful whether mentioning him would have assisted Descartes in gaining the patronage of anyone of similar importance. Moreover, Bérulle belonged to a specific religious school while Descartes wished his works to be widely received, independently of the religious school to which one belonged. Presenting himself as the favourite of the Oratorians might have been an obstacle to that. And besides, as we shall later see, Descartes does not hurry to mention by name anyone who has influenced his thought. The lack of an explicit reference to Bérulle is therefore not difficult to explain.

6.2 Why was the *Meditations* written?

This question might at first seem strange: isn't the answer clear? The *Meditations* is an extremely important philosophical work. Indeed, there are few philosophical works in history of equal importance. Descartes had some significant ideas he wished to impart, and that is what he did in the *Meditations*.

But the answer to our question is not that simple. Descartes had already published these ideas, in the fourth part of the *Discourse*. The discussion there is indeed concise, but he was not content just with presenting his ideas more fully in the *Meditations*. Rather, he made efforts to obtain objections to them from quite a few scholars and replied to these objections in much detail (apart from the fifth set, his replies are always longer than the objections). Descartes never did anything similar with any other work he published.

Moreover, the time the *Meditations* project demanded – the writing of the book and of the replies to all the objections – disagrees with the value Descartes himself ascribed to metaphysical work. Throughout his life Descartes considered science, and not philosophy, as the more important field of research. His priorities are expressed in various ways. First, in the volume of his writings devoted to scientific and mathematical subjects compared with that devoted to philosophy. Secondly, in the fact that the first writings he planned to publish – the *Rules*, *Geometry*, *Optics* and *World* – were not philosophical but either scientific or on scientific methodology (apart from the *Geometry*, which could also contribute to the mathematical natural sciences which he envisaged, but not to philosophy). And after having published the *Meditations* he again devoted most of the time he spent on writing to scientific works (the bulk of the *Principles*; the *Description*; the *Passions of the Soul*, which is primarily a work on physiological psychology). Thirdly, in the fact that he justified philosophy as the basis of science; this is so both in the

Discourse (see below) and in the *Principles*. In his letter to Abbé Claude Picot, the translator of the *Principles* into French, which was published as the preface to the French edition, he writes as follows on philosophy, by which he means both what today is considered philosophy and what is considered science:

> Thus the whole of philosophy is like a tree. The roots are metaphysics, the trunk is physics, and the branches emerging from the trunk are all the other sciences, which may be reduced to the three principal ones, namely medicine, mechanics and morals. ... Now just as it is not the roots or the trunk of a tree from which one gathers the fruit, but only the ends of the branches, so the principal benefit of philosophy depends on those parts of it which can only be learnt last of all. (AT IXB 14–15, CSM I 186)

This does of course justify the study of metaphysics, but it does not justify devoting to it as much time as the *Meditations* project necessitated. By then, Descartes had already drawn the necessary metaphysical conclusions to his own satisfaction, as the *Discourse* shows: why didn't he try to get closer to the fruits?

The greater importance of science relative to that of philosophy is expressed in Descartes' explicit evaluative statements. This is how he describes the relation between the importance of science and that of metaphysics in a letter to Princess Elizabeth:

> I believe that it is very necessary to have properly understood, once in a lifetime, the principles of metaphysics, since they are what gives us knowledge of God and of our soul. But I think also that it would be very harmful to occupy one's intellect frequently in meditating upon them, since this would impede it from devoting itself to the functions of the imagination and the senses. I think the best thing is to content oneself with keeping in one's memory and one's belief the conclusions which one has once drawn from them, and then employ the rest of one's study time to thoughts in which the intellect co-operates with the imagination and the senses. (28 June 1643, AT III 695, CSMK 228)

We should not think too often on metaphysical issues: better devote to them the necessary attention 'once in a lifetime' and then remember the conclusions. What should occupy us is the study 'in which the intellect co-operates with the imagination and the senses', namely

natural science. And earlier in the same letter (AT III 692–693, CSMK 227), Descartes describes what he considers the chief rule he has always observed in his studies: never to spend more than a few hours a day in the study of science, and a few hours *a year* in that of metaphysics, the object of the pure intellect.

This letter to Princess Elizabeth is not the only place in which Descartes expressed such views. In his conversations with Burman, in 1648, he describes the relation between the importance of science and that of metaphysics in stronger terms:

> A point to note is that one should not devote so much effort to the *Meditations* and to metaphysical questions, or give them elaborate treatment in commentaries and the like. Still less should one do what some try to do, and dig more deeply into these questions than the author did; he has dealt with them quite deeply enough. It is sufficient to have grasped them once in a general way, and then to remember the conclusion. Otherwise, they draw the mind too far away from physical and observable things, and make it unfit to study them. *Yet it is just these physical studies that it is most desirable for people to pursue, since they would yield abundant benefits for life*. The author did follow up metaphysical questions fairly thoroughly in the *Meditations*, and established their certainty against the sceptics, and so on; so everyone does not have to tackle the job for himself, or need to spend time and trouble meditating on these things. It is sufficient to know the first book of the *Principles*, since this includes those parts of metaphysics which need to be known for physics, and so forth. (AT V 165, CSMK 346–347; emphasis added)

Descartes explicitly recommends in this passage not to study metaphysics too much, and especially the *Meditations*, for otherwise the mind would be unfit to study the natural sciences, which are the really important subject to pursue. Moreover, the reason Descartes recommends the study of the first book of the *Principles* is that it contains the part of metaphysics necessary for physics, and not because of its self-contained value. Did Descartes see himself as having a stronger mind or character than his readers, and consequently as immune to this corruption of the mind that metaphysics brings with it? – doubtful, although possible. But why should he take upon himself the risk that the study of metaphysics brings with it, instead of pursuing the more important sciences?

Moreover, Descartes declared several times his intention to devote most of his time to science, and primarily to medicine. Medicine was

the science he considered more important than any other, the maintenance of health being 'the chief good and the foundation of any other good in this life'; and in the contribution of the sciences to it he saw their greatest value (*Discourse*, Part Six, AT VI 62, CSM I 143). The maintenance of health, he writes to the Marquess of Newcastle (Oct 1645, AT IV 329), has always been the main end of his studies. Already on 25 November 1630 he writes to Mersenne that he has decided that, after completing *The World* and the *Optics*, he will not write for others but will study for himself and his friends, that is, try to discover something useful in medicine (AT I 180). Indeed, in the same letter he also writes that, if he manages to convince others of his ideas in the *Optics*, he may someday complete his little metaphysical treatise in which he set out to prove the existence of God and of our souls when they are separate from the body (AT I 182); but this is a *little* treatise: nothing like the full AT tome of the *Meditations* with its Objections and Replies.

Descartes did not limit these declarations to private correspondence; this is how he ends the *Discourse*:

> I will say only that I have resolved to devote the rest of my life to nothing other than trying to acquire some knowledge of nature from which we may derive rules in medicine which are more reliable than those we have had up till now. (AT VI 78, CSMK I 151)

And indeed, on 4 December 1637, after the *Discourse* had been published, Descartes writes to Huygens that he is now working on a compendium of medicine, based on his readings and reasoning, so that he can on this basis extend his investigations in that field, investigations that would lead, among other things, to man living for more than a hundred years (AT I 649). The white hairs rapidly appearing on his head made it clear to him that he should devote himself to ways of slowing down their growth – meaning, presumably, to research in medicine generally – as he is in fact now doing, regretting the time taken by the preparation of the *Discourse* for publication (5 Oct 1637, AT I 434).

So why did Descartes devote so much time to the metaphysical work of the *Meditations*? Considering his explicit evaluative view, we have a paradoxical event: Descartes recommends devoting our time to science and not to metaphysics, but he himself devotes much time and effort to the latter. Descartes, the great scientist, who thinks metaphysical work might compromise scientific abilities, suspends his own scientific activity and turns to metaphysics. And this he does in the prime of his scientific life: in 1637 he publishes essays in mathematics and physics to

which few essays in the history of their fields compare in importance and influence. Moreover, this turn comes after he has publicly announced that he will devote the rest of his life to research that would lead to the improvement of medicine. Despite this declaration, Descartes turns to metaphysics shortly after the publication of the *Discourse*; and then he is not content with a 'little treatise', but arranges to receive objections from several prominent scholars, to which he replies in detail. Why?

To understand this, we have to return to the event that brought Descartes to suppress *The World* – namely, the trial and condemnation of Galileo (June 1633), of which Descartes heard after his book had been completed. He then wrote to Mersenne:

> In fact I had intended to send you my *World* as a New Year gift, and only two weeks ago I was quite determined to send you at least a part of it, if the whole work could not be copied in time. But I have to say that in the mean time I took the trouble to inquire in Leiden and Amsterdam whether Galileo's *World System* [published 1632] was available, for I thought I had heard that it was published in Italy last year. I was told that it had indeed been published but that all the copies had immediately been burnt at Rome, and that Galileo had been convicted and fined [22 June 1633]. I was so astonished at this that I almost decided to burn all my papers or at least to let no one see them. For I could not imagine that he – an Italian and, as I understand, in the good graces of the Pope – could have been a criminal for any other reason than that he tried, as he no doubt did, to establish that the earth moves. ... I must admit that if the view is false, so too are the entire foundations of my philosophy, for it can be demonstrated from them quite clearly. And it is so closely interwoven in every part of my treatise that I could not remove it without rendering the whole work defective. But for all the world I did not want to publish a discourse in which a single word could be found that the Church would have disapproved of; so I preferred to suppress it rather than to publish it in a mutilated form. (End of Nov 1633, AT I 270–271, CSMK 40–41)

Following Galileo's conviction, Descartes was afraid that the Church might disapprove of his book as well, and he suppressed it.

Descartes later described his decision in the sixth part of the *Discourse*:

> It is now three years since I reached the end of the treatise that contains all these things [namely *The World*]. I was beginning to revise

> it in order to put it in the hands of a publisher, when I learned that some persons to whom I defer and who have hardly less authority over my actions than my own reason has over my thoughts, had disapproved of a physical theory published a little while before by someone else. I will not say that I accepted this theory, but only that before their condemnation I had noticed nothing in it that I could imagine to be prejudicial either to religion or to the state, and hence nothing that would have prevented me from publishing it myself, if reason had convinced me of it. This made me fear that there might be some mistake in one of my own theories, in spite of the great care I had always taken never to adopt any new opinion for which I had no certain demonstration, and never to write anything that might work to anyone's disadvantage. This was enough to make me change my previous decision to publish my views. (AT VI 60, CSM I 141–142)

Descartes is of course writing of Galileo's case, but he avoids mentioning it explicitly. In addition, he does not admit that, like Galileo, he also maintained in *The World* that the Earth moves round the Sun. He does not even specify which theory he is talking about, and he writes in a way which misleadingly implies that he does *not* hold this theory. As we see, Descartes is excessively cautious.

But Descartes did not give up the idea of publishing his physics. At first he still hoped that the Church might change its position: in April 1634, about half a year after he had first heard of Galileo's trial, he expressed in a letter to Mersenne his hope that, as neither the Pope nor any council had so far endorsed the condemnation of Galileo, the case might turn out as that of the Antipodeans, namely people living in the Southern Hemisphere. Here too the Church was initially opposed to the idea but eventually accepted it (AT I 288). But his hope did not come true. He was therefore faced with problem of how to publish his physics without it being condemned.

The first step was the publication of the *Discourse* with its accompanying essays. The material contained in these works was supposed not to be problematic in the way his physics was: a scientific method, metaphysics along Augustinian lines with conservative results, a précis of physiological ideas, geometry, optics and a few meteorological issues with an analysis of the colours of the rainbow. This was part of the material which Descartes anyway intended to publish, and from his letters we also learn that already while working on *The World* he thought of the *Optics* and *Geometry* as separate treatises. These publications were extremely important in their own right – they contain some of Descartes'

most significant contributions – and it was obvious that they would attract much attention. The material they contained should prepare the readers for Cartesian physics and create a demand for its publication, and the responses to the material would teach Descartes how to present his physics to the public.

And so Descartes writes in a letter to an unknown addressee at the end of May 1637:

> As for the treatise on physics which you have been so kind as to urge me to publish, I would not have been so unwise as to speak of it in the way I did, had I not been keen to publish it should the public desire it and I gain something from it. But I would like you to know that the present publication [*Discourse* & *Essays*] is designed entirely to prepare the way and to test the waters. (AT I 370, CSMK 58)

The *Discourse* and its essays should prepare the ground and check it for the future publication of the physics. That is why Descartes published his method together with essays in which it was applied and its power demonstrated, and that is why he wrote that it could be applied in any domain. If he managed to achieve his intended purpose, he could publish his physics:

> If I can get the public to view my method in this way, I believe there will no longer be any need to fear that the principles of my physics will be ill received. (ibid.)

And Descartes writes similar things to Mersenne around that time. Mersenne expresses his worry that what Descartes wrote in Part Six of his *Discourse* might commit him not to publish his physics. Descartes calms him and replies that he *did not* promise there that he would not publish his physics in his lifetime, but only that he had decided not to publish it for the reasons he there gives. One can infer from that, he writes, that if these reasons alter, so might his decision. And he then adds and explains why he praised his physics in the *Discourse*:

> 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. (AT I 367–368, CMK 57)

Moreover, in the *Discourse* and its essays Descartes is extremely cautious not to mention any idea that might turn the Church against him. He

not only does not claim that the Earth orbits the Sun but he never even mentions the idea anywhere. In addition, since he thinks, as we saw in his letter to Mersenne above, that the movement of the Earth follows necessarily from the principles of his physics, he never mentions his principles either.

The omission of his principles has an additional reason: Descartes is worried that the fact that they contradict the principles of Aristotelian physics might also raise the ecclesiastics against him (as indeed was eventually the case). Similarly, while in *The World* Descartes sarcastically criticised the Scholastics' 'real qualities' (*qualitates reales*), confessing that he cannot find in them any more reality than in their other ideas (AT XI 40), some of which he felt compelled to leave in Latin because he could not interpret them (ibid. 39), this criticism disappeared completely from the *Discourse* and its essays. Instructive in this context are his words at the end of the first part of the *Meteorology*, after having described the nature of various bodies according to his principles, namely by geometrical properties alone, in contrast to the Aristotelian principles:

> Know also that in order to keep my peace with the philosophers, I have no desire to deny that which they imagine to be in bodies in addition to what I have given, such as their *substantial forms*, their *real qualities* and the like; but it seems to me that my explanations ought to be approved all the more because I shall make them depend on fewer things. (AT VI 239, Olscamp 268)[5]

Galileo's condemnation taught Descartes to be doubly cautious of any claim that might raise the Church against him, and in particular of any criticism of the Aristotelian principles it adopted. This extreme caution will characterise all his writings in the following years.[6] Only once he has established himself and his ideas will he dare publish his real views on these issues, writing in 1648 that 'there is no one more opposed than I to the useless lumber of scholastic entities', these entities explicitly including substantial forms (*Comments on a Certain Broadsheet*, AT VIIIB 366, CSM I 309).

And so in June 1637 Descartes publishes his *Discourse* with its accompanying essays, writings purged of any claim that might turn the Church against him, as preparation for a book on physics – *not* on metaphysics – which was supposed to be written following them.

Descartes did not content himself with the publication of these works but also tried to bring it about that the Jesuits, who were responsible for the condemnation of Galileo, read them and approve of his ideas.

In October 1637 he writes a highly flattering letter to the Jesuit Etienne Noël, the rector of several Jesuit colleges in France (AT I 454–456). He thanks him for promising to send his book to be examined by qualified Jesuits and implores him to read the book himself. He writes that the Jesuits would be more interested than anyone else in his book, and promises that his views comply with the mysteries of religion. The most relevant book for the Jesuits, he writes, is the *Meteorology* – namely, the one which contains the largest number of elements of his physics. So many people already accept the contents of this essay that the Jesuits, in order to continue to teach the subject, have either to disprove what is written there or follow it.

On 20 December the same year Descartes writes to Plempius, thanks him for recommending his book to a Jesuit, and says he would be glad if that Jesuit wrote to him about it, for 'whatever comes from the men of that Society is likely to be well thought out' (AT I 477, CSMK 77). On 22 February 1638 he again writes an extremely flattering letter, this time to the Jesuit theologian Antoine Vatier, who had been Descartes' teacher at La Flèche. Descartes thanks him for his comments and implores him too to bring more Jesuits to read his book and write him objections if they have any – a thing that would be a great honour to Descartes, for no one can do that better than them (AT I 562). He also promises Vatier that his principles do not contain anything contrary to faith and that transubstantiation can be explained by them. But since there are no signs showing he could publish his work, he submits himself 'to the providence which rules the world', hoping that it will give him the grace to complete his work 'if it is useful for its glory' (AT I 564–565, CSMK 88).

But Descartes' hopes did not materialise: the *Discourse* and its essays were not received in the way he wished. The essays received many and complex criticisms, and during 1638 Descartes was preoccupied with the controversies they raised. Moreover, the theologians did not adopt his book. Despite the copies sent to La Flèche and to various Jesuits, Descartes did not receive the comments or objections he wished for. On 9 March 1638 he writes to Huygens that he would have been particularly pleased if some Jesuits had been among his opponents, and that some letters he received led him to hope that that would be the case. But only one – Vatier – responded, who had doubts about the unpublished work; and one Jesuit probably represents the ideas of all, since they are in very close correspondence. And therefore he, Descartes, cannot yet see any hope that he will be able to give his *World* to the world in the near future (AT I 661–662, CSMK 91–92). On 27 July the same year, about a year after the publication of his book, he writes to Mersenne that he still hopes to

receive objections from the Jesuits of La Flèche, but that he is uncertain they intend to send him any. He would also like to know what they think of his *Meteorology*: from the public theses they had put forward that season it is clear they do not accept his ideas; and he does not know whether they intend to refute them or just be silent about them (AT II 267–268). In addition, copies of his book offered to the Church in Rome were accepted on the condition that it is not maintained in them that the earth moves (Sorell 1987, Chapter 10).

The *Discourse* and *Essays* failed in preparing the ground for the publication of Descartes' physics. This failure made him quite pessimistic with regard to his chances of publishing this work, as is apparent in a letter he wrote to van Hogelande in late 1639 or early 1640. Descartes criticises there the pretensions of the Czech reformer Jan Comenius (1592–1670) in writing a book laying out all human knowledge, mixing together science and theology; Comenius is 'ignorant of the very thing he is trying to impart to others', he writes. (van de Ven and Bos 2004, p. 384) But he then describes a different project, more his own than Comenius's, as a more realistic one, yet not worth attempting because of the hostility it would engender:

> It would perhaps not be difficult to suppose someone might exist who could lay down new foundations for the sciences that are much firmer and more stable than those we have at present, and who could open a path whereby everyone who followed it could be sure he would reach instruction on every matter he was naturally capable of grasping. Yet this could not happen unless almost all the sciences we find in the Schools were reformed, and there are undoubtedly countless people who would take this very hard, since they make their living and reputation from the sciences as currently practised. Accordingly I do not think anyone who has enough intelligence to make such a new start would be so imprudent as to undertake it; nor would he have the power to do so, unless he were of royal birth, or enjoyed the protection either of kings or of others who have supreme power over their fellow men, so as to avoid all fear of attracting a hostile reaction. (ibid.)

Having failed to acquire the protection of people 'who have supreme power over their fellow men' by means of his *Discourse* and *Essays*, Descartes judges it imprudent to publish his new foundation of the sciences. Similarly, on 11 March 1640 he writes to Mersenne that he still does not see anything that would convince him to publish the principles

of his physics in the future (AT III 39). At this stage it is clear to Descartes that something else should be done to acquire the support, or at least forestall the condemnation of his work by the ecclesiastics.

In addition, although his metaphysical ideas were only concisely developed in Part Four of the *Discourse* – less than 2600 words – they received quite a number of criticisms, some even before the book was published. Mersenne and Silhon had expressed discontent with Descartes' proofs concerning the nature of the soul and the existence of God already before publication (to Mersenne, Feb or Apr 1637, AT I 349–350; to Silhon, May 1637, AT I 353). Vatier claimed that Descartes' words on the existence of God were obscure (to Vatier, 22 Feb 1638, AT I 560). Two 'fairly lengthy' critical essays against his metaphysics were published (*Meditations*, AT VII 8).[7] Descartes realised that establishing his metaphysical ideas necessitates an additional work, a more detailed one.

Moreover, Part Four of the *Discourse* was insufficiently worked out, according to Descartes, and intentionally included only part of his metaphysical ideas. He decided to include it, he writes to Vatier, only when the book was nearly complete, 'and the publisher was becoming impatient' (22 Feb 1638, AT I 560, CSMK 85–86). More importantly, Descartes decided, after deliberation, not to include in the *Discourse* the arguments for the extreme form of doubt regarding material things. This he did because the book was written in French, to make it accessible to a wider public, and not in Latin, the language of the scholars. He was afraid, he writes, that weak minds might embrace the doubts while not being able to follow their refutation, and in this way they would be harmed by his book. Yet his proof of the existence of God requires the extreme form of doubt (ibid.; to Mersenne, Feb or Apr 1637, AT I 350). A satisfactory presentation of his metaphysics requires a lengthier, Latin work. Yet this, Descartes thought, can be accommodated within a Latin version of the *Discourse*: a work the length of the *Meditations*, not to say together with its *Objections and Replies*, was not necessary to rectify *these* shortcomings (to Vatier, 22 Feb 1638, AT I 561; to Mersenne, Feb or Apr 1637, AT I 350).

Accordingly, despite Descartes' initial intention to publish his physics after the publication of the *Discourse* and *Essays*, several factors made him realise that the time was still unripe for that, and that he had yet to prepare the ground for the reception of his scientific work. He first had to obtain the approval of the church. And, in addition, he had to publish a somewhat more extended Latin work establishing his metaphysics – yet this need not require more than a Latin version of the *Discourse*, nor necessarily precede the publication of the scientific work.

The two projects, however, combine well. As we saw, Descartes took upon himself the metaphysical investigation primarily in order to support religion, with the enthusiastic encouragement of Bérulle. A metaphysical work might thus acquire the much desired goodwill of the ecclesiastics. And it could be used in other ways as well to clear the way for his physics. And so Descartes turned to the project of the *Meditations*.

While writing the *Meditations*, Descartes already doubted his ability to acquire the support of the Jesuits; he even thought they would object to his work. On 30 July 1640 he writes to Mersenne, and on the following day to Huygens, that he is preparing for war with them (AT III 126, 752). He indeed continued to try to draw them closer to him, when occasion suggested the possibility;[8] but at this stage he primarily attempted to clear the way for his physics through other theologians. Descartes wished, first, to obtain the approval of several theologians to his work, and then, by means of their approval, obtain that of the Sorbonne as a whole, and this even before the publication of his book (the attempt brought him to postpone the publication of the *Meditations*). He asks Mersenne to hand copies of the *Meditations* prior to its publication only to theologians who are the least prejudiced and the least committed to Scholastic 'errors' (30 July 1640, AT III 126–127). The theologian on whom he pinned most hopes was, unsurprisingly, Gibieuf (to Mersenne, 30 Sept 1640, AT III 184; and 21 Apr 1641, AT II 360), to whom he writes asking for his help (11 Nov 1640, AT III 237–238), a request he will later repeat (19 Jan 1642, AT III 473–474, 480). Descartes also decided to dedicate the *Meditations* to the Sorbonne, in order to acquire their protection (to Mersenne, 30 Sept 1640, AT III 184), and he plans the contact with the Sorbonne with painstaking detail (to Mersenne, 11 Nov 1640, AT III 239–240).

This description of the events leading to the publication of the *Meditations* may lead one to expect that the subjects of the book should be metaphysical and that the book need not contain Descartes' scientific views. Descartes, so might one think, intended that the support his metaphysical ideas should get will pave the way for other ideas of his as well. However, the relation of the *Meditations* to Descartes' physics, and especially the way the book was intended to help introduce the latter into the European intellectual world, is more complex.

As the subtitle of the *Meditations* declares, in the book 'are demonstrated the existence of God and the distinction between the human soul and the body'. And in the dedicatory letter to the Sorbonne Descartes writes that he undertook to prove these things in his book by

philosophical arguments. The nature of his undertaking should bring the Sorbonne, he hopes, to grant him their patronage, which he solicits in that letter.

But the *Meditations* has an additional, covert purpose, as Descartes writes explicitly in a letter to Mersenne, on 28 January 1641 (AT III 297–298, CSMK 172–173; cf. to Mersenne, 11 Nov 1640, AT III 233). Descartes comments there that people notice in books the headings more than anything else. He then mentions some of the book's chapter headings: 'The nature of the human mind, and how it is better known than the body'; 'The existence of God'; 'The essence of material things, and the existence of God considered a second time'; 'The existence of material things, and the real distinction between mind and body'. And he continues:

> These are the things that I want people mainly to notice. But I think I included many other things besides; and I may tell you, between ourselves, that these six Meditations contain all the foundations of my physics. But please do not tell people, for that might make it harder for supporters of Aristotle to approve them. I hope that readers will get imperceptibly accustomed (*s'accoutumeront insensiblement*) to my principles, and recognise their truth, before they notice that they destroy the principles of Aristotle.

All the foundations of Descartes' physics are contained in the *Meditations*, but they are not emphasised in the text.[9]

Descartes was convinced that his principles of physics are clear and distinct, and that therefore anyone free from prejudices who is exposed to them would be convinced of their truth and adopt them. But he was afraid that if they were presented as incompatible with the Scholastic conception of material nature, various powerful theologians would oppose them and as a result his principles would be rejected and indexed the way Galileo's ideas had been. For this reason he tried to include them in the *Meditations* while allotting to them an apparent secondary role, so that they would not attract attention and by doing that prevent the approval of the book by the theologians, and so that readers would be exposed to them and consequently adopt them as if in passing.[10]

The *Mediations* was written the way it was – with the non-emphasised claims it contains, in such detail and while soliciting objections from many scholars and responding to them at length – not only to present and defend Descartes' metaphysics, but also to open a space through

which his principles of physics could make their first appearance on the public stage. It is in this light that the book should be read.[11]

6.3 Augustine and Descartes: methodological preliminaries

In the next chapter I discuss various parts of the *Meditations*, and in the course of the discussion I often emphasise Augustine's influence on Descartes' ideas. The question of whether Augustine directly influenced Descartes or whether the resemblance of their ideas is a mere coincidence or a result of indirect influences, has been debated in the literature from Descartes' day to the present. Recent Descartes and Augustine scholars who have argued for direct influence are Menn (1998) and Janowski (2004). Menn writes as follows on the coincidences between their ideas:

> It seems to me probable that Descartes read in Augustine himself everything that he needed to know about Augustinianism: I have considered a number of historically plausible intermediaries, and in each case Descartes seems to follow Augustine more closely than the supposed intermediary does. (1998, p. 69)

Wilson (2008, pp. 40–41) has tried to save both the probability of direct influence, suggested by the close affinities, and the truthfulness of Descartes' denial of any influence by suggesting that in his youth Descartes had read Augustine or had heard lectures on his philosophy, and Augustine's doctrines came back to him, their source forgotten, when he started working on his own metaphysics. But, as we shall see in the next chapter, the coincidences in detail make this improbable; and we shall soon see that Descartes' assertions when it comes to influences on his thought are in any case unreliable.

In this section and in the next chapter I provide evidence for the claim that Augustine's influence on Descartes was direct and significant. Yet although one result of my discussion might be the conclusion that this influence is more significant than has often been appreciated, this is not my main purpose in the comparison between their philosophies. The comparative study of Augustine's work is primarily intended to help us determine where Descartes *departs* from the former, for in these departures are to be found his original contributions.

I shall try to show two aspects of these departures. The first is the extent to which they rely on parts of Descartes' philosophical and scientific systems that have not been established at that place of the *Meditations*.

Descartes attempts to construct the *Meditations* as one indubitable layer upon another, without any presuppositions, starting everything afresh from evident foundations. Yet several pivotal claims he makes along the way depend on theories he reached through his scientific and technological studies, and others are understood only through his developed metaphysics, which was supposed to be derived in the *Meditations* and not to serve among its premises. This aspect of the *Meditations* shows how its alleged method, free of theoretical presuppositions, is to a large extent an illusion.

A second aspect of Descartes' departures which I shall try to identify is the one mentioned towards the end of the previous section. Descartes attempts to introduce into the *Meditations* the foundations of his physics, without being explicit that this is what he is doing and while ostensibly discussing other issues. These attempts shape parts of the discussion in the *Meditations* and identifying them would assist us in understanding some difficult moves and passages in the book. In this way, one of my claims in the previous section will also be supported, namely, that a main purpose of Descartes' in writing the *Meditations* was precisely the unobtrusive introduction of these ideas into the philosophical and scientific world.

The volume of Augustine's writings is huge, and several of them contain material relating to subjects that Descartes also discusses. It is improbable that Descartes, given his main research interests, devoted the time necessary to become familiar with most of them. I therefore need to justify my choice of the writings of Augustine which I shall compare with Descartes'. My justification will be partly *post factum*, relying on substantial parallels between the works of the two, which make convergence without influence highly unlikely. But I shall also try now to justify my reliance on specific texts independently of these parallels.

First, we saw that Bérulle ascribed special importance to *On the Trinity*, and it is therefore likely that he referred Descartes to this book, as it contains discussions that can assist Descartes in his project of finding secure foundations to knowledge. In addition, it is probable that Descartes' interest in replying to scepticism would bring him, once his attention has been drawn to Augustine, to read the latter's *Against the Academicians* (*Contra Academicos*), in which Augustine tried to do the same thing. Moreover, in the passages of *On the Trinity* that deal with scepticism (15.12.21) Augustine refers the reader to his *Against the Academicians* as a work in which a fuller treatment of the subject can be found. Acquaintance with the former work can in this way

direct Descartes to the latter as well. Apart from the parallelism that will be shown below, there is therefore also circumstantial evidence for Descartes' interest in these two texts. As for other works by Augustine, I shall use them to shed light on Augustine's thought, without claiming that they had any direct influence on Descartes'.[12]

The question of course arises, why doesn't Descartes mention Augustine's influence on his thought? Moreover, when Arnauld notes the significant affinity between the *cogito* argument of Descartes' *Meditations* and a similar argument found in Augustine's *On Free Choice of the Will* (*De Libero Arbitrio*), and between their opinions on the greater certainty of the intellect relative to the senses (Forth Objections, AT VII 197–198, 205), Descartes does not admit any influence; his only response is to thank Arnauld 'for bringing in the authority of St Augustine to support [him]' (Fourth Replies, AT VII 219, CSM II 154). And this is the *only* place in all the works he published in which Descartes mentions Augustine.

Descartes' responses to the references of his correspondents to relevant places in the works Augustine are similar. When Mesland refers him to Augustine's writings that contain ideas similar to his, Descartes thanks him the way he thanked Arnauld:

> I am grateful to you for pointing out the places in St Augustine which can be used to give authority to my views. ... I am pleased that my thoughts agree with those of such a great and holy man. For I am not the kind of person who wants his views to appear novel; on the contrary, I make my views conform with those of others so far as truth permits me. (2 May 1644, AT IV 113, CSMK 232)

Descartes indeed tries to appear unpretentious in this passage, claiming he does not aspire to *novelties*, yet his words imply a denial of an *influence* of Augustine on his thought.

Similarly, when Colvius refers him, after reading the *Discourse*, to a passage from *The City of God* that contains one of Augustine's versions of the *cogito* (Book 11, Chapter 26), Descartes thanks him for drawing his attention to that passage. He went to the library in Leiden to read the book, he writes, and found that Augustine indeed uses the doubt to prove his existence. And on this proof he adds:

> In itself it is such a simple and natural thing to infer that one exists from the fact that one is doubting, that it could have occurred to any writer. But this does not stop me from being glad to have met with St Augustine [*d'avoir rencontré avec saint Augustin*], if only to hush the

> little minds who have tried to find fault with my principle. (14 Nov 1640, AT III 248, CSMK 159)

It is implied that Descartes was not only unfamiliar with *The City of God* passage (although as we shall soon see, Mersenne had sent him the same passage three years earlier) but that he was unfamiliar with any of the occurrences of the *cogito* in Augustine.

In the same letter Descartes draws a distinction between his and Augustine's use of the *cogito*. While Augustine uses the *cogito* to show that there is a certain likeness of the Trinity in us, he, Descartes, uses it to show that the mind is an immaterial substance. However, as we shall later see, Augustine *does* use the *cogito* to prove the immateriality of the mind, and that too by means of an epistemic proof very similar to Descartes', in *On the Trinity* (10.8.16). When Arnauld will later mention this proof in a letter to Descartes (3 June 1648, AT V 186), Descartes will simply ignore the reference in his reply (AT V 192–194).

At a few other places Descartes' evasiveness verges on the ridiculous. Following his reading of the *Discourse*, even before the book was published, Mersenne cites to Descartes a *cogito* passage from Augustine (from a later letter to Mersenne (Dec 1640, AT III 261) we learn that it is the passage from *The City of God* to which Colvius later referred Descartes). Descartes first writes to Mersenne that in that passage Augustine makes a different use of the *cogito* than his (25 May 1637, AT I 376). Mersenne apparently asked Descartes again about the same passage, and when Descartes responds he writes that he could not find Mersenne's earlier letter, and that he had not managed to obtain Augustine's works (15 Nov 1638, AT II 435). It is hard to believe that Descartes should have had difficulties finding a copy of *The City of God*. Two years later, in December 1640 (AT III 261), after having received the letter from Colvius, he writes to Mersenne that the passage in Augustine to which Mersenne referred him is in *The City of God* Book 11 Chapter 26; but he does not write anything about the relation of his thought to Augustine's. Mersenne surely was not interested in a mere reference to a passage which he himself quoted to Descartes.

In the same letter, Descartes also promises to look at the first opportunity at Anselm's work, a version of whose ontological proof for the existence of God he developed in his own writings – and this is the only place in his *oeuvre* in which he mentions Anselm. In another letter to Mersenne (Mar 1642, AT III 543–544) he writes that he searched in vain in Augustine's writings for some passages Mersenne mentioned on another subject (the fourteenth Psalm). He also writes there, in a

somewhat different context, that he has never hitherto been familiar with Pelagius's opinions – opinions that Augustine often mentions in his writings; yet in an earlier letter to Mersenne (May 1637, AT I 366) he mentioned Pelagius's ideas and contrasted them with his. Lastly, when Mersenne asks him about Augustine's ideas on the ineffability of God, ideas *different* from Descartes', Descartes has no difficulty in comparing their ideas in some detail (21 Jan 1641, AT III 284).

Descartes never admits any acquaintance with Augustine's ideas that resemble his, and in this way at least implies no direct influence of Augustine on his thought. If there was indeed such influence, why does he deny it?

One might have thought that Descartes' excessive caution, following Galileo's condemnation, might have brought him not to admit any influence of any thinker on his philosophy, for fear that for any influence there will always be those who would find fault with it. But not only is this unlikely in the case of Saint Augustine,[13] we also saw that in his only published allusion to Augustine, in his replies to Arnauld, Descartes thanks him 'for bringing in the authority of St Augustine to support [him]' (Fourth Replies, AT VII 219, CSM II 154). Moreover, even if this were true of published work, Descartes could still admit Augustine's influence in his correspondence, and surely in his correspondence with Mersenne, to whom he confided so many of his plans to avoid censure. The total lack of any acknowledgment of Augustine's influence cannot be due to Descartes' caution.

The answer to our question is different. We should first ask: whose influence *did* Descartes acknowledge? As was just mentioned, he uses a variation on Anselm's ontological proof without giving any credit to Anselm. His physiology is deeply committed to earlier works, from Galen on, as Hall has established in his commentary (Descartes 1972); yet, apart from Harvey, Descartes never mentions anyone to whom he is indebted. We saw in Section 3.2 that his ideas of matter and sensory qualities are derived to a significant degree from Galileo's; yet Descartes not only does not mention this indebtedness, in his correspondence with Mersenne he also tries to appropriate Galileo's law of free fall while being critical of the value of the latter's work. Moreover, his work in mathematics was apparently influenced by Vieta's, despite his denial of any acquaintance with the latter's work: to Mersenne he writes that he did not even see the cover of Vieta's book (20 Feb 1639, AT II 524).[14]

Descartes even denied that he had been influenced by Beeckman, the man to whom he owed his return to scientific work and whom he had earlier regarded as his mentor. He owed to Beeckman the ideal of

mathematical physics, an early form of the law of inertia, and more. But when Beeckman told Mersenne that he had influenced Descartes and supported his claim by what he had written at the time, Descartes attacked him in an aggressive, arrogant letter, full of contempt to Beeckman's intellectual powers (17 Oct 1630, AT I 158*ff*). These exchanges brought about an ugly row between them, in which it seems the fault was wholly Descartes'.[15]

The inevitable conclusion from all these cases of his denial or evasion from admitting that he has been influenced by others and occasionally adopted their ideas is that Descartes was excessively vainglorious. In the long list of great thinkers to whom he was indebted, debts he endeavoured not to admit, we should also include Augustine.

This denial of influences is part and parcel of Descartes' idea that he can start afresh, dismissing all knowledge accumulated by previous generations, and reconstruct science, single-handed, on secure foundations. This inflated, unrealistic conception of one's abilities commits one to a denial of the influence of others.

That Descartes found it natural that one should present another's ideas as one's own is shown by what he ascribes to Aristotle. In the preface to the French edition of the *Principles* he writes:

> Aristotle, by contrast [to Plato], was less candid. Although he had been Plato's disciple for twenty years, and possessed no principles apart from those of Plato, he completely changed the method of stating them and put them forward as true and certain, though it seems most unlikely that he in fact considered them to be so. (AT IXB 6, CSM I 6)

This surely teaches us more about what Descartes was capable of doing than of what Aristotle was. Indeed, when he writes these words, Descartes wishes to present his philosophy as not significantly different from Aristotle's (*Principles* IV 200), in order to pave the way for its reception (cf. to Charlet, 9 Feb 1645, AT IV 157). It is therefore likely that he did not actually think that Aristotle's principles had been Plato's or that Aristotle had merely presented them in a new guise as his own. But what is important to us here is that he does not find such attempts implausible.

We can now turn to the *Meditations*.

7
The *Meditations*: Borrowed Themes with Original Variations

7.1 The First Meditation and the dream argument

The general structure of the First Meditation, 'What can be called into doubt', is as follows. In order to establish something stable and likely to last in the sciences, Descartes decides to demolish all his old opinions, which were built on falsehoods he accepted in his childhood, and start again from the foundations. To do that he tries to undermine the basic principles on which all his former beliefs rested. First, since everything he accepted as most true he has acquired either from the senses or through the senses,[1] and since the senses occasionally deceive us, he finds it prudent not to trust knowledge acquired in this way. But he immediately argues against this reason for total mistrust: although the senses do occasionally deceive us about objects which are very small or in the distance, this is not a sufficient reason for doubting that we are where we seem to be, that we have hands and a body, and so on. Indeed, madmen are similarly confident in their absurd opinions about their constitution, yet it would be mad to base our doubts on the insane as a model.

But now Descartes brings in the dream argument: since 'there are never any sure signs by means of which being awake can be distinguished from being asleep', we cannot know that we are indeed awake. Accordingly, whatever we seem to perceive might not be true, just like the visions that come in sleep. But Descartes again responds with a counterargument to his own sceptical argument:

> The visions which come in sleep are like paintings, which must have been fashioned in the likeness of things that are real, and hence ... at least these general kinds of things – eyes, head, hands and the body

> as a whole – are things which are not imaginary but are real and exist. (AT VII 20–21, CSM II 13)

And even if painters 'manage to think up something so new that nothing remotely similar has been seen before', they must use real colours; in the same way, the images in our dream are made of the 'real colours' of reality, the most simple and universal things:

> Corporeal nature in general, and its extension; the shape of extended things; the quantity, or size and number of these things; the place in which they may exist, the time through which they may endure, and so on. (AT VII 20, CSM II 14)

Accordingly, the disciplines that depend on the study of composite things are doubtful; but not arithmetic, geometry and related disciplines, which deal only with the simplest and most general things.

But now, at the third and final stage of his sceptical argument, Descartes turns to God: if, as he believes, he was created by an omnipotent God, then this God could also make him err in attributing reality to these simplest and most general things, and mistake in the most elementary calculations. And if his original cause is less perfect than this God, then since deception and error are imperfections, it is even more likely that he is always deceived.

And thus Descartes is finally compelled to admit, on the basis of powerful and well thought-out reasons, 'that there is not one of [his] former beliefs about which a doubt may not properly be raised' (AT VII 21, CSM II 14–15). And in order to get out of the habit of assenting to these opinions, he assumes there is no supremely good God who is the source of truth but some malicious demon of the utmost power and cunning that employs all his energies to deceive him.

Descartes developed the sceptical argument in three other writings as well: in the fourth part of the *Discourse*; in sections one to five of the first part of the *Principles*; and in a dialogue he left unfinished, *The Search for Truth by means of the Natural Light* (*La Recherche de la Vérité par la lumière naturelle*). The *Meditations* was written and published after the *Discourse* and before the *Principles*. The time of composition of the *Search* is unknown, and dates ranging from 1629 to 1650 have been suggested, but we shall see below that there are good internal reasons for placing it before the *Meditations* and probably after the *Discourse*.[2]

The presentation of the sceptical argument in the *Discourse* is highly condensed: less than half an AT page. That in the *Principles* is also quite

concise: around one AT page. In the *Meditations*, by contrast, it occupies almost a whole chapter, and in the *Search* it receives more than two AT pages. In addition, only in the last two is the scepticism developed in a process we may call *dialectical*: an argument for total scepticism is advanced, its scope is then limited by a counterargument, but then the scope is widened again by means of a new sceptical argument, and so on. (As we shall see, this dialectical process is more developed in the *Meditations* than in the *Search*.)

In both *Meditations* and *Search* we start by doubting apparent knowledge acquired through the senses, for these are sometimes deceptive and we have good reason to distrust whatever has deceived us even once (*Meditations* AT VII 18, *Search* AT X 510). This argument is repeated in the *Principles* (I 4) and in a little less developed form in the *Discourse*: 'because our senses sometimes deceive us, I decided to suppose that nothing was such as they led us to imagine' (AT VI 32, CSM I 127). There is no mention in the *Discourse* of the general principle justifying the doubt, namely that we should not trust what has deceived us even once. This omission is not justified by the concise presentation of the argument in the *Discourse*, for including it would have added just a few words to the work. Descartes probably has not yet thought of the scepticism with regard to the senses in its more articulated form at that stage. We again see how Descartes' thought gradually developed, and we also get some support for the claim that the *Discourse* is the earliest of the four works in which scepticism is presented.

At the next stage, in both *Meditations* and *Search*, an attempt is made to save something from this sceptical argument: although the senses occasionally deceive us when we perceive things that are too far away (both *Meditations* and *Search*), when we are sick or, in general, whenever they do not act in accordance with their natural constitution (*Search*), it doesn't follow that we should doubt what we clearly perceive: that I am where I seem to be and similar things (both works). The slightly more detailed discussion of the *Search* is probably due to its dialogical structure.

Both works now continue with a comparison to madmen who imagine that they are vases and similar things (more kinds of madness are listed in the *Meditations*). Our confidence in our whereabouts, in what we wear and in the form of our body resembles the melancholic madmen's confidence that they are dressed in purple when they are naked, that they are vases and so on. Like us, the madmen 'will swear that what they see and touch is just as they imagine it to be' (*Search*, AT X 511, CSM II 407). Our confidence might therefore seem as unreliable as theirs – unless taking

the insane as a model for ourselves is mad in its own right, and therefore this reason to doubt the clear deliverances of our senses is unjustified.[3]

Thus, to extend the scope of scepticism with regard to the senses Descartes now turns to the dream argument. 'The very thoughts we have while awake may also occur while we sleep', he writes in the *Discourse* (AT VI 32, CSM I 127). In the *Search* we read that all the things mentioned earlier which we believe are utterly true – 'that you are seeing me, that you are walking in this garden, that the sun is shining' – can also be thought while we sleep (AT X 511, CSM I 407–408). The *Meditations* maintains, as does the *Search*, that all the apparently familiar things mentioned earlier – that I am sitting by the fire and so on – can be dreamt as well, and we are then as convinced in them as we are when we are awake. But an important principle is also added: 'there are never any sure signs by means of which being awake can be distinguished from being asleep' (AT VII 19, CSM II 13). And finally, in the *Principles* (I 4) Descartes writes that in our sleep we seem to perceive, or imagine, countless things which do not exist anywhere; and he again mentions the general principle: 'there seems to be no marks by means of which we can with certainty distinguish being asleep from being awake.'[4]

The conclusion is that our life might be like one continuous dream, with all our thoughts similarly false. This is explicit in both *Discourse* and *Search*. The former claims it a possibility that 'all the things that had ever entered my mind were no more true than the illusions of my dreams' (AT VI 32, CSM I 127). And the latter asks:

> How can you be certain that your life is not a continuous dream, and that everything you think you learn through your senses is not false now, just as much as when you are asleep? (AT X 511, CSM II 408)

This explicit claim, that *all* our life might not be different from a dream, is absent from both the First Meditation and *Principles*. The formulation in these later works, although compatible with the 'continuous dream' interpretation, can also be read as *not* denying that we *are* occasionally awake, but just claiming that we can never know *when*. Yet the comparison with the earlier works favours the continuous dream interpretation of these later works as well, as do passages occurring later in the *Meditations*. For instance, both the description of 'all external things' as 'merely delusions of dreams' devised by the malicious demon (AT VII 22–23) and the general scepticism about the existence of the material world in the Second Meditation make sense only with such

an interpretation. And when Descartes mentions the First Meditation's dream argument in the Sixth Meditation, he gives it the continuous dream interpretation:

> [One reason for doubt] was that every perception I have ever thought I was having while awake I can also think of myself as having while asleep; and since I do not believe that what I seem to perceive in sleep comes from things located outside me, I did not see why I should be any more inclined to believe this of what I think I perceive while awake. (AT VII 77, CSM II 53)

Here the waking state is clearly distinguished from sleep and what is denied is that the sensations we have while apparently awake come from things located outside us. In *this* sense, of containing no more truth, life might be a mere continuous dream.[5]

But at this stage the *Search* and *Meditations* part way. The *Search* claims that since we were created by an omnipotent, superior being, He would have found it no more difficult to create us in a continuous dream-like state than in the state we thought we are in before encountering the dream argument, namely sometimes awake and sometimes asleep (AT X 512, CSM II 408). In contrast to the *Search*, in the *Discourse* there is no sceptical argument for the possibility of error that relies on an omnipotent God. In the *Search* we find it, in one sentence only, as corroborating the dream argument, and for that purpose alone. That is, in the *Search* the omnipotent God is used to support scepticism with regard to the senses. However, in the *Principles* the previous arguments are taken as sufficient in order to cast in doubt the things that can be perceived by the senses (I 5). The omnipotent God is used there only in order to cast in doubt the truths of reason: mathematical demonstrations and principles hitherto considered self-evident (I 6). As we shall soon see, this is the main use of the argument from the omnipotence of God in the *Meditations* as well, although there too it is used, in a complex way, to corroborate the dream argument. Apparently, Descartes thought of the possible use of God's omnipotence in sceptical arguments only after he had written the *Discourse*.[6] He then first employed it in an undeveloped and in fact redundant way in the *Search*, while it acquired the central and principled role of criticising the truths of reason only later, in the *Meditations* and even more so in the *Principles*.

The possibility that God is deceiving us by creating false impressions that are indiscernible from true ones is found in Cicero's *Academica* (II (Lucullus) XV 47), where it is also used as a reason for mistrusting our

senses. It is possible that Descartes took the idea from Cicero, first using it for roughly the purpose Cicero had used it, but then developing it into a source of doubt in the truths of reason. The possible influence of the *Academica* was already suggested by Curley (1978, pp. 68–69), who, however, thought that this is not so likely, since Cicero discusses the possibility that an omnipotent God misleads us in the context of scepticism with regard to the senses, while Descartes discusses it as a source of doubt in the truths of reason. However, since Descartes first used this possibility in the *Search* in order to reinforce scepticism with regard to the senses and only gradually shifted it to serve as a source of scepticism regarding the truths of reason, Cicero may well be the source of this argument in Descartes.[7]

(As regards the 'malignant demon' [*genium malignum*] who with all his industry tried to deceive [*fallere*] Descartes (AT VII 22), he may have arrived at the *Meditations* from Augustine's *On the Trinity*. When arguing against the Pythagorean belief in the transmigration of souls (12.15.24), Augustine mentions 'malignant and deceitful spirits [*spirituum malignorum atque fallacium*], whose care it is to deceive men by confirming or sowing this erroneous opinion about the revolutions of souls'. In this way the wakeful experiences of these men are as delusional as dreams.[8])

Unlike the *Search*, the *Meditations*, and only it, now has a two-stage attempt to save some of our knowledge from the dream argument. First, since we might be dreaming, we might not have the hands or body we seem to have; but even then the visions in dreams are like imaginary paintings fashioned in the likeness of real things. For even painters who invent sirens and satyrs cannot invent natures new in all respects, but jumble up the limbs of different animals. So hands and bodies, although perhaps not those we seem to have, are real. Notice that the painting example is analogous to the dream case not only in both involving imaginary things constructed out of real elements, but also in the identity of the elements: bodies and bodily organs.

But at the second stage Descartes allows more originality to the imagination, and in this way reduces the knowledge that can be saved from the dream argument:

> Or if perhaps [the painters] manage to think up something so new that nothing remotely similar has ever been seen before – something which is therefore completely fictitious and unreal – at least the colours used in the composition must be real. (AT VII 20, CSM II 13)

In other words, even if the object depicted in the painting is as novel as possible, its basic elements, the colours, are real.

The analogy just mentioned between dreams and painting makes us expect that now in dreaming, too, what would remain as the real ultimate elements are the colours: whatever is the nature of real objects, they have colours – and, to generalise, smell, taste, and other sensory qualities. And Descartes indeed continues there:

> By similar reasoning, although these general kinds of things – eyes, head, hands and so on – could be imaginary, it must at least be admitted that certain other even simpler and more universal things are real. These are as it were the real colours from which we form all the images of things, whether true or false, that occur in our thought.

But our expectations are not fulfilled.[9] The ultimate elements Descartes now lists are 'corporeal nature in general, and its extension; the shape of extended things; the quantity, or size and number of these things; the place in which they may exist, the time through which they may endure, and the like [*& similia*]' (AT VII 20, CSM II 14).[10] There is no mention of colours, or of any sensory qualities. The mentioning of extension, shape and so on is of course justified: painters too draw objects that have extension, shape, etc. But why are the sensory qualities missing from the list of simpler and more universal things that are real?[11]

The answer is clear: they are not there because Descartes thinks that corporeal nature does not include sensory qualities. These are instantiated only in the mind, when it is united with the body. Descartes' dialectic is influenced by an idea which is the product of his developed metaphysics. The argument of the *Meditations*, which was supposed 'to demolish everything completely and start again right from the foundations', actually proceeds while presupposing a specific metaphysics.

The elimination of the sensory qualities from material nature is the product of influences of Galilean, corpuscularian and other ideas, discussed in Chapter 3. The considerations involved are complex metaphysical and scientific ones, which are highly problematic. They cannot be presented as relying on any pre-theoretical common sense. Descartes does not begin from the beginning but rather relies, from the beginning, on his developed metaphysics. The argument is guided by ideas Descartes holds on the basis of considerations that are incompatible with those to which he declares himself committed.[12]

We should not exaggerate the extent to which Descartes' project is affected by *this* intrusion of his metaphysics into the dream argument. But the argument is problematic in other similar ways as well.

Why should we accept Descartes' claim that in dreaming, as in painting, we form all images of things from simple, universal things? Had the conclusion of the dream argument been that we are occasionally asleep and occasionally awake but that we cannot know when we are awake, then his claim would have been plausible. We could then have argued that both the waking state and the dreaming state are composed of the same elements and, consequently, whatever is the waking state in this continuous experience, we know what its elements are. But as we have seen, Descartes explicitly maintains in the *Discourse* and *Search* that all our life might be one continuous dream, and this is also the best interpretation of his position in the *Meditations*. If we live in a continuous dream, why should we think its elements are the same as those of reality? Our case would then not be like that of a painter, who uses, when creating new beings on his canvas, the elements of the reality to which he was exposed: if we live in a continuous dream then we were never exposed to a reality which we could imitate. Descartes' argument, intended to save some real elements from the dream argument, has atypical logical flaws.

We shall again understand the logic of Descartes' argument if we consider it in view of his developed metaphysics, as it is found, for instance, in the Fifth Meditation (AT VII 63–65) or in Part Four of the *Discourse* (AT VI 36–39). Descartes thinks that the concepts of extension, shape, quantity, time and all the others he lists at this place are not acquired through the senses. These concepts were innately imprinted in our mind by God. This is also the reason why they are clear and distinct, something which is never the case with what we only perceive through our senses. Moreover, God, the source of truth (*fons veritatis*, AT VII 22), is no deceiver, and therefore everything in our mind that has Him as its origin is true. For this reason, although Descartes thinks that the dream argument shows that everything which comes *from the senses* is uncertain, he is also convinced that the reliability of the innate concepts of the simplest and universal things he has listed is unshaken by it. And his confidence in the clarity of his metaphysics makes him believe that this is the way his readers would also find these concepts.

Descartes therefore thinks that in order to cast doubt on the reality of these simplest, universal things he has to cast doubt on the trustworthiness of the source of their concepts in his mind, namely of God. And indeed, only when he raises the possibility that the omnipotent god deceives him

does he find it possible 'that there is no earth, no sky, no extended thing, no shape no size [and] no place' (AT VII 21, CSM II 14).

We thus see again that the Cartesian dialectic of the dream argument presupposes Descartes' developed metaphysics concerning innate ideas and knowledge, God as the source of truth, the clarity and distinctness of geometrical concepts, and more. Descartes not only does not 'start again right from the foundations', but he relies on his idiosyncratic and complex metaphysics from the beginning.

But the difficulties with the way Descartes tries to save the certainty of some knowledge from the dream argument do not end here. We saw that Descartes tries to show that extension, shape, quantity, place and time are real. He next claims that 'a reasonable conclusion from this might be' that although it is possible that we are but dreaming,

> arithmetic, geometry and other subjects of this kind, which deal only with the simplest and most general things ... contain something certain and indubitable. (AT VII 20, CSM II 14)

Physics, astronomy, medicine, and all other disciplines that study composite things, things that might not exist, are, by contrast, doubtful.

But, surprisingly, the support of the mathematical disciplines does not rely on the *reality* of the simplest, universal things, a reality that Descartes has just made such an effort to establish. In the clause whose omission was marked by the ellipsis in the quotation above, Descartes writes that the mathematical disciplines deal with the simplest and most general things 'regardless of whether they really exist in nature or not'. This argument in support of the certainty of the mathematical disciplines does not fit the course of the argument so far. From the immediately preceding paragraphs it seemed that Descartes would like to save the certainty of geometry, say, because geometry deals with the properties of space, the extended thing, which really exists; but he actually saves it by arguing that its truth *does not depend* on whether or not space exists. And this is not a slip of his: to support his claim that the certainty of mathematics is not affected by the possibility that we are dreaming, he adds there:

> For whether I am awake or asleep, two and three added together are five, and a square has no more than four sides.

Descartes does not refer to the reality of the simple, universal things. It seems he is arguing that a calculation made in dream can be correct,

and *for this reason* the certainty of mathematics is not shaken by the possibility that we might be dreaming. This, one might say, is a common sense claim, which, unlike the justification discussed earlier, does not depend on Descartes' metaphysics. Moreover, if this commonsensical justification is acceptable, then the justification above that does rely on Descartes' metaphysics is redundant.

In addition, the reasons brought later in the *Meditations* (AT VII 21) for doubting the truth of mathematics show that we have at this place two ways to support its certainty in the face of the possibility that we are always dreaming, ways that are in mutual tension. On the one hand, we read that the omnipotent God might have created us so that it only seems to us that the extended thing, shape, and so on exist. This reason for doubt relies on the question of the reality of the simple, universal things. But then we read that, *what is more*, since others seem occasionally to go wrong where they are most confident, Descartes finds it possible that he too goes wrong every time he adds two to three or counts the sides of a square. This second reason for doubt is commonsensical, not depending on the question of the reality of the simple, universal things.

Furthermore, the move from the reality of the simple and universal things to the certainty of mathematics seems somewhat strained. If Descartes managed to save the knowledge of the reality of these simplest, universal things from the dream argument, why should he not stop at this stage, establishing the reality of space and a few more things as something we know for certain? The structure of this piece of knowledge, '*X* exists', parallels that of the piece of knowledge that he will later consider as his basic certain knowledge, 'I exist'. And as Descartes was to tell Burman, 'here we are dealing primarily with the question whether anything has real existence' (AT V 146, CSMK 333). By contrast, in the *Principles* Descartes notes that there is no need to list the 'very simple notions…which on their own provide us with no knowledge of anything that exists', giving as an example 'that it is impossible that that which thinks should not exist' (I 10, CSM I 196). That two and three added together are five and that a square has no more than four sides, the examples of the *Meditations*, are more like these insubstantial simple notions than like the *I exist*. Accordingly, the move from the existence claim to the claims on the relations between mathematical objects – the different numbers or shapes – is unsuccessful, both because of its invalidity and because the latter claims are not of the kind in which Descartes is interested.

Descartes' dialectic, in his attempt to save the certainty of some knowledge from the dream argument, is logically problematic and involves

two strategies which, although presented as one, are in conflict with each other. How is this to be explained?[13]

In order to explain these passages we should turn to Augustine's *Against the Academicians*, a work in which Augustine tries to refute the scepticism of the Academy. I have argued above (Section 6.3) that it is likely that, once his interest in Augustine had been awakened, Descartes would read this work. I shall discuss section 3.11.25 of *Against the Academicians* (Augustine 1995, pp. 74–75). In this section Augustine mentions sceptical arguments that rely on the possibility that he might be dreaming. The waking state is contrasted here, as in Descartes' *Search* and *Meditations*, with sleep and madness, and, again like Descartes, Augustine tries to save the certainty of some claims in face of the possibility that we are dreaming or insane. I quote him at length, for later reference:

> I state that this whole mass of bodies and the contrivance in which we exist – whether we be asleep, insane, awake, or sane – either is one or is not one. Explain how this view can be false! Now if I'm asleep, it might be that I don't say anything. Or, if the words escape my mouth while I'm sleeping, as sometimes happens, it might be that I don't say them here, sitting as I am, to this audience. Yet the claim itself can't be false.
>
> Nor do I say that I've perceived this because I'm awake. You can say that this also could seem to me while I was sleeping, and thus it can be very like what is false. Yet if there is one world and six worlds, then, whatever condition I may be in, it's clear that there are seven worlds, and it isn't presumptuous for me to affirm that I know this.
>
> Accordingly, prove that this inference ... can be false because of sleep, madness, or the unreliability of the senses! ... I think it's now sufficiently clear what falsehoods seem to be so through sleep and madness, namely, those that pertain to the bodily senses. For that three times three is nine and the square of rational numbers must be true, even if the human race be snoring away!
>
> I see that many things can also be said on behalf of the senses, things we don't find censured by the Academicians. I think the senses aren't blamed when false things befall madmen or when we see false things in dreams. If the senses report truths to those who are awake and sane, it's irrelevant to them what the mind of a sleeping or insane person invents for itself.

The resemblance to Descartes is considerable. Augustine mentions the insane, as Descartes does in both *Search* and *Meditations*, in order to cast

doubt on knowledge acquired through the senses that is unaffected by ordinary sceptical arguments pertaining to the senses (misperception of small or faraway things, for instance).[14] But as in both Cartesian works, Augustine rejects in the fourth paragraph the comparison to the insane as irrelevant (although unlike Descartes he also rejects there as irrelevant the comparison to those who are asleep). Moreover, again as in the *Search* and *Meditations*, the apparent truths that become uncertain following the dream argument are those that rely on the senses and are seemingly obvious; and the example given (at the end of the first paragraph) is of the same kind as Descartes': I might not be where I seem to myself to be.

Furthermore, as in Descartes' works, the dream argument succeeds in throwing doubt only on knowledge that comes from the senses, while mathematical knowledge is unaffected by it. And similarly to Descartes, who gives in the *Meditations* the example of adding two and three, Augustine gives the example of multiplying three by three: elementary arithmetical operations with small numbers. Lastly, in *On the Trinity* 15.12.21, at the place where he refers the reader to his *Against the Academicians* after having discussed in detail the limitations of the dream argument, Augustine writes similar things on the scope of the doubt in the senses:

> For since there are two kinds of things which are known: one, the knowledge of those which the mind perceives through the senses of the body, the other of those which it perceives through itself, [the Academicians] have babbled many things against the senses of the body; but they have been utterly unable to cast doubt upon the most certain perceptions of things that are true, which the mind knows through itself, such as that which I have already mentioned: 'I know that I live'. (2002, p. 192)

The resemblance of Descartes' thought about the scope of scepticism due to the dream argument to Augustine's is clear in the *Principles* as well. The heading of section I 4 is 'The reasons for doubts concerning the things that can be perceived by the senses', and in this section we find both the argument from the fact that the senses occasionally mislead us and the dream argument.

In addition, in section 3.11.24 of *Against the Academicians*, the one preceding Augustine's discussion of the doubt based on dream and madness, just a few lines before the passage quoted at length above, Augustine asks in the sceptic's name:

> 'How do you know that the world exists', replies the Academician, 'if the senses are deceptive?' (Augustine 1995, p. 74)

This is probably the only place in ancient literature in which we find scepticism with regard to the *existence* of the world perceived by the senses, and not only scepticism regarding whether that world is indeed as it appears to us. And of course, the former kind of scepticism is found in Descartes' writings as well (but see below on some important differences between the two philosophers in this respect).

These parallels – in structure, arguments, conclusions and examples – provide very strong support for the claim that this is a case of direct influence. Of course, the dream argument had appeared in many philosophical works that preceded Descartes', from Plato's to those of Descartes' contemporaries; but I am not aware of any other work that shares so many features with his. Moreover, the claim of direct influence is also supported by the fact that before his meeting with Bérulle, Descartes does not mention the dream argument, even in those passages in the *Rules* in which he describes how one should start laying the foundation of knowledge and how the sceptic can be answered. It seems that following that meeting, Descartes turned to Augustine and became convinced that he had to incorporate the dream argument as part of the dialectics leading, first, to the distinction between knowledge originating in the senses and knowledge due to the pure intellect, and secondly, to the first truth, *I exist* or *I live* (we shall discuss below the relations between these two basic truths). Bérulle must have been aware of this epistemic role that the dream argument plays in *On the Trinity*.

Accordingly, Descartes accepts Augustine's claim that mathematical knowledge is not cast in doubt by the dream argument or scepticism with regard to the senses more generally. He therefore finds it necessary to come up with a different argument to that end. We find such an argument already in the *Discourse*, an argument whose independence of the dream argument is underscored by its preceding the latter:

> And since there are men who make mistakes in reasoning, committing logical fallacies concerning the simplest questions in geometry, and because I judged that I was as prone to error as anyone else, I rejected as unsound all arguments I had previously taken as demonstrative proofs. (AT VI 32, CSM I 127)

This argument is fairly weak relative to the other sceptical arguments Descartes gives. It does not indicate any difficulty with the conclusions

of mathematical demonstrations or with their premises, but rather, abstracting from their content, it maintains that we might always make mistakes, never mind how cautious we have been in checking our demonstrations. It is little wonder that this argument did not acquire a place in philosophy resembling that of scepticism with regard to the senses or the dream argument. Moreover, it is possible that Descartes himself was not entirely pleased with it: in the *Search* it is not mentioned at all. In the *Meditations* the possibility of mistaking in the simplest calculations is related to the omnipotent God, who might 'have created me such that I am deceived all the time', and is thus given firmer grounds. And the argument is indeed mentioned in the *Principles* (I 5), but Descartes immediately adds that 'most importantly', mathematical demonstrations are uncertain because the omnipotent God might have created us such that we are always deceived even in what seems to us most evident.

However, in the *Meditations*, and only there, Descartes tries to save from the dream argument something additional, namely the existence of the simplest and most universal things – an existence which at the next stage he will again try to doubt. And he saves it by combining two counterarguments, a metaphysical one (regarding their existence), and a commonsensical one (2 + 3 = 5 even while dreaming), a fusion that does not create a coherent argument. By contrast, the omnipotent God is not used again in the *Principles* to cast in doubt the reality of these universal things, where the knowledge of their existence is not even mentioned as unaffected by the dream argument; nor are they mentioned in the *Discourse* or *Search*. Moreover, the lame grafting of the metaphysical counterargument on the commonsensical Augustinian one is not a trivial weakness, and this is atypical of Descartes. Were any other considerations at play while writing these passages?

An affirmative answer is plausible.[15] The metaphysical counterargument enabled Descartes to list here the elements of physical reality according to his system. Already on the fourth page of the *Meditations*' text we encounter as more certain and evident than anything perceived by the senses the foundations on which Descartes will later build his physics. These include a physical world that is characterised by extension, shape, quantity and so on, but without any distinction between extension and body and devoid of all sensory qualities. By means of a metaphysical counterargument, which has presuppositions that disagree with Descartes' general method of doubt and is unsuccessfully grafted to a commonsensical argument, we are exposed to central Cartesian ideas that are not part of the subject under discussion.

We are inevitably reminded of Descartes' letter to Mersenne, quoted above: there are, on the one hand, the subjects of the *Meditations* announced in the headings, which, he writes,

> are the things that I want people mainly to notice. But I think I included many other things besides; and I may tell you, between ourselves, that these six Meditations contain *all the foundations of my physics*. ... I hope that readers will get imperceptibly accustomed to my principles, and recognise their truth, before they notice that they destroy the principles of Aristotle. (28 Jan 1641, AT III 297–298, CSMK 172–173; emphasis added)

The unsuccessful grafting of the metaphysical counterargument on the dialectics of the First Meditation is a result of Descartes' forced attempt to introduce into the book at this place, as if incidentally, the foundations of his physics.

We have seen how the dream argument of the *Meditations* involves several elements of Descartes' complete system and that its alleged character as independent of all theory is thus an illusion. However, it might seem that these elements can be eliminated and in this way the argument will gain its desired theory-independent character. After all, it might be argued, the argument has been used, both before and after Descartes, by philosophers who did not share his metaphysics, and also differed radically from each other in their metaphysical or other views; so it *can* be made independent of any specific theory. To show that this *cannot* be done, I shall show (without presuming to be exhaustive) how different philosophers used *different* versions of the dream argument, versions that make sense *only given their other developed views*.

Unless we are committed to some philosophical theory, a sufficient response to the question 'How do you know that you are now awake and not asleep?' is, 'What do you mean? When you are awake you know that you are awake!' And if the sceptic persists, 'But do you have any *sign* to distinguish the waking state from dreaming?', then the response should be, 'Why do you need a sign? Do you have any doubts?' Not every distinction we make is based on some sign. Without specific philosophical convictions, the dream argument does not get off the ground.

But within the framework of some theories of knowledge, the dream argument does make sense. As was mentioned in the Introduction,

the earliest recorded occurrence of the dream argument is in Plato's *Theaetetus*:

> Socrates: Do you see another question which can be raised about these phenomena, notably about dreaming and waking?
>
> Theaetetus: What question?
>
> Socrates: A question which I think that you must often have heard persons ask: How can you *determine* whether at this moment we are sleeping, and all our thoughts are a dream; or whether we are awake, and talking to one another in the waking state?
>
> Theaetetus: Indeed, Socrates, I do not know how to *prove* the one any more than the other, for in both cases the facts precisely correspond; and there is no difficulty in supposing that during all this discussion we have been talking to one another in a dream; and when in a dream we seem to be narrating dreams, the resemblance of the two states is quite astonishing.
>
> Socrates: You see, then, that a doubt about the reality of sense is easily raised, since there may even be a doubt whether we are awake or in a dream. (158b–d; Plato 1937, Vol. 2, p. 160; emphases added)

Socrates's 'determine' translates a Greek word derived from *apodeixis*, originally *a showing forth* or *exhibiting*, which by that time meant *proof* in Plato's works, as did Theaetetus' *epideixis*. Socrates argues that since we cannot *prove or show* that we are awake and not asleep, we can or should doubt, when we are awake, that we are awake. But this doubt presupposes a conception of knowledge as dependent on justification, as if you can know only what you can prove or argue for. And in the very same dialogue Plato develops the conception of knowledge as a true belief with a *logos* – roughly, a justification of the belief or an argument in its support. Plato finds the dream argument compelling because he finds the conception of knowledge as involving a justification or proof such.

Plato's conception of knowledge was adopted by the Hellenistic sceptics, and they consequently searched for a criterion distinguishing the waking state from a state of dream, or the reliability of the appearances in the former from that of the appearances in the latter (a doubt that also has its origins in the *Theaetetus*, in the passage following the one quoted above). Arguing that there is no such criterion, they ended up maintaining that we do not know whether things are indeed as they seem to us when we are awake. Again, a sceptical argument that makes sense only within a specific conception of knowledge.[16]

A different kind of sceptical dream argument is found later, in Al-Ghazali (1058–1111):

> I told myself that when one is asleep one believes all sorts of things and finds oneself in all sorts of situations; one believes in them absolutely, without the slightest doubt. When one wakes up, one realises the inconsistency and inanity of the phantasms of the imagination. In the same way, one might ask oneself about the reality of beliefs one has acquired through one's senses or by reason. Could one not imagine oneself in a state which compares to being awake, just as wakefulness compares to being asleep? Being awake would be like the dreams of that state, which in turn would show that the illusion (of the certainty) of rational knowledge is nothing but vain imagination.
>
> Such a state might be the one that the mystics [Sufis] claim, for they assert that, when they become totally absorbed in themselves and completely abstract from their senses, they find themselves in a state of mind which does not agree with what is given by reason.
>
> Perhaps this state is none other than death? Did not Allah's messenger, peace be upon him, say: 'Men are asleep; in dying they awaken'. Life here below may be a stream, compared with life beyond. After death, things would appear in a different light, and, as the *Qur'an* says, 'We have lifted your veil, and today your sight is penetrating'. (2002, Chapter I)

Unlike Plato and the Hellenistic tradition, Al-Ghazali does not claim that we lack a criterion for distinguishing wakefulness from dream or for establishing the truthfulness of how things appear to us while we are awake in contrast to how they appear to us when we are dreaming. He rather suggests that there is a higher form of reality or cognition, related to being awake the way the latter is related to being asleep, and that for this reason the way things appear to us when we are awake should not be trusted. Al-Ghazali is influenced here by mystical thought, as his reference to the mystics in the second paragraph makes clear. This approach goes back ultimately to a different Platonic idea, the one expressed by the divided line of *Republic* VI (509–511), where the truth and being of the Platonic Ideas are said to relate to those of the objects perceived by the senses in the same way as the latter relate to the truth and being of shadows and reflections (dream appearances are not mentioned at that place, but they seem to fit the last category of being). The Platonic

influence is also apparent in the claim of the last paragraph, that when we die – namely, when the soul is released from its body – we shall perceive things adequately, and in comparing the reality of life to a state of flux. Again, Al-Ghazali's dream scepticism makes sense only within a complex metaphysical system, which is far removed from any pre-theoretical stance.[17]

When we turn to Descartes, we find the dream argument leading to a new kind of scepticism. Unlike Al-Ghazali, Descartes does not consider the possibility that there might be a higher form of reality that relates to the reality we perceive while awake the way the latter relates to what we perceive while dreaming. And as was claimed above, unlike Plato and his ancient followers, Descartes is not looking for a criterion to decide when he is awake or which appearances are more reliable, those that we have while awake or those that we have while dreaming. In fact, as was noted above, Descartes does not even mention the need for a criterion in his two earlier formulations of the dream argument, those found in the *Discourse* and the *Search*. Yet already in the *Discourse* he 'resolved to pretend that all the things that had ever entered [his] mind were no more true than the illusions of [his] dreams' (AT VI 32, CSM I 127); while the *Search* suggests that life is a continuous dream, and that everything the senses teach is false just as in sleep (AT X 511). And as argued, this is how the dream argument of the *Meditations* should also be interpreted. This sceptical possibility, that our stream of sensations during life never represents anything real in the material world, neither while we are awake nor while we are dreaming, is generally acknowledged as an innovation of Descartes.

Although Descartes at one point in the *Meditations* momentarily considers the possibility that there is not only no body but no mind either – 'I have convinced myself that there is absolutely nothing in the world, no sky, no earth, no minds, no bodies' (AT VII 25, CSM II 16) – this possibility is immediately rejected through the *cogito*. And even before mentioning the *cogito*, Descartes more often doubts not his own existence but only that of the material world (AT VII 21, 22–23, 24). Similar claims are found in other places in his writings. In the *Discourse*, for instance, he claims: 'while I could pretend that I had no body and that there was no world and no place for me to be in, I could not for all that pretend that I did not exist' (AT VI 32, CSM I 127). And the same conclusion is drawn in the *Principles* (I 7). We are thus left with a doubt concerning the existence of a material world, while we are certain in the existence of our own mind. The result of the dream argument is accordingly the notorious scepticism about the existence of the 'external' or

material world, which Descartes was the first to raise. Only a benevolent God could rescue Descartes from this scepticism, and even this only by means of some specious reasoning.

Two philosophers who are occasionally said to have preceded Descartes in mentioning the possibility that the material world does not exist are Augustine and Nicholas of Autrecourt (c. 1300–1369). But closer inspection will reveal significant differences between the possibilities they consider and the one Descartes suggests.

Augustine, in a passage quoted above, makes the sceptic ask: 'How do you know that the world exists…if the senses are deceptive?' And he replies: 'Your arguments were never able to disown the power of the senses to the extent of clearly establishing that nothing appears to us [*nobis nihil videri*].' (*Against the Academicians* 3.11.24; 1995 p. 74) Whatever it is that appears to us Augustine dubs 'the world', whether or not it is as it appears to us.[18] This 'world' is said to contain and sustain us, to include what appears to us as the heaven and the earth, and later to be 'this whole mass of bodies and the contrivance in which we exist', whether we are asleep, insane or awake. Nowhere does Augustine imply that the sceptic thinks the mind is immune to this existential doubt, nor does he suggest that the doubt affects only the existence of the material world but not the mind's. The description of the 'world' seems in fact to draw the contrast between us as *embodied* creatures and the world around us, which contains and sustains us; 'we' seems to designate the human being, not his mind. Unlike Descartes, Augustine does not draw any line, if only to be rejected, between a certainly existing mind and a possibly inexistent material world.

Nicholas of Autrecourt's relevant doubts appear in his First Letter to Bernard of Arezzo. Nicholas is trying to reduce Bernard's ideas to positions more absurd than Academic scepticism (1994, p. 57). In the course of doing so he infers from Bernard's claims the following two propositions: 'Every impression we have of the existence of external objects can be false' [*omnis apparentia nostra quam habemus de existentia obiectorum extra, potest esse falsa*][19] and 'In the natural light we cannot be certain when our awareness of the existence of external objects is true or false' (p. 47). Two things should be noted here. First, from the fact that every impression is possibly false, it does not follow that possibly, all impressions are false; but while Nicholas discusses the first proposition, the second is the one that expresses the doubt in the reality of the material world. Secondly, and more importantly, by 'external objects' Nicholas might literally mean here, objects external to our *body* – further evidence is needed to take it as the non-literal 'external' to our mind (namely,

different than, as the mind is not extended). And Nicholas's later reformulations of these propositions do not change these aspects of his first formulations (for instance, 'from your claims it follows that you have to admit that you are not certain of the existence of the objects of the five senses', p. 53). The interpretation of Nicholas's 'external' as external to the body is corroborated by the further moves he makes when he derives more extreme sceptical conclusions from Bernard's position. He first summarises: 'you have to admit that you are not certain of those things which are external to you [*extra vos*]', and he mentions as examples the sky, earth, fire, water, the Chancellor and the Pope; and then he adds a new element: 'Similarly, you do not know what things are within you [*nescitis que sunt intra vos*], as whether you have a head, a beard, hair and the like' (p. 55).[20] Moreover, Nicholas does not stop at this stage, but immediately adds as conclusions from Bernard's position that Bernard is ignorant of the existence of God (the Prime Mover), of cognition, of propositions, of his acts and even *of his mind or intellect*. Accordingly, in contrast to Descartes, Nicholas never considers a position according to which we can be certain of the existence of our mind while doubting the existence of the material world. Rather, he first discusses doubts with respect to the existence of things external to our body; and he then generalises it to a doubt about the existence of anything, the mind included. A sceptical position about the existence of the material world but not about that of one's own immaterial mind was an innovation of Descartes'.

Descartes was led to this new form of scepticism by his new theory of perception. Unlike any philosopher preceding him, Descartes held that the sensory qualities of which we are directly aware are not instantiated in material nature: neither in the bodies we seem to perceive nor, as was the view of much Scholastic philosophy, in our material sense organs. *These* positions, once they admit that we are aware of sensory qualities, are committed to the existence of the material world, since according to them the sensory qualities of which we are aware are instantiated in material things: either the things we perceive or our sense organs. Nor did Descartes hold, as Democritus seems to have, the paradoxical eliminative position that they are not instantiated anywhere. For Descartes, the subjective sensory qualities are instantiated in our immaterial mind, whose existence is independent of the existence of any material body. In this respect – instantiation not in material nature but in an immaterial mind – these sensory qualities are like our abstract thoughts, which were generally held by earlier philosophers not to depend for their occurrence on the existence of bodies. For this reason Descartes could also call the

subjective sensory qualities, again apparently for the first time in history, thoughts (*cogitationes*). It was therefore possible for him, *given his theories of nature and of perception*, to maintain that we are aware of subjective sensory qualities, namely that we seem to perceive, while the material world does not exist. Descartes' new, 'external' world scepticism presupposes his developed metaphysics. Far from demolishing everything completely and starting right from the foundations, Descartes deduces new possibilities that follow from his complex, innovative world view, itself based on a variety of technological, scientific, methodological and other ideas. The declared method of the First Meditation, which attempts to discard any theoretical presuppositions, is indeed an illusion.[21]

Some interpreters have thought that Descartes' innovative scepticism concerning the existence of a material world was a product of his different *interests*, compared with those of earlier sceptics. Thus Burnyeat has claimed that the *practical* orientation of the ancient sceptic, his pursuit of happiness, prevented him from pushing his scepticism so far, while Descartes' project of *pure* enquiry enabled him to take the further step (1982, pp. 25, 30–31). Descartes, claims Burnyeat, is using the *traditional* materials to support 'a doubt more radical than the traditional skeptic had dared suppose' (p. 37). Larmore has followed Burnyeat in assessing the reasons for the differences in the scope of doubt, extending Burnyeat's explanation of the ancient scope of doubt to Montaigne's general attitude to doubt as well (1998 § I, especially p. 1148).

But it is hard to see why a doubt concerning when we are awake and when asleep is less of an obstacle to life than a doubt concerning whether what we seem to perceive is ever real. In both cases the sceptic would be at an equal loss about what to do if he were to decide on that on the basis of his philosophical convictions.[22] Moreover, the practical implications of philosophical scepticism are limited, as Hume emphasised; and as Williams notes (2010, p. 300), in everyday life the Pyrrhonian sceptic is guided by the same practical criteria that guide everyone else most of the time; and since the Pyrrhonian sceptic sees himself as acting on the basis of how things appear to him without committing himself to the truth of these appearances, he could certainly maintain that the material world *appears* to exist, irrespective of whether it really exists (Fine 2000, § 8). In addition, it definitely seems as if the ancient sceptics did make ingenious efforts to cast in doubt any dogma their opponents held, including even logical truths (Cicero, *Academica* II (Lucullus) XXVIII.91–XXX.98), never mentioning the practical purpose of their doubts as determining its boundaries. So Burnyeat's explanation seems unacceptable.

On the other hand, Descartes did have materials for doubt that the earlier sceptics lacked, namely his new metaphysics and theory of perception, and these are among his reasons for doubt. It therefore seems that the mentioned difference in doubt is due to differences in the conception of nature.

Michael Williams (1986) also claimed that Descartes' dream scepticism depends on his metaphysics, emphasising the importance of Descartes' assimilation of sensations to thoughts (131); in these respects I agree with Williams. However, there are several important differences between our interpretations. First, Williams compares and thus contrasts Descartes' dream argument with the one found in the ancient sceptical traditions to which Cicero and Sextus belong. But he should also have considered the similarity between Descartes and Augustine in their shared attempt to *refute* scepticism by driving the doubt to its extremes. Descartes follows Augustine, whose project – like Descartes' and unlike Cicero's or Sextus's – is to eliminate doubt. Yet Augustine is never mentioned by Williams. This affects Williams's analysis as follows.

Williams maintains that unlike the ancient sceptics, Descartes' 'emphasis is on the "fact" that dreams can *reproduce the content of the most commonplace waking experiences*. This shift of emphasis', he continues, 'allows Descartes to pose a question that never occurs to the classical sceptics: how can Descartes ever be sure that he is not dreaming?' (128). According to Williams, the ancient sceptic thinks by contrast that similar perceptions are caused by similar objects (identical eggs or twins); dreams are important to the ancient sceptic for a different reason: although *strange* things are seen in them, the dreamers can still be taken by these delusions, and this undermines the reliability of persuasiveness of impressions (134–135). Williams thus concludes:

> Though there can be little doubt that the sources of Cartesian scepticism are primarily Academic, we see that Descartes' dream argument is the product of uniting considerations that the Academics keep distinct. To effect the union, Descartes must dissociate indistinguishability of perceptions with respect to content from causation by near-identical objects. His new conception of the mental, which allows him to think of 'sensations' in abstraction from the senses, makes this possible. Lacking this, the Academic sceptics think of sensation in partly causal-physical terms, as an affection of the living organism. Accordingly, they think of similar perceptions as perceptions of (caused by) similar objects. This precludes uniting their arguments

> so as to raise the question of whether there is any external world at all. (134–135)

But Williams is factually wrong. Already Plato in the *Theaetetus* emphasises the possible *resemblance* of appearances in dreams to those we have while awake. Responding to Socrates' question, 'How can you determine whether at this moment we are sleeping, and all our thoughts are a dream; or whether we are awake, and talking to one another in the waking state?', Theaetetus replies:

> Indeed, Socrates, I do not know how to prove the one any more than the other, for in both cases the facts precisely correspond; and there is no difficulty in supposing that during all this discussion we have been talking to one another in a dream; and when in a dream we seem to be narrating dreams, the resemblance of the two states is quite astonishing. (158b–d; Plato 1937, Vol. 2, p. 160)

Socrates doubts whether we can distinguish the waking state from dreaming, and Theaetetus emphasises their possible similarity, as Descartes would do. Plato is also never mentioned by Williams.

No less significantly, Augustine also writes while discussing the dream argument:

> For who does not know that things seen by those who are asleep are very similar to things seen by those who are awake. (*On the Trinity*, 15.12.21)

And this text has probably influenced Descartes' argument more than any other ancient text (see also Augustine's *Against the Academicians* 3.11.25).

Accordingly, the ancient sceptics did pose the question Williams claims they did not: they did think that what we dream can be indistinguishable from what we experience while awake. Descartes did not innovate in this respect. It seems that Williams thinks that according to the ancient sceptics, the delusions of dreams were indeed in the mind and not in the sense organs, and only sensations were bodily occurrences. By contrast, I maintain that earlier to Descartes the apparent sensations in dreams were also thought of as being instantiated in the body and that they too had to be moved into the mind for scepticism about the material world to become possible.

Williams also thinks that Descartes innovates in having a foundational conception of knowledge, and therefore, unlike the ancient sceptic, a stratified conception of knowledge, and that this allows him to have 'beliefs unscathed by the dreaming argument', for instance that two and three are five (128–129). But we saw that also according to Augustine, our knowledge of these mathematical truths is unthreatened by the dream argument. So neither is this aspect of Descartes' philosophy his innovation, and it is not due to his new metaphysical ideas.

Moreover, Williams does not claim that Descartes is the first to have made sensations into thoughts, and he certainly does not consider Descartes' reasons for assimilating them to thoughts. The reasons Descartes had for developing his metaphysics and the nature of these reasons (are they theory-free, or conclusions from scientific and technological advances?) are also not considered by Williams. Neither does he claim that the sceptical project and its refutation necessarily involve theoretical assumptions.[23]

It is instructive to contrast Descartes' argument with Sextus's, when the latter argues against the reliability of our senses due to the representational nature of perception. Sextus writes:

> Next, even if we grant that appearances are apprehended, objects cannot be judged in virtue of them; for the intellect, as they say, sets itself upon external objects and receives appearances not through itself but through the senses, and the senses do not apprehend external existing objects but only – if anything – their own affections. An appearance, then, will actually be of the affection of a sense – and that is different from an external existing object. (*Outlines of Pyrrhonism*, Book I, § 72; cf. *Adversus Mathematicos* 7.32*ff*)

For Sextus, what the mind or intellect apprehends are affections of the senses, namely of bodily, material organs. And if we are thus directly aware of material organs, then of course we know that material things exist, and scepticism about the existence of the material world is ruled out. For Descartes, by contrast, we apprehend the affections of the immaterial mind, and consequently it is possible that the material world does not exist. The difference between Sextus and Descartes is due to their different theories of perception.

Although the doubt concerning the existence of material things that accompanies the certainty in our own existence is absent from the philosophy preceding Descartes', it reappears time and again in later philosophy, justified by Descartes' version of the dream argument and

involving, often explicitly, his view of the sensory qualities of which we are aware as instantiated only in the mind.[24] Locke, for instance, also mentions the doubt concerning the reality of things external to the mind, explicitly grounding the possibility that only our mind exists in Descartes' position, that sensory ideas are in the mind, a position he takes to be obvious:

> There can be nothing more certain, than that the *Idea* we receive from an external Object is in our Minds: this is intuitive Knowledge. But whether there be anything more than barely that *Idea* in our minds, whether we can thence certainly inferr the existence of any thing without us, which corresponds to that *Idea*, is that, whereof some Men think there may be a question made, because Men may have such *Ideas* in their Minds, when no such Thing exists, no such Object affects their senses. (*Essay*, Book IV, Chapter ii, § 14, p. 537)

And his sceptics support their doubt by the Cartesian conception of the dream, for a sceptic would say that 'a Dream may do the same thing, and all these *Ideas* may be produced in us, without any external Objects' (ibid.).

A little later, Leibniz writes in his response to Locke on 'the sceptics' dispute with the dogmatists regarding the existence of things outside us', apparently projecting the modern doubt in the existence of material nature onto antiquity, and he continues by discussing the difference between sensations and dream or imaginings (*New Essays*, Book IV, Chapter ii, § 14, pp. 373–375). At about the same time, Pierre Bayle (1647–1706), correctly contrasting the ancient Pyrrhonists with the new philosophers, notes that the latter consider heat, smells, colours and the like as modifications of our soul that do not exist in the objects of our senses, and concludes that the same might be the case with extension, and that therefore there might not be bodies in the universe (1991, Comment B on the entry on Pyrrho, p. 197). And Berkeley, in support of his idealism, also interprets the dream in Descartes' way, as if the ideas we have while dreaming are instantiated only in the immaterial mind:

> HYLAS: Is it not certain *I see things* at a distance? Do we not perceive the stars and moon, for example, to be a great way off? Is not this, I say, manifest to the senses?
>
> PHILONOUS: Do you not in a dream too perceive those or the like objects?
>
> HYLAS: I do.

> PHILONOUS: And have they not then the same appearance of being distant?
>
> HYLAS: They have.
>
> PHILONOUS: But you do not thence conclude the apparitions in a dream to be without the mind?
>
> HYLAS: By no means.
>
> PHILONOUS: You ought not therefore to conclude that sensible objects are without the mind, from their appearance, or manner wherein they are perceived. (*Three Dialogues between Hylas and Philonous*, p. 159; cf. *Principles of Human Knowledge*, § 18)

Berkeley's conclusion is of course that 'real things, and chimeras formed by the imagination, or the visions of a dream ... are all equally in the mind' (*Three Dialogues*, p. 186).

The idealism that emerged in the generations following Descartes', with Leibniz, Berkeley and later philosophers, is thus a new metaphysical possibility created by Descartes' theory that the subjective sensory qualities are instantiated in the immaterial mind. In fact, we find idealism as a *possibility* explicitly suggested already by Descartes, when, after the *cogito* but before proving the existence of the material world he knows that some minds exist (namely his own) while he does not know whether any body exists. This is the first appearance of the idea of idealism in Western thought (at this place identical with another new idea, also making its debut, that of solipsism). Here lies another deep innovative and revolutionary influence of Descartes' on modern philosophy. And again, this new idea is not arrived at through meditations free of theoretical presuppositions, but is a conclusion from a complex metaphysical view, itself constructed on the basis of theories on the nature of the material world, on the limitations of the mechanical and on the possibilities of representation.

7.2 Cogito: ergo sum or ergo vivo?

After recapitulating the conclusions of the sceptical arguments of the previous Meditation, Descartes develops in the Second Meditation a version of the *cogito* and concludes that it is necessarily true that he exists whenever he thinks he does. He then enquires what he is, and concludes that in the strict sense he is only a thing that thinks, namely a mind, intelligence, intellect or reason (*mens, sive animus, sive intellectus, sive ratio*). From this it follows that he is not a human body; no wind,

fire or any other thin vapour that permeates the limbs; and in general that, in the strict sense he is now considering, he is nothing corporeal, for he supposed all corporeal things to be nothing and his knowledge of himself cannot depend on knowledge of things he does not yet know to exist. Moreover, the imagination cannot teach him what he is, for to imagine is to contemplate the shape or image of a corporeal thing, yet all such images might be mere dreams. Descartes then asks what is a thinking being, and answers with a list: 'a thing that doubts, understands, affirms, denies, is willing, is unwilling, and also imagines and perceives [*sentiens*]'. This enumeration of the mind's capacities ends the first part of the Second Meditation.

As mentioned in the previous chapter (section 6.3), already when the *Discourse* and *Meditations* were first published, and even before their publication, several people noted the resemblance of the ideas of this Meditation, especially of its first part, to those found in Augustine's work. The passage most often referred to, ever since Mersenne first mentioned it to Descartes (to Mersenne, 25 May 1637, AT I 376), is from *The City of God*:

> For we exist, and we know that we exist, and we take delight in our existence and our knowledge of it. Moreover, in respect of these three things of which I speak, no falsehood which only resembles the truth troubles us. For we do not make contact with these things by means of some bodily sense, as we do in the case of things extrinsic to ourselves. We perceive colours, for example, by seeing, sounds by hearing, smells by smelling, tastes by tasting, hard and soft objects by touching; and in all these cases it is the images resembling the sensible objects, but not the corporeal objects themselves, which we perceive in the mind and retain in the memory, and which excite us to desire the objects. It is, however, without any delusive representation of images or phantasms that I am wholly certain that I exist, and that I know this fact and love it.
>
> So far as these truths are concerned, I do not at all fear the arguments of the Academicians when they say, What if you are mistaken? For if I am mistaken, I exist. [*Si enim fallor, sum*.] He who does not exist clearly cannot be mistaken; and so, if I am mistaken, then, by the same token, I exist. And since, if I am mistaken, it is certain that I exist, how can I be mistaken in supposing that I exist? Since, therefore, I would have to exist even if I were mistaken, it is beyond doubt that I am not mistaken in knowing that I exist. (XI 26, p. 484)

The affinity to Descartes is of course striking. Augustine too contrasts the uncertain knowledge coming from the senses, where our knowledge is mediated by means of images and is therefore insecure, with the immediate knowledge of our existence. Like Descartes, he argues from the first-person point of view and mentions his knowledge of his own existence in response to the sceptics (the Academicians), and he uses the doubt to defeat itself. And the style of argument is also similar: the insistence on the fact that we might be mistaken, the repetition of the sceptical doubt, is used to securely establish the indubitable truth, I exist, *sum*. Here is Descartes' parallel *Meditations* passage:

> But I have convinced myself that there is absolutely nothing in the world, no sky, no earth, no minds, no bodies. Does it now follow that I too do not exist? No: if I convinced myself of something then I certainly existed. But there is a deceiver of supreme power and cunning who is deliberately and constantly deceiving me. In that case I too undoubtedly exist, if he is deceiving me [*Haud dubie igitur ego etiam sum, si me fallit*]; 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 that I am something. So after considering everything very thoroughly, I must finally conclude that this proposition, *I am, I exist*, is necessarily true whenever it is put forward by me or conceived in my mind. (AT VII 25, CSM II 16–17)

The *City of God* was widely read in Descartes' time and his associates were familiar with the relevant passage, so it is likely that Descartes was familiar with it as well.

Whether or not Descartes was familiar with this passage, *The City of God* is not the only work in which Augustine develops a version of the *cogito*. Another version is found in *On the Trinity*, and having claimed that Descartes was probably familiar with *that* work, I turn to examine Augustine's ideas and arguments there. It is worthwhile to quote the parallel passage in its full, saintly length:

> First, [consider] the knowledge from which our thought is formed so as to convey truth when we say what we know: of what sort is this knowledge, and how much of it can a man of even the most extraordinary skill and learning acquire? Suppose we pass over those things which come into the mind through the senses of the body, of which so many are different from what they seem that one who is excessively impressed by their apparent similarity to the truth believes

himself to be sane, when he is insane. (From this the philosophical Academy has prevailed to such an extent, that by doubting everything it has fallen into a much more wretched folly.) If, then, we pass over those things that come from the senses of the body into the mind, how much remains of things we know just as we know that we live? Here, at least, we have no fear of being accidentally deceived by some apparent likeness to the truth, because it is certain that even he who is deceived lives [*quoniam certum est etiam eum qui fallitur uiuere*]. Nor do we know this as we know those objects of sight, which are presented from without, where the eye may be deceived, as it is deceived when it sees the bent oar in the water, and when the navigators see the towers moving, and thousands of other things which are otherwise than they appear, for we do not even see this with the eye of the flesh. It is an inner knowledge by which we know that we live, where not even the Academician can say: 'Perhaps you are sleeping, and you do not know, and you see in dreams.' For who does not know that things seen by those who are asleep are very similar to things seen by those who are awake. But he who is certain about the knowledge of his own life does not say in it: 'I know that I am awake', but 'I know that I live'; whether he, therefore, sleeps, or whether he is awake, he lives. He cannot be deceived in his knowledge of this even by dreams, because to sleep and to see in dreams is characteristic of one who lives. Nor can the Academician argue as follows against this knowledge: 'Perhaps you are insane, and do not know it, because the things seen by the sane are very similar to those seen by the insane.' But he who is insane lives. Nor does he make this retort to the Academicians: 'I know that I am not insane', but 'I know that I live'. He can never, therefore, be deceived nor lie who says that he knows that he lives. Let a thousand kinds of optical illusions be placed before one who says: 'I know that I live'; he will fear none of them, since even he who is deceived, lives [*qui fallitur uiuit*]. (15.12.21)

The same points we noted above as common to both Augustine's and Descartes' arguments reoccur: scepticism based on the unreliability of the senses, on the beliefs of the insane and on dreams is brought in an attempt to prove that we have no knowledge. But, in contrast to our beliefs that rely on the senses, a different, inner knowledge assures us that we know that we live; and the sceptic's insistence on the possibility that we are deceived only helps to further secure the certainty of this knowledge. And again the assertions are made using the first person pronoun, 'I know that I live'.

However, in contrast both to Descartes' conclusion and to his own in *The City of God*, Augustine here concludes from his *cogito* not that he *exists*, but that he *lives*. In general, Augustine finds it valid to conclude, despite the possibility of deception and error, both that he exists and that he lives, and both these conclusions occur time and again in his different versions of the *cogito*. For instance, in his *On the Free Choice of the Will* (*De libero arbitrio*) he infers from the possibility that one is deceived that one exists, lives and understands (2.3.7), as he also did earlier in *On the Trinity* (10.10.13). In the *Soliloquies*, his earliest work that contains a version of these first certainties, Augustine mentions as certain his knowledge that he exists and that he thinks (II 1; there Augustine does not secure this knowledge through the possibility of deception and error). By contrast, in both *De Beata Vita* (37) and *De Immortalitate Animae* (XI 18), the first certainty is that one lives – in the latter work this is again secured through the consideration of deception, for one who is deceived lives.[25]

Augustine does not understand life in this context as synonymous with either existence or with existence as a mind. The distinction between the three is explicitly drawn in *On the Free Choice of the Will*:

> EVODIUS: Existing, living, and understanding are three things. A stone exists and an animal is alive, yet I do not think a stone is alive or an animal understands. However, it is quite certain that one who understands both exists and is alive. ... For anything alive surely exists too, but it does not follow that it also understands. This is the sort of life an animal has, I think. Furthermore, from the fact that something exists it does not follow that it is alive and understands. I can grant that corpses exist, but nobody would say that they are alive! And what is not now alive understands so much the less.
>
> AUGUSTINE: Hence we hold that a corpse lacks two of the three, an animal one, and a human being none. (2.3.7; see also *On the Trinity*, 10.10.13, quoted below)[26]

Augustine clearly holds that it is certain both that he exists and that he lives, and that this certainty is just confirmed by considering the possibility of deception and error; and he indeed establishes the one, the other or both in various places in the face of scepticism. Descartes, by contrast, although he follows Augustine very closely in his argument and dialectic, never mentions life as something that is established by the

sceptical move, but only existence. Why does he diverge from Augustine on this point?

The answer is clear: Augustine and Descartes have different views on the nature of life. For Augustine, it is a special form of existence, possessed and conferred by the soul, the principle of life; for Descartes, it is a mechanical phenomenon, characteristic of material beings, that does not involve the immaterial soul or mind in any way. Accordingly, when both hold themselves ignorant concerning their bodies (Augustine of its nature, Descartes of its existence as well), each can ascribe to himself only the attributes he believes pertain to the thinking thing, the mind. For Augustine, our mind is part of the soul, and therefore it both exists and lives; for Descartes, the biological, corporeal soul has nothing in common with the immaterial mind, and therefore the mind only exists but does not live.

Notice that for Augustine life is not merely a biological phenomenon but a mode of being. In this sense, when the soul leaves the body it continues to live, and not only to exist; the soul *literally* lives after the body's death. In the same sense Augustine understands the bible's talk of the living God (*Jeremiah* 10:10, *Psalms* 84:3, *Matthew* 16:16, *1 Thessalonians* 1:9), who is of course immaterial and has no body. Similarly, Plato had written on the soul as eternally living and as bringing life to the body (*Phaedo* 105d), for it partakes in the form of life. This interpretation of life is foreign to our contemporary understanding of it, which is much closer to Descartes'.

We see how the first certainty, the alleged cornerstone of the Cartesian structure, is determined by considerations on the nature of life, considerations based among other things on reflections upon the possibilities of machines, which in their turn rely on the technological achievements of the age. These considerations bring Descartes to depart from Augustine on this specific point. Descartes claims to extract a theory-independent certainty from his sceptical considerations, while in fact he specifies, on the basis of his developed theory, what should be ascribed to the mind. Instead of establishing non-theoretical foundations, Descartes derives a theoretical conclusion.

I proceed with a comparison of Augustine's and Descartes' arguments that are intended to determine the nature of the mind. Here too we shall see that where Descartes diverges from Augustine, this is done for reasons based on his developed theories, in disagreement with the declared method of the *Meditations*.

Like Descartes, Augustine uses the certainty of his own life and existence to conclude that he is a thinking being. He first relies on the fact

that we understand the commandment 'Know thyself' to establish that we exist and live as an understanding:

> Let not the mind then add another thing to that which it knows itself to be when it hears that it should know itself. For it knows with certainty that these words are said to itself, that is, to itself that is, lives, and understands. But a corpse also is, and a beast also lives, but neither the corpse nor the beast understands. It, therefore, knows itself to be and to live in the way the understanding exists and lives. (*On the Trinity*, 10.10.13)

And this conclusion is then further established by means of a *cogito* argument. Our lack of any knowledge of whether we are any specific sort of body, which is demonstrated by the controversies on these issues, is contrasted with our certainty that we understand, live and exist:

> Consequently, when the mind, for example, regards itself as air, then it thinks that the air understands, but it knows that itself understands, while it does not know that it is air, but only thinks so. Let it, therefore, separate that which it thinks itself to be, and consider only that which it knows. Let this remain to it, which not even they have doubted who regarded the mind as this or that kind of a body. For not every mind regards itself as air, but, as I mentioned above, some regard it as fire, others as a brain, and others as this or that kind of a body. All know, however, that they understand and live; they refer what they understand to the understanding, but refer being and life to themselves. And no one doubts that no one understands who does not live, and that no one lives who does not exist. Therefore, it follows that that which understands also exists and lives, not as a corpse, which does not live, exists, nor as the soul that does not understand lives, but in its own proper and more exalted manner. (ibid.)

Descartes, of course, also uses our lack of knowledge of whether we are any specific body to prove that we are strictly only a thinking being. When inquiring into his nature while doubting whether any bodies exist, he rejects any bodily attribute as belonging to his nature. He mentions and rejects, like Augustine, air and fire, and also wind and breath. Only thought resists this doubt, and therefore he concludes that he is a mind, intelligence, intellect or reason (AT VII 26–27). Unlike Augustine, Descartes can claim not only that he does not know whether

he is this or that body, but also, for reasons considered in the previous section, that he does not know whether bodies exist at all. But the structure of the argument is the same: knowledge that comes from the senses is uncertain; we consequently do not know whether we are any kind of body, while we know that we are a mind.[27]

Both Augustine and Descartes next use this certain knowledge to clarify what a mind is. First, Augustine:

> Who would doubt that he lives, remembers, understands, wills, thinks, knows, and judges? [*Viuere se tamen et meminisse et intellegere et uelle et cogitare et scire et iudicare quis dubitet?*] For even if he doubts, he lives; if he doubts, he remembers why he doubts; if he doubts, he understands that he doubts; if he doubts, he wishes to be certain; if he doubts, he thinks; if he doubts, he knows that he does not know; if he doubts, he judges that he ought not to consent rashly. Whoever then doubts about anything else ought never to doubt about all of these; for if they were not, he would be unable to doubt about anything at all. (ibid., 10.10.14)

Descartes also asks, what is a thinking thing? And he replies:

> A thing that doubts, understands, affirms, denies, is willing, is unwilling, and also imagines and perceives [*Quid est hoc? Nempe dubitans, intelligens, affirmans, negans, volens, nolens, imaginans quoque, & sentiens*]. (AT VII 28, CSM II 19; a similar list is found at the beginning of the Third Meditation, AT VII 34–35)

He next describes, as did Augustine, his thinking in the process of doubt, in order to establish that all these are indeed modes of his thought:

> Is it not one and the same 'I' who is now doubting almost everything, who nonetheless understands some things, who affirms that this one thing is true, denies everything else, desires to know more, is unwilling to be deceived, imagines many things even involuntarily, and is aware of many things which apparently come from the senses? Are not all these things just as true as the fact that I exist, even if I am asleep all the time, and even if he who created me is doing all he can to deceive me? (ibid.)

The overlap between the attributes each philosopher ascribes to the mind is significant, as are the differences. Augustine, but not Descartes,

mentions life, for the reasons discussed above. Descartes mentions doubt, which is not strictly on Augustine's list albeit concluding it [*quis dubitet*], and Augustine of course ascribes doubt to the mind throughout this passage. Similarly, only Augustine lists thought and knowledge [*cogitare et scire*], but Descartes of course sees thought as the fundamental attribute of the mind, and the very project of this Meditation is to secure knowledge to the mind. Both ascribe to the mind understanding; and Augustine's will [*uelle*] corresponds to Descartes' willing and 'unwilling' [*volens, nolens*], while his judgment corresponds to the latter's affirmation and denial.

Augustine's memory, however, is not paralleled by anything on Descartes' list. This is in line with Descartes' earlier decision in the same Meditation to believe that his memory tells him lies 'and that none of the things that it reports ever happened' (AT VII 24, CSM II 16). This mistrust is probably due to Descartes' account of memory: we saw above (p. 80) that he developed a physiological account of memory, comparing the way the animal spirits in their flow shape the brain to the folds that remain in a paper or fabric after it had been folded and straightened back again, and which make it easier to fold it again the way it has been folded in the past. Descartes will also mention the dependence of memory on the brain in his responses to Gassendi (Fifth Replies, AT VII 357). This kind of memory belongs therefore to the body more than to the mind, and consequently Descartes cannot ascribe it to the mind. This is another aspect of the *Meditations* that is due to Descartes' developed theories, this time primarily to his physiological psychology.

In addition to the corporeal memory, Descartes ascribes to man another kind of memory, intellectual memory. This memory, the memory of intellectual things, is independent of the body, has its own 'species', and is not found in animals.[28] In this too Descartes might be following Augustine, who in *On the Trinity* ascribed to man a memory of intelligible things that do not come from the senses, a memory that animals do not have (15.23.43). It seems Descartes does think that the intellectual memory belongs to the mind. But first, his ideas of the intellectual memory seem to have been developed only gradually and rather late (no allusion to it found before 1640), and they were never developed to anything as elaborate as his theory of the corporeal memory.[29] So it is doubtful whether while writing the *Meditations* Descartes had any fixed view about it. Moreover, even if Descartes did have by then any view concerning the intellectual memory, it has not yet been mentioned in the *Meditations*, while the memory that has just been mentioned is the corporeal memory – the one reporting past events – which does not

belong to the mind. And Descartes could not mention the intellectual memory without digressing to a discussion of a subject he found difficult to explain (to Mesland, 2 May 1644, AT IV 414). So even if he held by then a view of the intellectual memory as belonging to the mind, it was problematic for him to ascribe memory to the mind at this place. Augustine, by contrast, ascribes to the mind the memory of the reasons for doubting, apparently a memory of intelligible things that does not depend on the body.

Descartes' list also contains significant *additions* to Augustine's list. Unlike the latter, Descartes maintains that a thinking thing, namely a mind, also imagines and perceives [*sentiens*]. And Descartes feels he has to justify ascribing these sensory aspects to the mind. While he is aware that no one will deny that the mind doubts, understands and wills, he argues as follows for his classification of imagination and sensation:

> But it is also the case that the 'I' who imagines is the same 'I'. For even if, as I have supposed, none of the objects of imagination are real, the power of imagination is something which really exists and is part of my thinking. Lastly, it is also the same 'I' who has sensations [*Idem denique ego sum qui sentio*], or is aware of bodily things as it were through the senses. For example, I am now seeing light, hearing a noise, feeling heat. But I am asleep, so all this is false. Yet I certainly *seem* to see, to hear, and to be warmed. This cannot be false; what is called 'having a sensation' [*sentire*] is strictly just this, and in this restricted sense of the term [*praecise sic sumptum*] it is simply thinking. (AT VII 29, CSM II 19)

This need of justifying the ascription of imagination and sensation to the mind is also felt when Descartes reproduces his list at the beginning of the Third Meditation (AT VII 34–35).

Generally, Descartes understands by sensation the having of ideas that are caused by external bodies, as he wrote a few paragraphs earlier (AT VII 27) and as he will maintain again later in the *Meditations* (AT VII 79–80). But at this stage, still assuming bodies might not exist, he is interested only in the mental aspect of sensation, and in this restricted sense it is for him a form of thinking. Similarly, in the parallel Third Meditation passage he ascribes to himself, namely to his mind, the modes of thinking which he calls sensation and imagination 'in so far as they are merely modes of thinking' [*quatenus cogitandi quidam modi tantùm sunt*] (AT VII 34–35) – this reservation probably made because,

as we saw, sensations and imaginations are for Descartes *mixed* modes, instantiated in both mind and body.[30]

The powers of imagination and sensation that Descartes ascribes here to the mind are the ability to have ideas of sense: ideas of light, sound, heat and so on. And he can ascribe these powers to the mind because he thinks that these ideas of sensory qualities are instantiated in the mind. In this view he is opposed to all earlier thought on sensation, Augustine's included. As argued above, Descartes was the first to maintain that the sensory qualities are instantiated in the mind and not in the perceived bodies or the sense organs. Augustine, by contrast, held that they are instantiated in the sense organs. This is how he describes vision in *On the Trinity*:

> Let us recall how these three, though differing in nature, may be fitted together into a kind of unity, namely, (i) the form of the body that is seen, (ii) its image impressed on the sense, which is vision, or the sense informed, and (iii) the will of the soul which directs the sense to the sensible thing and keeps the vision itself fixed upon it. The first of these, that is, the visible thing itself, does not belong to the nature of a living being, except when we see our own body. But the second belongs to it in such a way that it arises in the body and through the body in the soul, for it arises in the sense, which is neither without the body nor without the soul. (11.2.5)

The sensory quality is instantiated in the sense organ, and the soul is aware of it. Similarly, in *The Magnitude of the Soul* (*De Quantitate Animae*) Augustine writes that 'sensation is a passion of the body which as such is not unknown to the soul' (26.49). For this reason Augustine cannot maintain that sensation is a power of the mind: it depends for its existence on a sense organ. Moreover, for Augustine sensation is a power of the soul, which is not identical with the mind: animals too have a soul and with it sensation, but they have no mind. For Descartes, however, the powers to imagine and sense do not depend, in their restricted sense, on a bodily organ; in addition, they are powers of the immaterial mind, and not of any soul that animals share with us. He can therefore conclude, in contrast to Augustine, that sensation and imagination are powers of the mind.

We again witness how a central aspect of Descartes' *Meditations* – this time the characterisation of the nature of the mind – is grounded in his complex theories of perception, and is not at all a conclusion of reflections that are free of any theoretical assumptions. Descartes'

reconceptualisation of the nature of the mind, which was to be so influential on future philosophy, was not developed by the method he declared to be following.

7.3 The essence of the wax, and of bodies generally

The Second Meditation, it seems, could have ended with the enumeration of the mind's capacities that concludes its first part (AT VII 29). However, at this stage Descartes claims that his mind 'enjoys wandering off and will not yet submit to being restrained within the bounds of truth': it still seems to him that corporeal things are known more distinctly than his 'puzzling "I" that cannot be pictured in the imagination'. In order to eventually tighten the mind's reins, we let it go free this time and embark on the Second Meditation's second part: we examine a particular body we touch and see, a piece of wax.[31] We first conclude that it is something extended, flexible and changeable. Since all these characterisations contain a potential infinity, we 'must admit that what this wax is is in no way revealed by [the] imagination, but it is perceived by the mind alone.' Our perception of the wax[32] is thus due not to sight, touch or imagination, but it is a mental inspection or judgment. Similarly, when we see men, we *judge* that they are men, although the ordinary way of talking might mislead us into thinking that we *see* that they are men. And our perception of the wax is more perfect now, when we distinctly perceive its nature by our mind. Accordingly, if the knowledge of the wax and its nature are due to the intellect and not to the senses, then surely our perception of our own mind is easier and more evident, for the senses might mislead us about what we see, touch or imagine, but they cannot mislead us about our own existence; furthermore, every consideration about bodies establishes more effectively the nature of the mind. And so we conclude with what we wished to establish, that we can achieve easier and more evident perception of our mind than of anything else.

This part of the Second Meditation – the wax discussion – has baffled scholars, mainly because its declared conclusion, reached in its penultimate paragraph, seems not to follow from the preceding discussion of the nature of the wax and of our understanding of it, and that in a glaring way.[33] The declared aim of the discussion was to show that the nature of the mind or 'I' is known with more distinctness than that of corporeal things (AT VII 29). However, most of the discussion does not say anything about this claim, which is first addressed only in its penultimate paragraph. And even then, Descartes first claims not

that he knows his *nature* better than that of corporeal things, but that he certainly *exists* if he judges that the wax does. (This also is done by repeating the *cogito* argument, that the mind has to exist in order to judge, and not by adducing any new argument.) Only in the last third of the paragraph does Descartes turn to the claim about his better knowledge of his own nature, and then he merely asserts: 'every consideration whatsoever which contributes to my perception of the wax, or of any other body, cannot but establish even more effectively the nature of my own mind'. We are given no argument for this unintuitive conclusion, and no example of considerations about the wax that contribute to the knowledge of the nature of our mind; nor have we been provided with any such example earlier in the discussion. Descartes then concludes that spontaneously or without noticing it (*sponte*; *insensiblement* in the French translation) he has gotten back to where he wanted to be; and the unconvinced reader is left wishing that more notice had been given to the way of getting there.

The perfunctory treatment of the final part of the discussion, which was declared to be its reason and purpose, as well as the atypically weak argument, are puzzling. To clarify the nature of this discussion, we should look more closely at what was in fact achieved along the way.

Descartes begins by noting how the particular piece of wax changes all its specific sensory qualities (taste, scent, colour and so on) as well as its specific spatial properties (shape and size) while remaining the same piece of wax. Since people think they understand the piece of wax most distinctly, Descartes now asks, what was it in the wax that he understood with such distinctness? – presumably meaning by that, what is it in the wax that is distinctly understood and is true of it throughout its changes, being responsible for the wax remaining the same specific body? Since all specific sensory qualities and spatial properties change, it is none of them. He next thinks the following: the piece of wax is a body that takes different forms; removing all that does not belong to the wax, we are left with a thing which is extended, flexible and changeable. And since extension, flexibility and changeability allow for innumerably many specific forms, while our imagination cannot encompass innumerably many forms, it follows that what the wax is is not revealed by the faculty of imagination but perceived by the mind alone. This perception is a mental inspection or scrutiny (*mentis inspectio*), which, due to the attention now given to it, has become clear and distinct.

As was noted by Gueroult (1984, Chapter 4; originally published 1953) and, following him, Williams (1978, p. 222), Descartes does not claim to have *inferred* what the wax is, but rather to have *discovered* its

concept in his mind. Descartes' reflections in the Second Meditation that lead him to his concept of body as a purely extended thing could not justify eliminating only the sensory qualities from it, for he noted that the piece of wax changes both its sensory qualities *and* its spatial properties over time. Rather, his reflections help him concentrate on his *innate* concept and clarify it, somewhat in the manner of Platonic recollection (see also *Principles* II 3–4). Descartes is explicit about this procedure in his Sixth Replies:

> I attended to the ideas or notions of each particular thing which I found within myself, and I carefully distinguished them one from the other so that all my judgements should match them. I observed as a result that nothing whatever belongs to the concept of body except the fact that it is something which has length, breadth and depth and is capable of various shapes and motions. (AT VII 440, CSM II 296–297)

Accordingly, the wax discussion obviously involves much Cartesian metaphysics. Descartes relies here on his metaphysics of innate ideas, which is a highly contentious theoretical position. Moreover, he relies on his own conviction of what his innate idea of body must be: an idea of an *extended* thing, but not of a thing that has any *sensory qualities*. The passage of the Replies continues:

> But colours, smells, tastes and so on, are, I observed, merely certain sensations which exist in my thought, and are as different from bodies as pain is different from the shape and motion of the weapon which produces it. (ibid.)

Earlier we examined the way Descartes' conception of body was developed and the complex influences that brought him to hold it. We again witness how the *Meditations* is replete with assumptions derived from Descartes' developed system, and how Descartes' declared method is not applied in it.

Descartes emphasises in the wax discussion the *distinctness* with which he understands the nature of the wax. While 'distinct' in its various forms is used only three times earlier in the Second Meditation (one of which also while mentioning that we think we know the nature of body distinctly (AT VII 26)), it is used twelve times in the wax discussion, usually to emphasise that we have a distinct understanding of what the wax or body generally is, and a few times to say

that our knowledge of our own nature must be even more distinct than that. Descartes seems to be hammering home the idea that we have a distinct concept of the nature of body as something which is merely extended. This concept belongs of course to the foundations of his physics, and we are again reminded of his letter to Mersenne, in which he confides that the *Meditations* contains these foundations and that he hopes readers will get imperceptibly accustomed to them and recognise their truth. As he is convinced his concept of body is a priori and distinct, he obviously believes that readers free from prejudice will recognise it as the true concept of body due to this exposure and adopt it as such.

If we assume that the actual purpose of the wax discussion is to acquaint readers with Descartes' concept of body and consequently adopt it, it is easier to understand some characteristics of the discussion. Descartes would not declare that this is a main purpose of the discussion, as this would make his readers alert to the question of whether this concept of body agrees with the accepted Aristotelian one; while *he* wishes them to get imperceptibly accustomed to his principles, 'before they notice that they destroy the principles of Aristotle' (to Mersenne, 28 Jan 1641, AT III 298, CSMK 173). For that reason also the declared purpose of the discussion is different, namely, to establish that the nature of the mind is better known or perceived than that of the body. Moreover, this implicit purpose would also explain the rather strained justification of the whole discussion, namely, that since Descartes' mind enjoys wandering off and refuses to be restrained within the bounds of truth, he gives it free rein in order to make it submit more readily later. We have no reason to assume that this freedom would indeed make future submissiveness easier; often it is the other way round. Descartes did not conclude the Second Meditation after its first part not because of a lack of discipline of his mind but because he wanted to introduce his concept of body.

The introduction of the Cartesian concept of body as the implicit purpose of the wax discussion also explains why the observations in the course of this discussion about mental inspection and about judgement are not made use of later in the *Meditations*. Descartes *does* argue powerfully for these claims; for instance, he *does* give a convincing example for the claim that different things (men and automata) can look the same, and that therefore taking what we see in a specific way is an additional, mental aspect of perception. But he does not make any later use of this observation. In addition, none of these observations supports the claim that the mind is known or understood more distinctly than the body, a

claim which was the declared purpose of the discussion. And, as interpreters have claimed, neither can the later condensed rehearsal of the *cogito* argument be taken as providing such support. This atypical sloppiness of Descartes' is easier to understand if we assume that the declared purpose of the discussion is not its actual purpose, and that Descartes made here a strained attempt to justify the claim that the mind is better known than the body while in fact being mainly interested in powerfully introducing his concept of body.[34]

The clarification of the essence of bodies *is* important to Descartes' declared purposes in the *Meditations*, and the Cartesian concept of body is indeed made use of later in the text for these purposes. Descartes announces at the beginning of the *Meditations* text, as well as on the corrected 1642 title page of the work, that in the book he demonstrates the distinction between the human soul and the body. In order to do that, he notes in the Synopsis, 'we need to have a distinct concept of corporeal nature' (AT VII 13, CSM II 9). And indeed, when he comes in the Sixth Meditation to prove that he, namely his soul, is distinct from his body, he relies on his distinct idea of himself as simply a thinking, non-extended thing, as well as on his distinct idea of body as simply an extended, non-thinking thing (AT VII 78). Accordingly, some discussion of the nature of body should have been included in the work, and its presence is therefore in itself no digression from Descartes' explicit purposes in the *Meditations*.

However, for the proof of the distinction between soul and body it would have been enough to note that a body is an extended, non-thinking thing; it does not matter whether it has or does not have any additional properties. But along the way we learn much more about corporeal nature, and usually as a by-product or partial digression of a discussion focused on other issues.

As we saw, in the wax discussion, while Descartes is formally attempting to show that the mind is better known than the body, we learn that we have an innate idea of body as an extended, flexible and changeable thing. We also saw earlier, while considering Descartes' dream argument, how he grafts onto the discussion the foundations on which he will later build his physics, namely, a physical world that is characterised by extension, shape, quantity and so on, as something more certain and evident than anything perceived by the senses. A similar move occurs in the Third Meditation, while Descartes is inquiring whether the objective reality of any of his ideas – namely, the reality they have in virtue of what they represent (AT VII 40) – is greater than his formal or eminent reality (ibid., 42*ff*). As he should, he considers there, among

other ideas of his, ideas of corporeal things. When discussing extension, shape, position and movement – the specific elements of the idea of body which, he claims, are clearly and distinctly perceived – he notes that they are not formally contained in him, since he is nothing but a thinking thing. Yet since they are merely modes of a substance, and he is a substance, it seems possible that they are contained in him eminently (AT VII 45, CSM II 31).[35] This argument could have been applied to the ideas of sensory qualities as well: whether or not what they represent as existing in bodies resembles them, and even in case nothing corresponds to them in bodies, they apparently represent modes of the corporeal substance, and so they should be contained in Descartes eminently. But instead of applying this argument to sensory ideas, Descartes claims that these are very confused and obscure, to the extent that he does not even know whether they represent non-things as things. He gives as an example the ideas of heat and cold: these 'contain so little clarity and distinctness that they do not enable [him] to tell whether cold is merely the privation of heat, or vice versa, or whether both of them are real qualities, or neither is' (AT VII 43–44, CSM II 30).[36] We have thus learned in the course of a discussion leading to a proof of God's existence how confused and obscure our ideas of sensory qualities are; we also saw there how unreliable are our ideas of heat and cold, qualities which according to Aristotle are two primary qualities of bodies, and which the Scholastics considered as the basic causal agents in the sublunary world (Pasnau 2011, §§ 1–2).

Descartes next claims that if sensory ideas represent non-things then they arise from nothing and are in him only because of some deficiency in his nature. On the other hand, if they do represent things, then since the reality they represent is so extremely slight that it cannot even be distinguished from non-things, he sees no reason why they could not get their being from him. But the second half of this argument is unacceptable given Descartes' views of sensory qualities. The idea of light, for instance (which is mentioned in this passage), represents, according to Descartes, a kind of pressure of the second element; the idea of sound (also mentioned in the text) represents vibrations in the air; and so on. These modes of bodies are exactly what is also represented by the clear and distinct ideas of bodies, namely those of extension, shape, position and movement. The objective or representational reality of the ideas of light, sound, and other sensory qualities is therefore identical to that of the clear and distinct ideas of bodies. And since Descartes does not think that the latter represent 'extremely slight' reality, he is not entitled to

hold that the former do. It seems that Descartes *should* have applied to the sensory ideas the same argument he applied to the geometrical ones. Yet he was interested in introducing this discussion of the nature of corporeal ideas, again as part of a discussion focused on different issues, and this adversely affected the validity of his whole argument – as it did in the case of the wax discussion, and as it did in the case of the dream argument.

Analysing Descartes' further treatment of the concept of body in the *Meditations* is not one of the aims of this work.[37] I shall therefore describe it only in outline, to indicate how Descartes' earlier discussions are made use of later in his book. Descartes returns to a discussion of bodies in the Fifth Meditation, whose title is, 'The essence of material things, and the existence of God considered a second time'. But despite the title, material things or bodies (*corpora*) are not discussed under these terms in this Meditation, nor is it specified what their essence is. We do read, however, that the ideas of extension, size, shape and so on are innate and distinct (AT VII 63–64); and that the essence, nature or form of the triangle and of other shapes is immutable and eternal and does not depend on our mind (ibid., 64–65). These ideas are the only ones mentioned as distinct in this Meditation, apart from the idea of God. Moreover, mathematical proofs are mentioned several times along this Meditation as paradigms of indubitable knowledge, and the Meditation concludes with Descartes' assertion that he can now fully and with certainty know innumerable things about all of 'that corporeal nature which is the subject-matter of pure mathematics' (ibid., 71, CSM II 49).

The earlier considerations on the nature of bodies are brought together in the Sixth Meditation. We are reminded that 'colours, sounds, tastes, pain and so on' are less distinctly imagined than 'that corporeal nature which is the subject-matter of pure mathematics' (AT VII 74, CSM II 51), of which we are again said to have clear and distinct perception in the first paragraph of this Meditation. This distinction is relied on when we proceed to the proof of the existence of bodies. As God is not a deceiver, and as he has given us a great propensity to believe that our ideas of corporeal things indeed come from corporeal things, while he gave us no faculty to recognise that they have any different source, corporeal things are indeed the source of these ideas. But we can ascribe to bodies with certainty only the properties we clearly and distinctly understand, namely those that are contained in the subject-matter of pure mathematics (AT VII 79–80). By contrast, there need not be in bodies anything

resembling our less distinct ideas of colours, sounds, smells, tastes, and so on, but there are in bodies differences *corresponding* to them (ibid., 81; see also ibid., 83). By means of this weak argument for the different relations between the two kinds of ideas and the properties they represent, we end not only with the existence of material things, as the title of the Sixth Meditation promised, but also with their having a Cartesian and not an Aristotelian nature.

Epilogue

The conclusions of this work have been drawn along the way; these final pages will serve to give an overview of the results rather than to infer or justify them.

In the first part of the book we saw how Descartes developed, as a result of his work in mathematics, a new conception of representation, one which allows an adequate representation to be isomorphic to what it represents without resembling it. This new conception proved essential to science, and Descartes himself made significant use of it in his physiological work as well as in his theory of perception.

The ideal of the mathematicization of the physical sciences, which Descartes inherited from Galileo, Beeckman and other scientists of the age, brought him to adopt Galileo's geometrical view of material nature. Together with his dualism, the conclusion was that the sensory qualities of which we are directly aware are instantiated not in the perceived bodies or in our sense organs but in our minds. This new view became a cornerstone of practically all subsequent theories of perception, whether philosophical or scientific. Descartes' new theory of perception, which incorporates this view of the qualities and his conception of representation, became the orthodoxy of future science.

The second part of the book showed how recent technological developments, primarily clockwork automata, brought Descartes to conclude that life does not involve any principle that does not operate in inanimate nature as well. This made him modify our concepts of soul and mind, identifying them in man and detaching the mind from any relation to life. His comparison of living organisms to automata convinced later generations of philosophers and physiologists that life should indeed be explained without recourse to any immaterial principle; a conviction that waned temporarily during the eighteenth century, due

to the inability of mechanistic explanations to account for a variety of phenomena specific to life, only to re-emerge and establish itself conclusively in the following century.

On the other hand, the limitations of the technology of his day convinced Descartes, and helped him convince future generations, that the mind must be immaterial. Three centuries later a new technological breakthrough, namely the development of the digital computer, engendered an analogous change in worldview, bringing with it the rise of materialism while repudiating Descartes' arguments for dualism.

Descartes' dualism, together with his view of perception, life and mind, created a distinction between functional and conscious perception. He himself ascribed only the former to animals, which were natural automata on his view. The distinction was accepted by future generations, including the medical establishment, even with some deplorable consequences in medical practice. With the mentioned advances of technology in the twentieth century and the consequent spread of materialism and elimination of man's immaterial mind, the possibility of human-like creatures having only functional, non-conscious sensation has also emerged, and since then zombies have been haunting the philosophical scene.

All these epoch-making innovations resulted from attempts to integrate, generalise and reinterpret a variety of developments in the science, mathematics and technology of the age and existing conceptual frameworks. They owe nothing to the method of radical doubt and consequent theory-free determination of indubitable knowledge, the declared method of the *Meditations*. In the last part of this book I tried to show that this method, which in recent decades has been powerfully criticised as a way of acquiring substantial knowledge, is in fact not put to work even in the *Meditations*.

In order to do that I had also to note that Descartes is trying to introduce into the *Meditations* the foundations of his physics, without this being an explicitly central topic of the work. I also emphasised how deeply committed Descartes is in this work to earlier philosophers, in particular Augustine. With these observations in place, I showed how Descartes' developed system is presupposed from the first pages of the work. Where he is original and influential, as he is in developing scepticism with regard to the existence of the material world and in his version of the Augustinian *cogito*, his innovations are conclusions from his developed theory (of perception, life, and so on) and not consequences of the application of the declared method of the *Meditations*.

I hope that the conclusions of this work offer a largely new perspective on Descartes' philosophy. This perspective is not meant to replace existing approaches; in particular, it is not meant to replace the analytic approach to his arguments and texts. In fact, it presupposes this approach, as could be seen in the course of the work, especially in the discussion of the *Meditations*, where conclusions of the analytic approach were used as a basis for further discussion.

Nor do I mean to present the Cartesian innovations emphasised in this work as his most important ones. Other seminal Cartesian ideas, of which some were not even mentioned above, can easily be listed. His discovery of the law of refraction, his analysis of the rainbow and his contribution to the manufacturing of lenses are among the most important achievements in the history of optics. His contributions to the development of the laws of motion and impact play a similar role in the history of kinematics and dynamics. A more philosophical contribution to physics was his analysis of the relative nature of motion. And other achievements can also be added to this list. The influential innovations on which I have focused are *philosophical* ones. Yet if the arguments of this work have been successful, then it offers an improved view of the origin and nature of some Cartesian ideas that generated a philosophical revolution.

Notes

1 Introduction

1. *Dialogues faits à l'imitation des anciens*, published under the pseudonym Oratius Tubero.
2. The history of scepticism in the Early Modern period has been amply documented. For a classical exposition, see Popkin (2003; first edition 1960). Popkin also describes how Descartes failed to convince his contemporaries in his answer to scepticism (ibid., Chapter 10). For a more recent survey of the history of Early Modern scepticism, see Larmore (1998). Floridi (2010) contains a concise survey of the rediscovery and reception of Sextus in the Renaissance, and the book also contains an up-to-date bibliography of literature on the subject (§ 4.6).
3. For Cicero see (*Academica* II (Lucullus) XXVII.88–XXVIII.90); for Sextus, (*Outlines of Pyrrhonism*, Book I, § 104; *Adversus Mathematicos* 7.402–8); for Augustine (*Contra Academicos*, 3.11.25); for Montaigne, (*Apology for Raymond Sebond*, Book II, Essay 12; Vol. II, pp. 44–45 in Montaigne (1946))
4. Not only Hobbes but many of Descartes' contemporaries were quick to note the variety of influences on his ideas, or at least the significant convergences in positions (I shall mention several other such observations in the course of the book). Descartes rarely credits his predecessors or contemporaries, and this lack of credit brought about accusations of plagiarism, vehemently put forward by Pierre-Daniel Huet in his *Censura Philosophiae Cartesianae* (1689) and repeated by others since. While doing historical justice is not a purpose of this work, I shall nevertheless often try to trace the influences on Descartes, in order to determine where in fact his indisputable originality does lie and how he arrived at his philosophical innovations.
5. A deceiving God has already been mentioned by Cicero (*Academica* II (Lucullus) XV 47) and Augustine (*On the Trinity* 12.15.24), and I shall later discuss their possible influence on Descartes in this respect. The possibility of a deceiving omnipotent God was also discussed in the middle ages, by Ockham, Nicholas of Autrecourt and others. For a concise survey, see Groarke (1984, § 5). For more on these authors and their scepticism, see Kretzmann et al. (1988).
6. See Jean de Silhon, *The Immorality of the Soul* (*L'immortalité de l'âme*, 1634), selections translated on pp. 199–200 of Ariew et al. (1998). See also Tommaso Campanella, *Universalis philosophiae, seu metaphysicarum rerum, iuxta propria dogmata* (Paris 1638), p. 32, where Campanella uses the *cogito* to refute scepticism and ascribes it to Augustine, whom he quotes.
7. See also Bernard Williams (1996), who writes that 'the rewriting of Descartes' story in that way has constituted a good deal of modern philosophy' (p. viii).
8. Epicurus might appear to be an exception: in his letter to Herodotus (38*ff*) he tries to derive the foundations of his atomic theory deductively from a very

small number of evident propositions, some of which we would classify as conceptual while the others are derived from observation. For instance, that nothing comes into being out of what is non-existent (a conceptual principle) or that bodies plainly are in something and move through something (as attested by the senses – from this observation Epicurus infers the existence of space). But Epicurus does not present this part of his theory-construction as resulting from a general foundationalist methodology. Moreover, later in his letter – when he starts discussing perception, for instance (46*ff*) – his method changes, and he can be seen as attempting to argue for hypotheses that are supported by experience although not derived from it. Yet this change of method is not presented as such but rather appears to be methodically continuous, from Epicurus's point of view, with the method he follows in the earlier parts. It would therefore probably be more accurate to see the first part of his letter not as a result of a foundationalist methodology but as originating in an attempt to argue as powerfully as possible for his position, relying wherever possible on deduction and a minimal number of observations.

9. In Descartes' discussions of method we find a variety of methodological distinctions, some of which are relevant to the *Meditations*. In the Second Replies he distinguishes the analytic from the synthetic method or style (he does not use 'method' at that place), describes the inquiry in the *Meditations* as analytic, and explains why this way of inquiry is preferable in metaphysics to the synthetic one (AT VII 155*ff*). However, the analytic inquiry of the *Meditations* is of a specific kind: it starts by casting all preconceived opinions in doubt, arrives at secure foundations, and then builds our knowledge on these. Descartes describes this way of inquiry as the method of the *Meditations* at several places; see for instance Fifth Replies, AT VII 361–362 and Seventh Objections and Replies, AT VII 514, where he also calls it his *method*. In a letter to Clerselier (AT IXA 203) he calls this method 'the method [*méthode*] of doubting everything'.
10. The way Descartes' method was abandoned is perhaps demonstrated by the contrast between Wittgenstein's earlier *Tractatus* and his later *Philosophical Investigations*. See also Ryle's contrast between Husserl's Phenomenology and his own *The Concept of Mind* (Ryle 1962).
11. Similar claims have been made in the literature on various specific points in the first two Meditations, for instance by Michael Williams (1986) and Gary Hatfield (2003); I compare my claims to theirs in the last chapter. But I differ from them not only in point of detail but also in seeing the whole methodology of the *Meditations* as misguided and in exposing Descartes' implicit theoretical assumptions in order to demonstrate its necessary failure.
12. In the Scholia, added in 1662 to his *An Antidote against Atheism* of 1652, where he is referring to Section 6 of the book. See page 145 in *A Collection of Several Philosophical Writings of Dr. Henry More*, 2nd edition, London 1712. Quotation and reference taken from Rogers (1985, p. 292).
13. However, unlike some recent Descartes scholarship, my purpose is not to emphasise Descartes' interest in developing a new science: although science *was* more important to Descartes than metaphysics (see section 6.2), I am interested in Descartes' *philosophical* contributions. I shall discuss Descartes' scientific work only to the extent that it contributes to the understanding of his philosophical considerations.

2 Descartes' Theory of Perception

1. This blind man, or at least his stick, managed to travel a long distance over the centuries, demonstrating various features of theories of vision along its way. It started feeling its way around in Athens, third century BC, in Chrysippus' *Physics*, and reappeared a century later in Apollodorus' work (Diogenes Laertius 7.157). We find it again in Rome, in the second century AD, in Galen's *On the Doctrines of Hippocrates and Plato* (VII 7, 20). It then moved, in the fifth century, to Latin philosophy, and is mentioned by Augustine of Hippo, in North Africa (*De quantitate animae* 23, 43). Later, in the ninth century, it makes its appearance in Islamic science, this time in Arabic, in Hunain ibn Is–Hâq's *The Book of the Ten Treatises on the Eye* (University of Michigan 1928, p. 37). Somehow or other it found its way to Descartes' seventeenth-century France, where its master is explicitly mentioned as well, and they are even granted an illustration.

   As in many other, more significant things, here too Descartes is deeply indebted to earlier discussions yet adds to them a new twist, while drawing the analogy in a more appealing and persuasive manner.
2. Descartes occasionally distinguished mind from soul, but on other occasions, as in the mentioned *Principles* section, he used these terms interchangeably. I follow him here in the latter, interchangeable use. The sources and meaning of the distinction and of the identification will be discussed later in the book, once the distinction becomes relevant.

   For a careful study of Descartes' use of these and related terms in the *Meditations* and related texts, see Fowler (1999, Chapter 5).
3. Hardly any claim found in Descartes scholarship has not been contested, and that is true even of the claim that there is a causal relation between the bodies we perceive and their ideas in our mind. The distinction between mind and body as two different substances convinced some scholars, as well as many philosophers, that a causal relation between them should be impossible, and some of the former have consequently tried to read Descartes as if he is not committed to such a position. See Keeling (1968, p. 153) and Yolton (1984). Wilson (1991, p. 60) argues against alternative interpretations of the texts.
4. The clause in diamond brackets was added to the French translation of 1647, most probably by Descartes himself. See CSM I 178. I use the same bracket convention as Cottingham et al. when inserting into the translation of the Latin text of the *Meditations* material found in its French translation. See CSM II 1–2.
5. For a similar understanding of Descartes' considered view of objective sensory qualities, see for instance Kenny (1968, pp. 217–219), Jolley (1990, pp. 82–83) and Dicker (1993, pp. 205–209).

   Although I defend the view that Descartes ascribes colour, light and other sensory qualities in an objective sense to physical reality, what is essential to my central claims in the text is not whether he thinks it is correct to *call* these dispositional properties 'colour', 'light' and so on, but whether our ideas of sensory qualities represent properties in bodies. I address below objections to this last claim.

6. Descartes thus clearly distinguishes between the fact that we *see* the colours of bodies, and the fact that we *consider*, or are aware of, the ideas in the mind that represent them, ideas which we should not be said to *see* (similarly for other sensory qualities). Wolf-Devine's claim, that Descartes does not distinguish *seeing* colours by means of representations from having some kind of 'immediate perception' is therefore mistaken (1993, p. 97, endnote 8 to page 3). She takes this alleged lack of distinction to commit Descartes, in case he holds a representational theory of perception, to a vicious regress, for he explains seeing or perceiving (of colours) by means of seeing or perceiving (of their representations) (p. 3). But the distinction exists in Descartes, who is therefore not involved in any vicious regress.
7. The relevant Latin text of the *Meditations* reads:

   Nec sane absque ratione, ob ideas istarum omnium qualitatum quae cogitationi meae se offerebant, & *quas solas proprie & immediate sentiebam* …

   The literal translation of the italicised text is, 'which alone I properly and immediately sensed'; the reference is to the ideas of qualities. The reading which makes these ideas the immediate data of consciousness seems manifest.

   Wilson however has maintained that this is not the *only* possible reading of this passage (1994, pp. 215–216). In light of Descartes' analysis of levels of perception in the Sixth Replies (see below), she thought that possibly Descartes refers here to what belongs to the senses in contrast to what involves 'intellectual or computational processes'. 'Properly' would then echo the Aristotelian proper sensibles, namely the sensory qualities, which were indeed mentioned earlier.

   Still, Descartes writes here that it is the *ideas* of the sensory qualities which we (properly and) immediately sense, and not what they are ideas of. So even if there is some relation here to the analysis in the Sixth Replies, this relation would not render anything but the ideas the immediate data of our awareness.

   Moreover, it is more likely that 'properly' repeats the claim of the Second Mediation (AT VII 29), that what is properly called seeing, hearing and so on is seeming to see, hear and so on (*'At certe videre videor, audire, calescere. Hoc falsum esse non potest; hoc est* proprie *quod in me sentire appellatur* …'). That is, properly speaking, sensing is being aware of ideas of sense. Descartes returns in this part of the Sixth Mediation to the scepticism regarding the senses he discussed in those earlier passages, and it is only natural that he will repeat that claim as well. By contrast, it would be strange if Aristotelian terminology, which Descartes generally and consciously tries to avoid, found its way into this passage, without any use made of it in what follows.
8. Some interpreters have tried to deny that Descartes held a representational theory of perception, according to which we are immediately aware of ideas and not of the things we perceive (Arbini 1983). Yet the texts quoted and mentioned above are unambiguous. Moreover, as Wilson has strongly argued (1994), the fact that in the *Meditations* Descartes considers the possibility that when we seem to perceive nothing might correspond to our sensory ideas, although it is indubitable that we are aware of these ideas, shows that it is impossible that we are directly aware of the things we see, hear and so on.

9. *Man*, AT XI 176; *Optics*, AT VI 112–113, 131–132; *Principles* I 68; *Passions* I 13, 35; as well as in several other places.
10. See De Rosa (2007), especially § 1, for more references.
11. *Meteorology*, Discourse Eight, AT VI 333–335; *Description*, AT XI 255–256. I am aware of only one text that seems to support the view that the ideas of colour, heat, and so on do not represent anything objective, *Principles* I 71; I discuss this text in note 18 below.

    Nolan (2011, § 2) has also denied that Descartes ascribes colour or other sensory qualities in an objective sense to bodies. His interpretation hinges on Descartes' frequent use of phrases like 'which we call "colour"' when discussing the relation of our sensation to reality. Nolan takes such phrases to imply a nominalist thesis, according to which names of sensory qualities stand for *nothing* in bodies. We *call* things 'colours' or 'coloured', but there's nothing there that deserves the name.

    But Nolan's conclusions are unjustified by Descartes' use of 'which we call' phrases. First, it might be acceptable to call something the way we do, so the use of 'which we call' phrases does not in itself support a nominalist thesis. And Descartes indeed uses this phrase with other terms that he clearly thinks are acceptable. Consider, for instance, his following uses (emphases added, here and below): 'When we see two stones, for example, and direct our attention not to their nature but merely to the fact that there are two of them, we form the idea of the number *which we call* "two"' (*Principles* 1.59, CSM I 212); 'when we see a figure made up of three lines, we form an idea of it *which we call* the idea of a triangle' (ibid.); 'And it is this extended thing *that we call* "body" or "matter"' (ibid. 2.1, 223); '*what we call* the human body' (ibid. 2.2, 224); the angle '*we call* the angle of incidence' (*Optics*, AT VI 96, CSM I 158). Descartes has no reservations regarding our use of 'two', 'triangle', 'body', 'human body' or 'angle of incidence', despite his use of 'which we call' phrases, so the presence of these in his discussions of sensory qualities is no evidence for nominalism.

    Secondly, when Descartes thinks that calling something by a term is mistaken, he says so: 'in the case of created things, that which always remains unmodified – for example existence or duration in a thing which exists and endures – *should be called not a quality or a mode but an attribute*' (*Principles* 1.56, CSM I 211; cf. ibid. 1.50). By contrast, he never similarly rejects the use of the terms of sensory qualities in an objective sense, despite having plenty of contexts in which this would have been appropriate had he held such a nominalist position.

    Thirdly, in several passages in which a 'which we call' phrase is used, it is later dropped and replaced by an objectivist phrasing. For instance, in the *Optics* (AT VI 91–92; a passage Nolan mentions (p. 88)), after writing of the bodies *we call* black and white, Descartes continues to write about bodies *which are* red, yellow or blue, and continues to claim that he believes he 'can determine the nature of each of these colours [*la nature de chacune de ces couleurs*]' (CSM I 156): a phrasing strongly supporting an objective sense of colour words. Similarly, earlier in the *Optics* (AT VI 85), Descartes writes in the same sentence, 'you may perhaps even be prepared to believe that in the bodies we call 'coloured' the colours are nothing other than [*ces couleurs ne sont autre chose, dans les corps qu'on nomme colorés*] the various ways in

which the bodies receive light and reflect it against our eyes' (AT VI 85, CSM I 153): Descartes does not reject the use of the term, first preceded by a 'we call' phrase, but explains what it amounts to. And although the *Treatise on Light* opens by mentioning what 'we call by the name "light"', much of it is devoted to a discussion of light in an objective sense.

Lastly, Descartes very often uses terms of sensory qualities in an obviously objective sense. He ascribes colour and luminosity to terrestrial bodies (*Discourse* AT VI 42), says that fire produces colour in bodies (ibid., 44), and much more. He also writes in *Man* that by 'figures' he means 'not only things which somehow represent the position of the edges and surfaces of objects, but also anything which ... can give the soul occasion to perceive movement, size, distance, colours, sounds, smells and other such qualities' (AT XI 176, CSM I 106): figures or ideas represent both geometrical and sensory qualities, all of which the soul perceives. And in the *Optics* the analysis of afterimages and of what they represent is used to support Descartes' claim that the nature of colours lies in diverse movements (AT VI 131–132, CSM I 168).

Descartes' use of 'which we call' phrases is often (but not always) intended to warn us that there is something in the nature of what we call by the term which is not as we might have taken it to be – this is often a warning against the assumption that sensory qualities resemble our ideas of them. But this phrasing cannot be taken as supporting an eliminative position.

12. For instance, Wolf-Devine (2000, p. 509), Lockhorst (2006, § 2.2), Cottingham (2007, pp. 19, 113), Kenny (2010, p. 663).
13. Despite the detailed explanations found in Descartes' works of why a representation need not resemble what it represents, and despite the detailed examples of such representation without resemblance found in them, Hatfield has recently argued that 'Descartes' considered view' is that 'ideas represent by resemblance or similitude' (2013, p. 133). Hatfield motivates his interpretation by a single clause found in the *Meditations*, in which Descartes says that when he wills, is afraid, affirms or denies, there is always a particular thing which is the object of his thought, yet his thought 'includes something more than the likeness of that thing' (AT VII 37, CSM II 26). The representation of a thing, concludes Hatfield, is always by a likeness of it.

    Even if this were the only acceptable interpretation of this clause, to see it as Descartes' considered view, despite all the detailed discussions of representation without resemblance mentioned above (most of them not mentioned by Hatfield) is surely unjustified. However, Descartes has just written in the very same paragraph that some ideas are 'as it were [*tanquam*] the images of things'. So even here, when he first discusses representation in the *Meditations*, ideas are only 'as it were' images, and we should understand 'likeness' along the same lines. Later in the book we arrive at a more elaborate conception of representation, replacing the initial naïve one, and there representation is explicitly said not to require resemblance (AT VII 81–83).
14. Quoted by Galen in *On Doctrines of Hippocrates and Plato*, Vol. V, pp. 602–604 in his *Opera Omnia*; translation taken from Rocca (2003, p. 39). Rocca (2003) is my main source for the notes on ancient anatomy in this paragraph.
15. *On the Doctrines of Hippocrates and Plato*, Vol. V pp. 185–187 in his *Opera Omnia*, translation taken from Rocca (2003, p. 195). On Galen see Rocca (2003), especially pages 187–198.

16. See Hall (1969, Vol. I, p. 162). Hall refers to *On the Doctrines of Hippocrates and Plato* 7.4, 7 and to the *De usu partium* 9.14. See also *De usu partium* 9.8 (Galen 1968, p. 442), where Galen says that 'the eyes as a whole were made for the sake of the sensory nerves, [in which] is lodged the whole principle of vision'.
17. Kepler, *Ad Vitellionem paralipomena*, Vol. 2 in his *Gesammelte Werke*. Edited by Franz Hammer, Munich (1939, pp. 151–152). Translation and reference taken from Lindberg (1976, pp. 203 & 280).
18. In the *Principles* I 71 Descartes writes of 'the sensations of tastes, smells, sounds, heat, cold, light, colours and so on' that they 'do not represent anything located outside our thought'. (CSM I 219) This seems to be not only in disagreement with what we find in earlier writings, but even with what is found a few sections earlier, in I 68, where Descartes writes of 'what is represented by the sensation of colour or pain' (CSM I 217; see also *Principles* I 69, 70). As Wilson has argued (1990, especially § IV), the contradiction is resolved if we take Descartes to mean in I 71 that nothing like the sensations of tastes, smells and so on exists outside our thought, unlike sizes, shapes, motions and so on, which can exist in this way and with which the former are contrasted in the next sentence. What Descartes grants the latter clarifies what he denies the former. Wilson relied only on the Latin text, but the French translation adds, following the claim that sensations of tastes, smells and so on do not represent anything located outside our thought, that they 'vary according to the different movements which pass from all parts of our body to the part of the brain to which our mind is closely joined and united.' (ibid.) Descartes apparently saw that the former claim is at best misleading, and while preserving the letter dismissed its sense by ascribing to the sensations what he understands by a representational role (see, for instance, the quotations in the text from the *Optics*, Discourse Four, AT VI 112–114). See also De Rosa (2007, p. 193), for a discussion of this passage.
19. Cottingham (1989–1990, Section 2) argued that according to Descartes, an effect must *resemble* its cause, and since perceived objects affect us only by pressure and motion, the qualities in them that we perceive cannot be wholly different from pressure and motion as our ideas of colour, sound and so on are. But I think Cottingham failed to establish the ascription to Descartes of this alleged causal resemblance principle. An effect cannot have, according to Descartes, more *reality* than its cause (*Meditations*, AT VII 40), but that does not mean that it need *resemble* it. Cottingham's only support for this additional constraint (p. 152) is the following passage from Descartes' conversations with Burman:

    > Burman, quoting from Descartes' *Meditations*, AT VII 51: 'the mere fact that God created me is a very strong basis for believing that I am somehow made in his image and likeness.'
    >
    > Burman: But why do you say that? Surely God could have created you without creating you in his image?
    >
    > Descartes: No. It is a common axiom and a true one that the effect is like the cause. Now God is the cause of me, and I am an effect of him, so it follows that I am like him.
    >
    > Burman: But a builder is the cause of a house, yet for all that the house is not like him.

> Descartes: He is not the cause of the house, in the sense in which we are taking the word here. He merely applies active forces to what is passive, and so there is no need for the product to be like the man. In this passage, however, we are talking about the total cause, the cause of being itself. (AT V 156, CSMK 339–340)

It seems Descartes was somewhat hasty in committing himself here to the causal resemblance principle, which he immediately proceeds to restrict, following Burman's pertinent observation. Moreover, the causation we are interested in at this place, between objective sensory quality and the movement or pressure it causes, is like the causation involved when a builder builds a house, the mere application of forces, and not 'the cause of the being itself'. So the use Cottingham makes of the causal resemblance principle is unjustified. Lastly, if qualities could not cause motions for the dissimilarity reason, neither could motions cause qualities; which, however, they obviously do according to Descartes, namely when brain events give rise to sensations. Cottingham's causal resemblance principle thus creates difficulties for him on the other end of the causal process of perception (pp. 155 & 159).

For a detailed criticism of the ascription to Descartes of the principle that a cause must resemble its effect, see O'Neill (1987). O'Neill also discusses the passage from the conversations with Burman (pp. 241–243).

20. From the identification of matter with space it follows that a void is impossible. In *The World*, however, Descartes does not explicitly derive this conclusion. In Chapter Four, which discusses the void, Descartes shows that it is not necessary for the possibility of motion and that it need not be assumed in order to explain various physical phenomena. Nevertheless, he writes that he does not assert there is no void at all in nature, and that a full explanation of the matter would have been too long (ibid., 20). He even comments that if there could be a void it would be in hard bodies (ibid., 17). In later writings, however – the second part of the *Principles*, for instance – space is identified with body (Section 11), and the conclusion is drawn that 'it is a contradiction to suppose there is such a thing as a vacuum' (Section 16, CSM I 229). This conclusion is drawn even earlier in his letters (e.g. to Mersenne, 9 Jan 1639, AT II 482).
21. An alternative explanation of why Descartes came to adopt a geometrical model of material nature and eliminate these sensory qualities from it, an explanation developed by Rozemond (1998, pp. 22–24) and others, is that according to Descartes every substance has a principal attribute through which its modes can be explained, material nature's being extension. As sensory qualities cannot be understood in terms of extension, they must be modes of a different substance with a different principal attribute, namely the mind. – But although this explanation can be supported by Descartes' views of substance and attribute as developed in the *Principles*, it is problematic in several respects. These views are not found in the much earlier *The World*, although already there the views of body as pure extension and of the nature of sensory qualities are to be found. It seems that Descartes could develop his view that every substance has a unique principle attribute only because he reduced matter to pure extension, so the suggested explanation puts the cart before the horse. Descartes' use of the substance–attribute terminology and conceptualisation became significant only in his replies to the objections,

while he was studying Scholastic philosophy with the intention of writing his *Principles* in a Scholastic form to facilitate its adoption by the universities. Talk of attributes is absent from *The World* and *Discourse*, and is rare in the *Meditations* as well (only two occurrences). It is therefore anachronistic to rely on this conceptualisation in an attempt to describe Descartes' reasons for his position; at most it could provide him with a *post factum* justification. In addition, classifying the sensory qualities as thoughts – cogitations – was an innovation of Descartes', which was forced on him because he moved these qualities into the mind (more on this below) and not vice versa. In fact, the things Descartes counts as thoughts – understanding, willing, imagining and perceiving (*Principles* I 9; cf. *Meditations*, AT VII 28) – are heterogeneous to a degree that strains his 'unique principle attribute' doctrine: what makes all these 'thoughts' is only that we are aware that all are in us.

22. My interpretation is close to Sorabji's (1974); see especially p. 72 and note 30 there, and p. 76.
23. The references to Shield (2010) are to the supplement, 'Controversies Surrounding Aristotle's Theory of Perception'. Shield also holds there that resemblance by encoding can explain selective attention in perception better than can literal resemblance, but I cannot see why he thinks this should be so.
24. Epicurus, Letter to Herodotus, 46–50; Lucretius, *De rerum Natura*, 4.30*ff*
25. The translations from Sextus's *Adversus Mathematicos*, which are all from *Against the Logicians*, are based primarily on Bett's translation (Sextus 2005), but I have also used and occasionally followed either Bury's earlier translation (Sextus 1935) or, where it exists, Long and Sedley's, to whom I also then refer.
26. For more on Augustine's theory of perception, see O'Daly (1987, Chapter 3).
27. Anyone condensing a description of medieval thought on representation in perception, be it even of its approach to representation and resemblance alone, to roughly two pages, must feel injustice is being done to this rich and varied tradition. For a better appreciation of the tradition, which starts at the latest with Avicenna in the eleventh century and continues into the fourteenth century and beyond, see Tweedale (1990), Pasnau (1997), the contributions of Lagerlund, Tweedale and King to Lagerlund (2007) and Pasnau (2011). For Aquinas, see also Kretzmann (1993). Simmons (1994) surveys some of the relevant ideas of the late, sixteenth century Scholasticism of Francisco Suarez, Antonio Rubio and Francisco de Toledo.
28. The debate over the nature of intentional existence is discussed in detail in Pasnau (1997, passim). Aquinas held that the species are intentionally instantiated both in the medium and in the sense, but it seems that he never managed to clarify what intentional existence is. Pasnau, despite his attempts to clarify Aquinas's concept of intentional existence, concludes that Aquinas defines it only in negative terms, and that 'we are told only what it is not'. We would further like to know what intentional existence is, he writes, 'but here Aquinas falls silent' (p. 41; see also King (2007, pp. 84–85)). This obscurity in Aquinas's position triggered the debate on the nature of intentional existence in the late Middle Ages. For our purposes, however, it is enough to note, as was done in the text, that the intentional

existence of the species still allowed for their resemblance to what they were species of.

29. Lindberg's book is my source for much of the information on medieval optics; see especially chapters 5 and 6. Lindberg's extensive selections from the medieval perspectivists' works in Grant (1974, § 62), a few of which are quoted here, include many additional assertions of the theory of perception described in the text. See also Darrigol (2012, pp. 15–36), on medieval- and Kepler's optics.
30. See Bacon, *Opus maius*, v.1, Distinction 1, Chapters 2–4; Grant (1974, pp. 407–410). For more on Bacon on the species, see Pasnau (1997, pp. 64–66).

    Pasnau has claimed that William of Auvergne (ca.1180/90–1249) had a non-resemblance theory of mental representation (Pasnau 1997, pp. 101–103). This ascription is based on a single short passage in William's *On the Soul* (VII.9, 216a; 2000, p. 457). William discusses there the intellect, and claims that according to Aristotle, the sign of heat in the intellect 'is not a likeness of heat in the true and proper sense, just as you see in names and numbers and in the writing down of those things that have no likeness to those things of which they are the signs'. So far this is along the lines of describing *intellection* as a kind of language, and no possibility of representation without resemblance in *perception* is suggested. But then William continues:

> In the very pupil of the eye, which is, of course, a body, the sign of a four-sided and a triangular figure is not the likeness of it, and such a shape is, nonetheless, clearly and fully seen. But how is it possible that one sign existing in the pupil should be the likeness of so great a variety of things? For, when one tree with its branches, leaves, and flowers is seen, what sign can exist in the pupil of the eye that can be a likeness of this tree, its branches, flowers, and leaves?

    The idea behind the question, how can the sign in the pupil be a likeness of the tree with its branches, leaves and flowers, might be that the image in the pupil is only a *partial* likeness of the tree, yet it still represents it. The same question could be asked of a representation that does not resemble what it represents: how could *such* a representation stand for all the specificity in the tree it represents? – surely information on the tree's flowers, say, might equally be lost in such a representation as well. So this part of William's passage does not support the claim that he had in mind a representation which is *independent of* resemblance. However, the application of this interpretation to William's comment that 'the sign [in the pupil] of a four-sided and a triangular figure is not the likeness of it' is not straightforward. Was he thinking of a projection that preserves the square or triangular form only partly, yet for all that does not prevent the observer from seeing the form? – this would accord with the claim that he does not have in mind a different kind of representation. But whatever William's intention is in these cryptic remarks, he does not develop in them any *alternative* idea of representation. Moreover, in his own theory of perception he did maintain that representation is by means of likeness (see, for instance, Teske (2006, pp. 168–169, 175)). So at most we see here William questioning the need of resemblance in representation, but not rejecting it or developing any alternative model.

31. Pasnau (2011, §§ 4–6) also complains anachronistically that 'the what-it-is-like of the experience itself is not usually a subject of interest [for the Scholastics]' (p. 51). But they were not interested in this late twentieth century invention because they thought of the sensory qualities of which we are aware as instantiated in the sense organs and not in a mental event called 'experience'. Next, Pasnau, now explicitly following Berkeley, finds it pragmatically impossible that the Scholastics thought the representation of which we are aware literally resembles the qualities of things, for 'inanimate objects cannot be characterised in terms of phenomenal experiences – that follows directly from their being *inanimate*' (ibid., p. 54). But again, according to the Scholastics the sensory qualities of which we are aware are instantiated in our sense organs, so there is no incoherence in their literally resembling what they represent. The post-Cartesian Berkeley should not be taken as a guide to what was coherent in the Scholastic world. Lastly, Pasnau, lacking any textual evidence, finds it necessary to have recourse to a principle of charity in order to justify his interpretation of Scholastic thought (ibid., p. 57): these desperate measures are in fact a strong support for the literal interpretation of the Scholastics' view, as quoted above from Tweedale.
32. Kepler, *Ad Vitellionem paralipomena*, Vol. 2 in his *Gesammelte Werke*. Edited by Franz Hammer, Munich (1939, p. 152). Translation and reference taken from Lindberg (1976, pp. 204 & 280).
33. At the beginning of his *Perspectiva* and elsewhere: see Lindberg's footnote no. 52 to Witelo's mentioning of afterimages in *his Perspectiva* III, Theorem 6, (Grant 1974, p. 401). After-images were often mentioned in medieval discussions of perception; see, for instance, Pasnau (1997, pp. 71*ff*), for an account of Peter Aureol's discussion of them.
34. The traditional species theory was redeveloped a little later in more detail within Kepler's framework by his follower, Christopher Scheiner, in his *Oculus* of 1619. See Pantin (2007, pp. 100–102).
35. The full title of Digby's book is *Two Treatises. In the one of which, The Nature of Bodies; in the other, The Nature of Mans Soule; is looked into: in way of discovery, of the Immortality of Reasonable Soules*. For his praise of 'Monsieur des Cartes, who by his great and heroyke attempts, and by shewing mankinde how to steere and husband their reason to best advantage, hath left us no excuse for being ignorant of any thing worth the knowing', see p. 275. Digby wrote to Hobbes as early as 4 October 1637 about Descartes' *Discourse*, 'a production of a most vigorous and strong braine' of a man who may 'had carryed the palme from all men living' (the letter is quoted in full in Nicolson (1929, p. 358)).

3 The Development of Descartes' Theory of Perception

1. Work on Descartes' early thought as represented in the *Rules* might benefit from the manuscript of the work recently discovered in Cambridge University Library by Richard Serjeantson, who claims that it is a copy of an early draft of the treatise. Currently this new manuscript is not publically available.
2. My position here, according to which Descartes' views on the nature of matter and perception changed between the *Rules* and his later works, is thus

in disagreement with Gaukroger's, who reads into the *Rules* Descartes' later position (Gaukroger 1992, pp. 110–111). Atypically, Gaukroger supports his interpretation neither by a quotation nor by an exact reference. He mentions Rule 12 as the place where we find Descartes' claim that the material world does not contain anything resembling the idea of colour, and so forth; but such a claim is not found there. As I have shown, Descartes' position in the *Rules* is different. See also note 4 below.

3. CSM translates *figura* here and in the following paragraphs occasionally by *shape* and occasionally by *figure*. Since Descartes uses the term with a single meaning throughout, I preferred to maintain terminological uniformity here. I use only *shape*, although in some places the English would prefer *figure*. When later in the book I do use *figure*, I note this change of term.
4. Wolf-Devine, commenting on these passages (AT X 421–413), writes that although Descartes 'has held back [in them] from saying explicitly that there are no "real qualities" or proper sensibles out there or that figure and motion are the objects of all the senses alike, that is clearly the direction he is moving in, and the distinction between proper and common sensibles has essentially been discarded.' (1993, p. 21) However, although in hindsight we can say that Descartes' view of perception from *The World* on is close in important respects to his explicit view in the *Rules*, we need further justification in order to maintain that he had his later view developed already when working on the earlier work but that he just did not make it explicit there. The only argument Wolf-Devine gives for thinking that Descartes has more up his sleeve than he shows is that he anticipated opposition from the Scholastics, which he was attempting to head off (p. 18). But this anticipated opposition did not prevent him from being explicit about his views and arguing for them in great detail in *The World* or in the *Optics*, the latter published shortly after Galileo's trial, the period in which Descartes was most cautious regarding possible Scholastic opposition (more on this in Chapter 6). Wolf-Devine's argument is thus far from sufficient, and we do not have good reasons for thinking that Descartes hides from the reader of the *Rules* the ideas he would later make central to his theory.
5. Galileo twice calls the geometrical properties 'primary accidents' (*primi accidenti*), a phrase that later in the century, through Gassendi (1658, Second Part (*Physica*), Third Book, Chapter II) and later Boyle and Locke, would become, with a minor change – primary *qualities* – a common denomination. Galileo also calls them 'real accidents' (*reali accidenti*).
6. See, for instance, Hamou (2011, pp. 170–171) and LoLordo (2011, p. 71) for two recent examples.
7. For Ficino's arguments for the superiority of the intellect over sense, see Ficino (1948, pp. 203–206).
8. For more on Galileo's Platonism, see Koyré (1943, pp. 425–428) and Shea (1971, pp. 150–163).
9. For the development of Galileo's thought about the purely geometrical nature of bodies, see Crombie (1972).
10. Aristotle, *On the Soul* 403b31, 404a1, 404a27, 405a8, 406b20, 409a32; *On…Respiration* 471b30.
11. Jacopo Mazzoni (1548–1598) may have played a mediating role between Plato's corpuscular view of matter and Galileo's, both through their mutual

work and study in Pisa and through his book, *De comparatione Platonis et Aristotelis* (1597) (see Purnell (1972, pp. 284–286); Crombie (1972, p. 73); Shea (1972, p. 108, n. 58); Wallace (1998)). Another source for Galileo's corpuscularianism is probably Heron's *Pneumatics*, whose Introduction contains corpuscularian explanations of various phenomena relating to air and water, supported by a variety of experiments (see Boas (1949, especially p. 48)).

12. Several scholars have read into the *Rules* Descartes' later Galilean position, according to which body is nothing but extension. Maull (1980, p. 27), for instance, claims that in the *Rules* Descartes identifies bodies with extension, referring to a passage in the discussion following Rule 14 (AT X 442–443). But all Descartes says there is that we cannot *imagine* extension without body; it does not follow from that that there is nothing in bodies but extension, nor does Descartes claim that anywhere else in the *Rules*. Moreover, a little later in the book he maintains that the pure intellect, which alone is capable of distinguishing abstract entities, *can* distinguish extension from body. The sentence 'Extension is not body' is true in the same way that 'a surface is the limit of a body' is: in both the pure intellect conceives in abstraction what cannot be grasped by means of the imagination (ibid., 444–445).

    Garber is more cautious: he maintains that 'in the later sections of the *Rules* we also have a strong suggestion of the doctrine of the identification of body and extension that characterises [Descartes'] mature thought' (1992, p. 289), but he never claims that this suggestion is due to actual identification of the two. Yet in note 41 (p. 328) he too mentions Descartes' claim in the *Rules* that reason can distinguish body from extension. But things that can be distinguished, especially by the reliable reason, are not the same, so we should not see Descartes as suggesting this identification in the *Rules*.

    It is also worth mentioning that in a remark written in 1620 (*Cogitationes Privatae*, AT X 218) Descartes seems to be describing bodies as being hot or cold, dry or wet, namely as having the four basic properties of bodies according to Aristotle, and so it seems that only a few years before writing the *Rules* his conception of bodies had been far from purely geometrical. It is true, however, that his thought gradually approached his later position, and that steps in this direction can be detected, in hindsight, also in the *Rules*.

13. Corpuscularian and atomist views are found in Beeckman's *Journal* already in 1616; see Boas (1952, pp. 437–439).

14. This important difference between Galileo's position on the one hand, and Descartes and his followers' on the other, is not always noticed. Hamou, for instance (2011, p. 165), identifies Locke's Cartesian position, according to which redness in porphyry is a power to produce a perception of red in us, with Galileo's. Similarly to Locke, he writes, Galileo thinks of this redness as '*only a name* for something in porphyry that is not red but which makes porphyry look red'. Yet Galileo does not write that it is a name of something, but that outside the living sentient body it is *only* a name – a name of *nothing*, an empty or sheer name [*puro nome*]. He writes, as we saw, that 'if ears, tongues, and noses be taken away, the number shape and motion of bodies would remain, but not their tastes, sounds and odours' (Galileo 1960, p. 30), not admitting the existence of objective sensory qualities, be they only as powers.

15. This fragment survived in Galen, *de Med. empir*. 15, where it follows the fragment in which the sensory qualities are relegated to convention while reality is ascribed to atoms and void. The latter fragment is also found, in a slightly different form, in Sextus, *Adversus Mathematicos* vii 135.
16. In the next few paragraphs I concisely present some of the main evidence for the early date of Descartes' development of his mathematical ideas. For a detailed discussion of Descartes' early intellectual biography, see Gaukroger (1995). For a survey of Descartes' analytic geometry see Boyer and Merzbach (1991, p. 335–346), and for a detailed presentation and discussion see Boyer (1956, Chapter V).
17. See also Gaukroger (1995, pp. 129–131) for a similar position. Gaukroger adopts there (p. 131) Schuster's position, that Descartes began to realise 'that algebra and geometry move hand in hand in the invention and specification of ever more complex constructions'. (The quotation from Schuster is taken from his 1977 dissertation (i. 146), which was not available to me.) What is important to the claims made in the text is not the exact dating of Descartes' (not yet fully articulated) discovery of the correspondence of algebra and geometry, but the fact that he had developed it by the time he wrote the later parts of the *Rules*, where he discusses perception. And this is evident from the method discussed in the *Rules* themselves.
18. Descartes does not use primarily Cartesian coordinates, but quite often oblique coordinates instead. He also rarely draws the curves he discusses. Moreover, unlike our later practice of analytic geometry, Descartes not only use algebra to represent geometrical objects and relations, but also geometry to represent some algebraic equations. See Boyer (1956, pp. 82–102) and Boyer and Merzbach (1991, pp. 335–346) for these and other respects in which Descartes departs from standard contemporary approaches to analytic geometry.
19. For a more detailed description of Descartes' technique and a concise presentation of his approach to Pappus's problem, see Mancosu (2008, pp. 111–114).
20. For the way analytic geometry was developed, see Boyer (1956). Apollonius had already used coordinate geometry in the third century BC, and interest in his work and attempts to recover it flourished in the later part of the sixteenth century. Major advances in algebra were also made during the sixteenth century, both in technique and in symbolism, and Vieta applied algebra to calculations of quantities in geometry. All these developments made possible the invention of analytic geometry, which was made independently by Descartes and Fermat in the sixteen-twenties.
21. Yolton (1996, pp. 185–190) has emphasised what he called the 'reverse-sign' aspect of this passage, but his further non-causal interpretation of it is problematic; see Slezak (2000). 'Reverse-sign' is not a successful term either, for seeing the word as a sign of an idea in the mind does not reverse any more natural relation of signification; what today we find unexpected is only the application of this conceptualisation to the light – idea-of-light relation.

    Yolton later changed his interpretation of these passages, considering not light but the motion in the brain as the action which is a sign (2000, p. 578 and note 5 on p. 586). He gives, however, no justification for this change of interpretation, which is unsupported by the text. The brain is not mentioned

at all in *Light*, while light is explicitly and recurrently claimed in the treatise to be an action. Moreover, the treatise opens in claiming that light need not resemble its idea, and then the word–idea analogy is brought.

The peculiarity of this passage has escaped Clarke, who focuses on the relation between the word 'cat' and the cat it signifies, and not on the causal relation between a word and the idea it causes, which is the relation that is supposed to be analogous to the one between the perceived property and the idea of sense it causes (Clarke 2003, p. 51).

22. Descartes mentions again as an analogy the manner in which words make us conceive what they signify (namely, an idea) in the *Passions* I 50 (AT XI 369, CSM I 348). However, it is not used there as an example of any representational relation, let alone representation without resemblance, but as an example of an acquired habit: although we are not innately disposed to conceive what a word signifies when we hear or read it, we can acquire this habit and conceive the idea rather than the word's sound or form. (The CSM translation is badly distorted at this place, as it omits a whole clause.)

4 Soul and Physiology

1. My presentation of Descartes' physiology is concise, emphasising elements relevant to my discussion below. For two much more detailed recent presentations of his physiology, see Des Chene (2001) and Clarke (2003). Clarke should be treated with caution, though, as I think he tries to make Descartes more of a materialist than the texts allow.
2. The full title is, *The Description of the Human Body and All Its Functions, those that do not depend on the Soul as well as those that do. And also the principal cause of the formation of its parts* (*La Description du Corps Humain*).
3. See letter to Elizabeth, January 1648, and Conversations with Burman, AT V 170.
4. See Hall's footnotes 19 and 25 to his translation of *Man* (Descartes 1972).
5. For more on Descartes' physiological psychology, see Hatfield (2007).
6. According to Baillet, who published a detailed biography of Descartes in 1691 and had access to sources that are no longer extant, Descartes lived in Saint Germain from the summer of 1614 to the autumn of 1615 (Book 1, Chapter 8, p. 38). Descartes would then have had plenty of opportunities to visit the royal gardens and observe the various mechanisms in them. See also Gaukroger (1995, pp. 62–64) for Baillet's reliability on this.
7. A visitor to the gardens, Andre Du Chesne, offers an enthusiastic description of the artificial animals in one of the grottos: 'The dragon is accompanied by various little birds, which truly seem not painted or imitated but alive, fluttering their wings, making the air echo with a thousand warbling' (quoted in Chapuis and Droz 1958, p. 44). See also the similarly enthusiastic description by Montaigne of the waterworks in the Villa di Pratolino, built by Francesco de'Medici, Grand Duke of Tuscany, during the fifteen-seventies and visited by Montaigne in November 1580 (Montaigne 2003, p. 1132). These waterworks resemble those that are still operative at Hellbrunn, near Salzburg. Adam and Tannery quote a few additional sources of the period

that describe such waterworks, the earlier of which Descartes could have read (AT XI 212–215). They add to them on page 669, and they also correct there their earlier hypothesis, that in the description in *Man* Descartes has in mind Fontainebleau, to Saint-Germain-en-Laye.

8. Salomon de Caus: *Les raisons des forces mouvantes avec diverses machines tant utilles que plaisantes ausquelles sont adjoints plusieurs desseings de grotes et fountaines*. Francfort: J. Norton, 1615. Salomon de Caus (1576–1626) was a French engineer, in the service of the Palatine elector (Bedini 1964, pp. 25–26).
9. Descartes corrects Mersenne and describes the blast of air coming out of Heron's aeolipile as steam (to Mersenne, 25 Feb 1630, AT I 118). The ancients thought of this air as a result of a transformation of water into air, and Mersenne follows them in that, but de Caus has shown its real nature. Descartes might be revealing here his acquaintance with de Caus's work. See note by Adam and Tannery at AT I 124.
10. Comparisons of some aspects of animal physiology to hydraulic systems exist in writers who preceded Descartes. There is apparently some evidence that already Alexandrian physiologists in antiquity 'attempted to account for the movement of fluids through the body ... by analogy to pneumatic technology' (Berryman (2003, p. 363); Berryman (2009, pp. 197–200); see references there). In Descartes' own lifetime Fabricius, when describing the functioning of valves of veins, writes: 'The activity which Nature has here devised is strangely like that which artificial means have produced in the machinery of mills' (1603, p. 123). Harvey compares only once in his *De Motu Cordis* (1628) a feature of the cardiovascular system to artificial hydraulic systems, and this is again when discussing the valves of veins: when a probe is 'introduced from the extreme towards the more central parts [of a vein], the valves, like the floodgates of a river, give way, and are most readily pushed aside' (Chapter XIII). Perhaps he is consciously using this comparison to correct that of his teacher, 'the celebrated Hieronymus Fabricius of Aquapendente, a most skilful anatomist, and venerable old man', whom he has mentioned three paragraphs earlier. The scope and detail of Descartes' comparisons are, however, unprecedented.
11. See also Hall (1970), where Hall writes that in his physiological explanations 'Descartes is discovered to follow a fairly predictable practice – namely, a reductive (corpuscular, nonpsychistic) interpretation partly of empirical fact but primarily of earlier Renaissance revisions of Greek physiological doctrine' (p. 77). 'What Descartes had to offer', he remarks, 'were not explanations of fact. They were explanations, rather, of other peoples' explanations' (p. 64). See Hall's examples there, mainly in Section III.
12. His physiological psychology of vision is a partial exception. Some of Descartes' original *speculations* in his *Optics* on the relation of eye structure to the characteristics of our vision, although apparently not based on physiological observations, proved either true or valuable to the progress of science.
13. See Smith (1998, p. 94), Lokhorst (2006) and López-Muñoz et al. (2012). López-Muñoz et al. also document the history of the thought on the pineal gland as an instrument of the soul, from antiquity to Descartes.
14. For more on this see also Grene (1993).
15. Quotation and reference taken from Wade (2005, pp. 34–35).

16. See Wade (2005, p. 80) and James (1932).
17. Jan Swammerdam (1637–1680) showed a little earlier, in the mid-sixties, by experimenting on frog muscles, that muscles do not increase in volume when contracting, and that they need not be connected to the brain in order to contract. Nicolas Steno (1638–1686) has consequently tried to account for muscle contraction without increase in volume in his influential *Elementorum Myologiae Specimen* of 1667 (see Brown (1968, pp. 96*f*) for Steno's account). In 1669 Jonathan Goddard, a member of the Royal Society, showed that human muscles *decreased* in volume while contracting (Brown 1968, p. 108). Similarly, in his *De Cerebro* of 1665, Malpighi (1628–1694) refuted Descartes' theory of vision on the basis of his superior knowledge of physiology (Bertoloni Meli 2011, pp. 86–88).

    Descartes' physiology thus suffered several fatal blows immediately following its publication. On the other hand, it did provoke much research into the subjects on which it speculated: the several works on the brain published in the mid-sixties were a result of Descartes' discussion of brain structure and function in *Man*, published in 1662 (Willis's *Cerebri anatome*, 1664; Steno's lecture, 1665; Malpighi's *De cerebro*, 1665; Fracassati's *De cerebro*, 1665).
18. *Opera philosophica* II, p. 8; translation taken from Foster (1901, p. 62). Steno's lecture was published with the title *Discours de Monsieur Steno sur l'anatomie du cerveau* in 1669. Foster gives no exact reference; I took the reference to Steno's *Opera* from Brown (1968) and from Bertoloni Meli (2011), note 10 to page 84.
19. On Boerhaave and Stahl see next section. On Pitcairn see Brown (1968, Chapter IV), Guerrini (1987) and Stigler (1992). Brown presents Pitcairn's dismissive attitude towards Cartesian hypotheses mainly around page 215. Pitcairn's Cartesian conception of the body as a hydraulic machine is described mainly on pp. 222–225. Brown assesses Pitcairn's Cartesianism on pp. 236–237.
20. In this assessment of Descartes' contribution to physiology I agree with Hall. See Hall (1969, Vol. 1, pp. 255 & 256–257).
21. For more on the contrast between Aristotle's comparisons of animals to automata and mechanistic uses of such comparisons, see Berryman (2003, pp. 358–361) and de Groot (2008); for a detailed discussion of this passage, see Henry (2005, pp. 28–34). Henry, though, was driven to the improbable hypothesis that Aristotle was considering not actual but imaginary automata that are similar to contemporary ones running on a computer program (pp. 38–40).
22. Alexander's discussion is reported by Simplicius, *Commentary on Aristotle's* Physics, 310.36–311.30; on Alexander see also Henry (2005, Part 2).
23. My discussion of the ancient authors is indebted to Berryman's *The Mechanical Hypothesis in Ancient Greek Natural Philosophy* (2009), pp. 205–215, from which the translation of Galen's text (based on Singer's translation (Galen 1997, p. 194)) is also taken.
24. Aquinas's comparison of the purposefulness in animal behaviour to that of human artefacts, timepieces included, was repeated by some later philosophers preceding Descartes. It is found in Francisco Vallés's *De Sacra Philosphia* (1587), Chapter LV (reference taken from Georges-Berthier (1914, p. 85,

note 7)) and, more significantly, in Mersenne's *Quaestiones celeberriamae in Genesim* (1623), where he writes:

> All those creatures that lack a mind are like clocks, which indeed tend to indicate the passage of time in an orderly way, but because they do not conceive this end, nor can they dispose themselves towards it, they must of necessity be disposed by another being who can knowingly dispose all these things. (p. 127; György Geréby helped me with the translation of this passage)

Mersenne is clearly following Aquinas in this passage. Although Descartes' use of the clock analogy is importantly different than Aquinas's and Mersenne's, the analogy might have suggested itself to him also because of its availability in this different form.

25. For the early history of automata, from antiquity to Descartes, see Chapuis and Droz (1958), de Solla Price (1964) and Bedini (1964). These writings contain also much material on later developments of clockwork and hydraulic mechanisms.
26. In his *Nachrichten von den vornehmsten Künstlern und Werkleuten*, page 66.
27. I have derived much of the information below on della Torre from García-Diego (1986).
28. On this and other automata and their possible ascription to della Torre see García-Diego (1986, Chapter 6) and King (2002).
29. Because of the simplicity of the mechanism, some doubt its ascription to Schlottheim (Chapuis & Gélis 1928, p. 217); but it is an automaton whose repertoire of movements is typical of the period.
30. The book was translated in 1650 into English by Sir Robert Stapylto. This passage is found already on pages 15–16 of a 1637 copy of the original.
31. This dove acquired considerable fame at the time, and we shall see it mentioned by Descartes below. It was mentioned at roughly the same time by Heinrich Cornelius Agrippa (1486–1535), in his *De occulta philosophia* II.1 (1533), as an example of what he there calls *automata* (writing the word in Greek), among various mythological artefacts (for instance, Daedalus' statues) and other artefacts that if they indeed existed probably worked on pneumatic principles like those of which we read in Heron's works. Agrippa, though, ascribed their operation to magic. This passage from Agrippa, including 'the wooden dove that flew', found its way into the first recorded use of 'automaton' in English, in the play *The Bloody Brother* (IV.i), written around 1625 according to the OED (first published in 1639).

    Archytas was a Pythagorean, active in the first half of the fourth century BC. The flying dove is mentioned by Aulus Gellius, writing in the second century AD and quoting Favorinus, who wrote earlier in the same century:

    > (9) But that which the Pythagorean Archytas is reported to have envisioned and made ought to seem neither less remarkable, nor equally groundless. For, many celebrated Greeks and in particular the philosopher Favorinus, a man very studious of ancient traditions, have written most positively that a model of a dove, which was made by Archytas out of wood with a special construction in accordance with the discipline of mechanics, flew. Evidently it was poised just so by counter weights and was set in motion by a puff of air concealed inside (10). In the case of a thing so hard to believe, I certainly want to quote the words of

> Favorinus himself: 'Archytas of Tarentum, who was an expert in the field of mechanics, made a wooden dove which flew; whenever it alighted, it rose no more. For up to his point…' (*Attic Nights*, 10.12.9–10; the quotation from Favorinus does not continue after the ellipsis; translation taken from Huffman (2005, pp. 570–571)).

Certainly Archytas could not have built any flying automaton, and *if* Favorinus is to be trusted, all he may have built is a kind of projectile. Moreover, the six centuries separating Archytas from Favorinus and Aulus Gellius may well have helped foster some urban legend. We also have reasons for thinking Gellius' text might be garbled (see Berryman (2003, pp. 354–355)), and the reference to a 'current of air' might be his introduction of Hellenistic pneumatic technology in an attempt to make sense of what he *thought* Archytas must have built. It might also be that this automaton was described by a later Archytas, mentioned by Diogenes Laertius as the author of a treatise *On Mechanism* (DL VIII 82) and conflated by Favorinus with Archytas the Pythagorean. This later Archytas might indeed have used pneumatic devices – we know nothing of him apart from this reference of Diogenes. However, no record of any automaton propelled by condensed air remains in the writings we have on pneumatic devices from antiquity, and it is unlikely that knowledge of such a remarkable automaton would not be preserved in them. And of course, the Ancients did not have the knowledge required to build anything that could fly or even glide. (See also Huffman (2005, pp. 570–579) and Huffman (2008).)

32. The only contemporary description of della Torre's automata was written by Ambrosio de Morales, a close friend of his, who was the court-historian of Phillip the Second and a professor at the University of Alcalá de Henares. In his 1575 book, *Las antigüedades de las Ciudades de España*, Morales describes the activity of his friend as follows:

> Juanelo as a diversion also wanted to create anew the ancient statues which moved and, on that account, were called automata [*Automatas*] by the Greeks. He made a lady more than one tercia high [about 30cm] who, placed on a table, dances all over it to the sound of a drum [*tambor*] which she meanwhile beats herself, and goes round in circles, returning to where she started from. Though it is a toy and fit for mirth, it is nevertheless a great proof of his high intelligence. (p. 93; translation taken from García-Diego (1986, p. 101).

García-Diego doubts the accuracy of Morales's report. He notes (pp. 101–102) that Cristóbal de Villalón had already described in his *La ingeniosa comparación entre lo antiguo y lo presente* of 1539 'men acquiring such skill that, by means of clocks, wooden images and statues can be made to walk around a table without anyone moving them as well as playing a guitar or kettledrum or other instrument' (p. 174). This description fits the ascription of such automata to the earlier Jakob Bülmann, and Morales might be confusing between della Torre's automata and other automata that Charles the Fifth may have had. We are not interested here, however, in questions of authorship but in the period in which these automata were first manufactured.

33. Poisson is quoted in footnote b, AT X 231–232.

34. According to Rodis-Lewis (1998, p. 68), Descartes amused himself, together with the engineer Villebressieu (from her words it seems that this was in 1627–1628) in constructing automata 'and other astonishing devices'; she gives no reference, however.
35. Translation and reference taken from a hand-out of Jonathan Barnes, distributed during his talk at the Department of Philosophy, CEU, 18 March 2010.
36. Aristotle, *On the Soul*, 403b31, 405a8, 406b20, 409a32.
37. Goclenius, for instance, still defines in his philosophical lexicon of 1613 the soul as 'life itself' (p. 100). Reference taken from page 122 of Serjeantson (2011), which contains much more material on the development of the concept of the soul from the Renaissance to the early eighteenth century.
38. See Fowler (1999, Chapter 5), for a study of Descartes' use of *mens*, *anima* and related terms in the *Meditations*.
39. Even in the *Phaedo*, where two kinds of being are introduced, one changing and visible and another, the divine one, unchanging and invisible (79a), the embodied soul is a mixture of the two, and it can be a mixture in different proportions (80d–81d). In this way the *Phaedo* also admits degrees of being, and for the same reasons that pushed later philosophers towards this ontology: the soul, as the cause of the body's life, is between the pure being and the changing one.
40. Descartes' reasons for thinking of the mind as immaterial are considered in the next chapter.
41. Descartes seems to describe the mind only once as superior to matter or body, in his responses to the objections of Bourdin (AT VII 559). He is adopting there the terminology used earlier by Bourdin, a terminology to which he did not return later, even in his discussion of substances and perfection in the *Principles*. This short passage should therefore not be taken as representing his considered view.
42. Leibniz is an exception in this respect. At least his late work, dating from the early eighteenth century, contains an explicit rejection of this aspect of Descartes' thought and an ascription of a soul to animals, a soul capable of perception and sensation but not of thought or apperception. See for instance Section 14 of his *Monadology* of 1714 (Leibniz 1965, p. 149) or his 'On the souls of men and beasts', written around 1710 (Leibniz 2006, pp. 63–67). These views of his already belong to the budding vitalism of the eighteenth century, to be described below, which responded among other things to the failures of the attempts to give a mechanical explanation of life. But Leibniz also views matter as inert, influenced by the Cambridge Platonists and others (Smith and Phemister 2007). This makes him endow not only living beings but *all* matter with some form of perception, although not necessarily with sensation (which is a more developed form of perception), and thus with a soul in a broad sense (e.g. Letter to Wagner 1710, § 3; Leibniz 1951, pp. 504–505). Leibniz was partly provoked to argue for his position following the publication of Stahl's *Theoria medica vera* in 1708; see Duchesneau (2000).
43. Inevitably I shall skip some of the important history of physiology. I shall not discuss, for instance, Descartes' early influence in the Netherlands. On

this, and especially on Descartes' early influence on Hogelande and Regius (Henry Le Roy), see Sloan (1977, Section V). Sloan mentions there how Regius endorsed Descartes' comparison of the animal to a clock or automaton (p. 24), while rejecting Descartes' standards of certainty (p. 27).

44. Garber contrasts Digby's and Descartes' reasons for distinguishing the mind from the body: while Digby, he claims, 'depends mainly on arguments from the limits on the behaviour of mechanical systems', for Descartes 'the distinction follows from the very ideas we have of the soul and the body' (1998, p. 770). But this ignores Descartes' detailed arguments in the *Discourse*, which serve as his reasons for ascribing an immaterial mind to language using creatures and only to them (see next chapter). Digby is a more faithful Cartesian than Garber is in this respect.
45. The passage is from Gassendi's *Syntagma philosophicum*, published posthumously in 1658. The translation is taken from Bertoloni Meli (2011, p. 4), who took it from page 806 of Howard Adelmann's *Marcello Malpighi and the Evolution of Embryology* (Cornell University Press 1966). Bertoloni Meli does not give an exact reference to the *Syntagma* and I did not have access to Adelmann's work.
46. See for instance his reference to Descartes in his critical discussion of the latter's opinions on the heat of the heart and the fermentation supposed to take place in it (ibid., 2.22, Proposition 221). In Part II of his book he also criticises Descartes' views on the contraction of muscles (see Brown (1968, p. 200)).
47. My translation is based on Maquet's (p. 319), with some modifications taken from Hall's translation of the same passage (Hall 1969, Vol. 1, p. 344).
48. Giglioni (1997, pp. 173–174) thinks that since Borelli's claim that the movement of the heart is due to mechanical causes alone and does not involve the soul 'must have appeared audacious enough', Borelli chose to proceed cautiously by adopting 'the usual technique of the "double truth"'. When Borelli concludes that the person inclined towards a mechanical explanation of the heartbeat 'does not seem really so completely inept and worthy of ridicule', Giglioni remarks that 'we can legitimately suspect that beyond his usual caution he is suggesting indirectly which solution is to be preferred'. If Giglioni is right, then Descartes' influence on Borelli's mechanisation of life is greater than is suggested in the body text.

    On Borelli's physiology and on other aspects in which it was influenced by Descartes', as well as on his experimentally rejecting some Cartesian doctrines (for instance, that the heart is warmer than the rest of the body) see Brown (1968, Chapters II–IV, passim.); Hall (1969, Vol. 1, pp. 342–348); Bennett (1999, p. 101); Magner (2002, pp. 211–214).

    On Descartes' similar influence on Marcello Malpighi see Brown (1968, Chapter II), Giglioni (1997) and Bertoloni Meli (2011, passim). Brown (Chapters II–IV) also describes Descartes' influence on Lorenzo Bellini (1643–1704). Bertoloni Meli (2011) is a valuable source for much of the anatomical and physiological research in Malpighi's generation.
49. *Works*, Vol. I (London: 1744), p. 194a.
50. The best source for a general yet detailed introduction to English physiology in the seventeenth century is still (Brown 1968). For the way Hooke, who

was recommended to Boyle by Willis, made Boyle understand Descartes' philosophy, see Davis (1994).

51. Giglioni (1995, p. 256) thinks that Boyle departs from Descartes in conceiving man not as a 'rough Cartesian statue' or watch but as a hydraulic machine. However, as we saw above, the watch was, for Descartes, only an *example* of a self-moving automaton, and not the *model* for the human body. The latter was for Descartes a hydraulic machine, and this conception of his is a source of Boyle's.
52. The quotations and references to Boyle's works above are, in order of their occurrence in the text, from 'An Excursion about the Relative Nature of Physical Qualities', *Works* III, p. 34; 'A Free Enquiry into the Vulgarly Received Notion of Nature Made in an Essay Addressed to a Friend', *Works* V, pp. 211–215; *Works* IV, p. 409; *The Christian Virtuoso*, *Works* V, pp. 703–706; 'Of the Excellency and Grounds of the Mechanical Hypothesis', *Works* IV, p. 72; and *Works* IV, p. 412. Taken from Hall (1969, Vol. 1, pp. 287, 289 & 294) and Giglioni (1995, pp. 256 & 261–262).
53. Quotations taken from Boyle (1688, pp. 86, 212, 93–95; cf. p. 218). For more on Boyle's physiology and conception of life see Hall (1969, Vol. 1, Chapter 20); Giglioni (1995).
54. For more on Hooke's physiology see Hall (1969, Vol. 1, Chapter 21).
55. *De anima brutorum quae hominis vitalis ac sensitive est: exercitationes duae*; translated as 'Two Discourses Concerning the Soul of Brutes', Treatise XI in Willis (1684). All references below are to the English translation.
56. For Descartes' claim that the animal's soul is material, see Fifth Replies, AT VII 356; Sixth Replies, AT VI 426; to More, 5 Feb 1649, AT V 276. Descartes identified the animal's soul with its blood, following the scriptures (*Leviticus* 17.14, *Deuteronomy* 12.23), in his letter to Plempius for Fromondus, 3 Oct 1637, AT I 414–415.

    Hall does not distinguish between the different meanings Descartes ascribed to 'soul', and maintains that Descartes simply denied that animals have a soul. He therefore thinks that Willis departed from Descartes in his ideas of the animal soul. 'The title of Willis' work', he writes, 'points to a difference between his view and Descartes' on this subject' (1969, Vol. 1, p. 321). But the difference is not even verbal, as can be seen from the passages referred to in the previous paragraph. Willis interpreted Descartes more accurately than does Hall: Descartes, he writes, asserted 'the Souls of Brutes to consist altogether of round and highly moveable Atoms, which he Calls the Elements of the first Kind' (ibid., p. 3).
57. For more on relevant aspects of Willis's physiology see Brown (1968, Chapter III, mainly pp. 165–171); Hall (1969, Vol. 1, Chapter 22); Finger (2005, Chapter 7).

    Finger mistakenly holds that Willis *departed* from Descartes in ascribing perception and memory to animals, and that 'by refusing to bog himself down with Cartesian metaphysics, Willis opened the door for scientists to study the higher functions of mind in the clinic with animals' (2005, p. 99; cf. p. 92). This is of course mistaken, for Descartes has already developed materialist theories of animal memory and perception, and even dissected animals in order to learn how cognitive faculties are realised in the brain. I

quoted above his letter to Mersenne from late 1632, in which he wrote that he is dissecting animals' heads to see how memory and imagination work (AT I 263). Willis is following Descartes, albeit improving on him in many important claims about brain anatomy and function, rather than rebelling against his metaphysics.

Walter Charleton (1619–1707), then temporary Registrar of the College of Physicians, delivered anatomy lectures in 1679, in which, being strongly influenced by Willis's Cartesianism, he also described the body of man as a 'System of innumerable smaller Machines or Engines' (Brown (1968, p. 173)).

58. The pamphlet was titled, 'Apollo Mathematicus; or, the Art of Curing Diseases by the Mathematicks According to the Principles of Dr. Pitcairn'. Its author was most probably Dr. Edward Eizat, a member of the Royal College of Physicians of Edinburgh. For more on the pamphlet and its criticism of Pitcairn, see Brown (1968, pp. 235–237) and mainly Stigler (1992, pp. 111–118).
59. Quotation taken from Jevons (1962, p. 347).
60. *Praelectiones academicae in proprias institutions rei medicae. Edidit et notas addidit Albertus Haller*. Gottingen and Amsterdam, 1739–1742. Anonymous English translation *Dr. Boerhaave's Academical Lectures on the Theory of Physic. Being a Genuine Translation of his Institutes and Explanatory Comment*, London 1742–1747. Quotations and references in the text are to pages 64–66 and 70 of the English translation, taken from Hall (1969, Vol. 1, p. 370); Cook (2000, p. 234); and Knoeff (2002, p. 88).
61. Page 102 in Boerhaave (1703), 'Oratio de usu ratiocinii mechanici in medicina', reprinted in Luyendijk-Elshout, A. M. and Kegel-Bringreve, E (1983), *Boerhaave's Orations*, Leiden, pp. 94–120. Translation and reference to this treatise, here and below, are taken from Knoeff (2002, pp. 89–90).
62. For more on Boerhaave see Jevons (1962); Hall (1969, Vol. 1, Chapter 26); Wright (2000a); Knoeff (2002).
63. From his commentary to Boerhaave's *Academical Lectures*, Vol. 3, p. 388; quotation and reference taken from Hall (1969, Vol. 1, p. 378).
64. See Hall (1969, Vol. 1, pp. 402–404, 407). Quotation from Haller (1801), *First Lines of Physiology*, Edinburgh, p. 884 (published in Latin in 1747, third edition 1765). See also Wright (2000a).

    On the influence of Boerhaave in England, through his students and otherwise, See Brown (1968, pp.303*ff* & 344*ff*).
65. *Treatise on the Soul* [*Traité de l'âme*] is the title La Mettrie gave in 1750, while preparing for publication his collected works, to his extensively revised earlier *Natural History of the Soul* [*Histoire naturelle de l'âme*], first published in 1745.

    Chapters I to X of the *Treatise* were translated by Thomson into English in La Mettrie (1996); my quotations below are taken from her translation, and page references are to it. Chapter XIII of that treatise, however, On the Intellectual Faculties of the Rational Soul, is also relevant to our survey of La Mettrie's thought. My references to it are to the 1796 reprint of La Mettrie's *Philosophical Writings*, and the translations mine.
66. La Mettrie's monism somewhat resembles Searle's, according to which consciousness is an emergent property of the brain (Searle 1992).

Machine Man and *Treatise on the Soul* seemed to some interpreters to be incompatible, the former denying the existence of the soul while the latter affirming it. But the disagreement is merely terminological. The *Treatise* belongs to the physiologist tradition, and thus uses 'soul' to designate whatever explains life, sensation and thought. The materialist La Mettrie thinks that that thing is material, that its sentient part is extended and resides in the brain, and so on: this is the position of both works, although only in the *Treatise* it is called 'soul'. *Machine Man*, by contrast, is more philosophical (it does not contain the specific physiological hypotheses that can be found in the former work), and it uses 'soul' as was common in that tradition, to designate an immaterial thinking entity. The existence of such an entity is denied in both works.

67. *De la mécanique des animaux*, in Perrault (1721, pp. 330–331); reference taken from Moravia (1978, pp. 48–49); translation mine.
68. Quotation taken from Perrault (1721, Vol. 1, p. 329); translation and reference taken from Des Chene (2005, p. 248).
69. Perrault's 'apperception' seems to be roughly synonymous with our 'consciousness'; see Wright (2000b, p. 688). For more on Perrault see Wright (2000b); Des Chene (2005); Hattab (2011, pp. 83–86).
70. Quotation taken from Hall (1969, p. 360).
71. Section XLI in his *Disquisitio de Mechanismi et Organismi Diversitate*, the essay opening his main work in this field, *Theoria Medica Vera* (1708). Descartes, however, is not mentioned in this section, nor, according to the index to the second edition, anywhere else in the book.
72. On Stahl see Hall (1969, Chapter 25); Moravia (1978); Duchesneau (2000).
73. See Wright (2000b: § 3) on Perrault on the unconscious action of the thinking soul.
74. By *perpetuum mobile* Whytt did not understand the impossibility signified by this phrase today, but a thing that is able to supply itself with new energy for its activities and, before its destruction, is able to reproduce a likeness of itself. Whytt may have taken the phrase from Leibniz. The latter, however, initially thought that the animal is such a perpetually moving *machine*, as he explicitly wrote in his early *The human body, like that of any animal, is a sort of machine* (1680). Despite the later important change in some of his views, mentioned above (note 42, p. 247), he continued to defend some version of this mechanistic conception in his late and acrimonious debate with Stahl (Smith 2011, pp. 103–108).
75. 'Définition de la Vie ; Les Théories Anciennes et la Science Moderne'; reprinted in his *La science expérimentale*, p. 212.

5 Mind, Machine, Sensation

1. See also *Comments on a Certain Broadsheet*, AT VIIIB 353.
2. This understanding of Descartes' arguments, as showing that having a mind is also sufficient for these kinds of behaviour, was denied by Newman (2001, p. 391 and later in his paper). But Newman misses the point of the emphasis on the fools and madmen, an emphasis that is relevant only if the practical

sufficiency of a mind for these kinds of behaviour is meant to be conveyed by it.

Newman also interpreted Descartes not as 'denying that machines can *exhibit* sophisticated language-like behavior – *as if* signifying genuine thought', but as denying that the 'productive processes available to machines' can be like ours, namely, as denying that they can 'use words in order to refer to objects of thought', 'appearances to the contrary notwithstanding' (ibid., p. 401). – But this interpretation is implausible, for it would render inapplicable Descartes' 'very certain means of recognising that [these machines] were not real men' (*Discourse*, AT VI 56, CSM I 139): the 'certain means' are applied on the basis of *appearances*, not on the basis of unknown internal processes. Newman's textual basis for his interpretation is Descartes' claim there, that machines 'could never use words, or put together other signs, as we do *in order* to declare our thoughts to others'. But it is we who are said to use words in order to declare thoughts, while machines are said to be incapable of *imitating our use* of words, not our reasons for this use. So the textual basis for Newman's interpretation is insufficient.

3. This view is different from those of some scholars. Séris, for instance, claims that 'the nature of the machinery a man of his time might have in mind is irrelevant here' (1993, p. 177). But as we have already seen and shall see again below, Descartes *does* rely in his arguments on the nature of the machines with which he was familiar, a thing which refutes Séris' claim.
4. Aristotle of course had a metaphysical theory of the mind as well, which is developed primarily in *On the Soul* III 5, as did later philosophers who preceded Descartes. But in the text I am interested in the ingredients of the conception of man added by Descartes on the basis of the technological innovations of his age.
5. While I am not familiar with the route from Descartes' first reason for denying artefacts intelligence to Turing's counterargument, the one from Descartes' language test to Turing's has been traced by Darren Abramson (2011). Turing read Jefferson's 'The Mind of Mechanical Man' (1949), from which he quotes and to which he responds in his 'Computing Machinery and Intelligence' of 1950 (Section 6.4, The Argument from Consciousness), the earliest work in which the Turing Test is found. Jefferson presents Descartes' language test and quotes from the *Discourse* (p. 1106), a passage in his article that Turing marked with a very heavy line. Turing's test is thus consciously a rendering of Descartes', to which he gives an influential different answer.
6. See primarily the works of Hilary Putnam, published between 1960 and 1967 and collected as papers 17 to 21 in his *Mind, Language and Reality* (1975), in which the conception of man as a probabilistic Turing machine is developed.
7. Fifth Replies, AT VII 356 (quoted above); Sixth Replies, AT VII 426, where a 'corporeal soul' is explicitly ascribed to animals; to Voetius, May 1643, AT VIIIB 168, where the dog is said to have a corporeal soul, 'some thin body'; to More, 5 Feb 1649, AT V 276.
8. Montaigne, *Apology for Raymond Sebond*, Vol. I, pp. 444*ff* in Montaigne (1946).
9. *Meditations* VI, AT VII 81; to Hyperaspistes, Aug 1641, AT III 424; the Sixth Replies, AT VII 437, has the mind 'intimately conjoined' with the brain.

10. My position on this is close to Cottingham's (1985). Others have tried to find a way to avoid ascribing to Descartes modes of this third kind, mixed modes (Farkas 2005). But it seems that the textual evidence is unambiguous. Moreover, Farkas's motive for her interpretation is not textual but the dubious acceptability, in her eyes, of such modes; but there is no indication in Descartes' writing that he also considered them dubious.
11. In this he is more correct than Simmons, who writes that, 'being immaterial, sensations cannot be literally sized, shaped, or positioned', and then interprets a passage in which Descartes seems to assume that they are (Sixth Replies, AT VII 437) as if these sensations merely *represent* size and other similar properties (Simmons 2003, pp. 557–558).
12. *Man* AT XI 174–177, 202; *Discourse* AT VI 55; *Passions* II 136, AT XI 429. The two later occurrences are when the earlier material from *Man* is being mentioned.
13. I discuss Augustine's influence on Descartes in the two last chapters.
14. *Opus maius*, v.1, Distinction 1, Chapter 4; Grant (1974, p. 410).
15. Ibid.; to Elizabeth, 21 May 1643, AT III 667; to Arnauld, 29 July 1648, AT V 222.
16. See Rozemond (2003, § 1) and Reid (2008, esp. § 4) on these issues.
17. The primitive notion of the mind–body union is a later addition to Descartes' list: in the *Rules* only the other three kinds of primitive notions are mentioned, where they are called 'simple natures' (AT X 419). This indicates that Descartes' substance dualism might have gradually developed over the years.
18. Allen also thought that since ideas are modes of the immaterial mind, ideas of 'primary qualities' cannot literally resemble these qualities (namely extension, shape, motion and so on), and that consequently, Descartes' talk of resemblance 'should be understood at least in part metaphorically' (Allen 2008, pp. 285–286). – Yet there is no trace of a metaphorical sense in Descartes' use of 'resemblance' in this connection. On the other hand, once we acknowledge that the mind, in virtue of being 'mixed' with the pineal gland, immediately considers the figures formed on the gland's surface, there is no difficulty in its ideas literally having extension.
19. This might be an appropriate place to discuss the relation of Descartes' thought on animal sensation and behaviour to that of Gómez Pereira (1500–1567). This Spanish doctor claimed in his book *Antoniana Margarita* (1554) that animals have no sensations, and his ideas on the subject were time and again compared to Descartes', the comparison beginning already with Mersenne (letter to Mersenne, 23 June 1641, AT III 386). And although Descartes denied that he has ever seen Pereira's work (ibid.), Pierre-Daniel Huet (1630–1721) and some later philosophers accused Descartes of plagiarism.

    I do not address here the question of influence but rather contrast Pereira's and Descartes' ideas. First, Pereira's reason for denying sensation to animals was his claim that if a creature senses, it also judges and forms universal propositions, abilities which it is absurd to ascribe to animals. This reason is not found in Descartes' work: in this respect Pereira departs, unlike Descartes, from the Aristotelian tradition. Descartes ascribes organic sensation to animals and he also does not imply that awareness of sensory qualities, his second level of sensation which is unique to man, necessarily entails

the ability to judge and form universal propositions. Secondly, the denial that animals have awareness of sensory qualities is what is original with Descartes; while the very distinction between organic or functional sensation and awareness of sensory qualities is not found, to the best of my knowledge, in Pereira's work.

Thirdly, although Pereira is occasionally credited with the idea that the animal is nothing but a machine or natural automaton, this ascription is doubtful. Pereira distinguished between *three* kinds of movement: natural movement, which is the only one found in inorganic objects; voluntary movement, characteristic of humans; and vital movement, which describes animal motion. If this third kind of movement is irreducible to the first kind, then Pereira's thought is here in marked contrast to Descartes', who emphasises that animal movement does not involve any principle not found in inorganic nature. And indeed, in order to explain animal teleological behaviour, which he cannot ascribe to animal sensation, Pereira recognises a special kind of instinctive movements, which involve generic causes. These causes are placed under the general term 'nature', which acts as a regulator, responsible for animals having the organs they need and their capacities, and for some animal movements acting as signs. These special teleological, vital powers are far removed from Descartes' conception of the organic world. Accordingly, claiming, on the basis of Pereira's work, that 'Descartes' model of the animal-machine is not entirely new' (Smith 2011, p. 101), seems unwarranted.

Pereira, writing in mid-sixteenth century, was not familiar with clockwork automata or the other technological developments that inspired the Cartesian view of nature. It was therefore unlikely that his denial of sensation to animals would bring him to develop the view of the animal as a natural automaton.

This being said, it should be noted that Pereira's work has not been sufficiently researched, and further work might bring to light other affinities between his thought and Descartes', as well as additional differences. (My main source for Pereira's thought is Bandrés and Llavona 1992.)

20. For the attempts of La Chambre in his *Treatise on the Knowledge of Animals* (1648) and of Pardies in his *Discourse on the Knowledge of Beasts* (1672) to allow animals to have sensations in the strict sense within a roughly Cartesian framework, see Hatfield (2008, p. 420).
21. The translation originally used 'soul' for both *animus* and *anima* in these passages, although *animus* was occasionally translated by 'mind' as well. For consistency, I translated here *animus* throughout as 'mind' and *anima* as 'soul'.
22. See, for instance, Block and Fodor (1972, pp. 173–174), Block (1978) and Chalmers (1996, pp. 94–99).
23. Kirk, focusing on man alone, claimed that 'although Descartes did everything short of spelling out the idea of zombies, the question of their possibility did not arise for him' (2012, § 1). But Descartes' *animals*, having functional or organic sensation without any consciousness, and thus no pain or any other sensation 'in the strict sense', are exactly these non-conscious automata or zombies.

6 Descartes and the Metaphysical Project

1. The original titles of these books are: *Quaestiones celeberriamae in Genesim*; *L'impiété des deists*; *La vérité des sciences contre les sceptiques et pyrrhoniens*; *Les deux vérités: L'une de Dieu et de sa providence, l'autre de l'immortalité de l'âme*.
2. Rodis-Lewis (1998, p. 67) claims it is likely that Baillet made a mistake in the date of the meeting, which had probably occurred a year earlier, in November 1627. Her arguments rely on the assumption that Descartes retired from Parisian society in order to work on his *metaphysics* before Baillet's date of the meeting, while he embarked on the metaphysical project under Bérulle's influence. But it is equally likely that he retired to work on his geometry, optics and scientific methodology. She also relies on Baillet's claim that in the spring of 1628, namely *before* the meeting at the nuncio's, Descartes had written a draft of a work on God, while she justly argues that it is more likely that Descartes would write such a work *after* the meeting. But one may doubt Baillet's dating of the draft's writing (or even its existence) and not only his dating of the meeting. Descartes' letters to Gibieuf (8 July 1629, AT I 17) and Mersenne (25 Nov 1630, AT I 182), and his own dating in the *Discourse* (AT VI 31) of his move to the Netherlands and the beginning of his metaphysical work, also support the later dating of the draft's writing.
3. Baillet (1691, Vol. 1 p. 165); translation taken from Menn (1998, pp. 48–49), where a more detailed account of the events can be found. Rodis-Lewis (see previous note) also recounts these events, as does Gaukroger (1995, pp. 183–186).
4. The information on the Oratory and the Spiritual School is derived mainly from Jolley (1992, p. 402) and Thompson's introductions to the translations of the writings of the French School of Spirituality (Bérulle 1989).
5. Compare also Descartes' advice to Regius on how to present his position regarding substantial forms and real qualities so as not to raise the opposition of Voetius and his other colleagues (to Regius, Jan 1642, AT III 491*ff*).
6. The *Discourse* and its *Essays* were also published anonymously, to provide Descartes with an additional layer of protection. This did not help much, though, as the identity of the author quickly became common knowledge.

   The first English translator of the *Discourse*, however, misjudged the reason for omitting Descartes' name from his book. 'The Great Des Cartes', he wrote, 'is the Author of this Discourse; which in the Originall was so well known, That it could be no mans but his own, that his Name was not affix'd to it'. (1649, on the first two pages of the unnumbered preface, 'To the Understanding READER'). The translator, himself anonymous, was writing in 1649, after the *Meditations* and the *Principles* had also exploded on the philosophical and scientific scene. But the publication of 1637 was Descartes' first, when he was still largely unknown in the republic of letters, so such a presumption would of course have been unjustified.
7. One of these was by Pierre Petit (1598–1677). His objections did not much impress Descartes, who apparently initially wrote something of an offensive nature about them in the preface to the *Meditations*. But after learning more

about Petit from one of his visitors, Descartes decided to soften his tone and revised the Preface, removing any reference by name to Petit (to Mersenne, 27 May 1638, AT II 144; to Mersenne, 27 May 1641, published in Bos (2010)).

8. See his letters to Etienne Charlet (1570–1652), his former teacher in La Flèche and then the head of the Jesuits in Paris, from October 1644 and 9 Feb 1645.
9. Garber quotes part of this passage from the letter to Mersenne (1986, p. 222) and claims, on its basis, that Descartes tries in the *Meditations* not only to reply to the sceptics, as many interpreters have assumed (see references in the second footnote of his article), but also to establish a new scientific methodology, opposed to the Aristotelian one, which was prevalent in his day. (Garber uses the term 'epistemology', and not 'methodology'; but as he discusses the way of acquiring scientific knowledge, the latter term seems more appropriate.) This new methodology is grounded on the priority of knowledge whose origin is in the pure intellect over ideas that come from the senses. This subject is indeed central to the *Meditations*, and this Platonic methodology is indeed opposed to the Aristotelian one; however, Descartes does not try to deemphasise it in the book. On the contrary: he mentions it in his dedicatory letter to the Sorbonne, in the Preface to the reader (AT VII 4, 9), and primarily in the Synopsis, which he opens by saying that the greatest benefit of the doubts of the First Meditation is in 'providing the easiest route by which the mind may be led away from the senses' (ibid., 12, CSM II 9; see also Synopsis, AT VII 14). The subject is also emphasised in many of its occurrences in the body of the book. It is thus unlikely that this is the subject Descartes is so secretive about in his letter to Mersenne. Moreover, Descartes mentions in that letter the foundations of his physics, and it is more likely that he means by that the basic claims of his physics and not of his methodology.
10. My view on these issues agrees with Curley's, who in Chapter 8 of his book, 'Body', considers 'how Descartes has contrived to smuggle the foundations of his physics into this treatise on first philosophy [namely, the *Meditations*]' (1978, p. 207). While this is the main interest of Curley in that chapter, I shall draw attention to Descartes' smuggled goods primarily in order to show how the *Meditations* project presupposes from its very beginning and all along the way Descartes' developed theories, and by doing that undermines itself. Given his different interests, Curley discusses more places in the *Meditations* than I shall in which Descartes introduces elements of his physics, and I refer the reader to Curley's chapter in order to get a fuller picture of Descartes' subtle manoeuvres, which lead Curley to conclude that the *Meditations* is 'a very artfully constructed work' (p. 234). All the same, I think I do draw attention in the next chapter to several points not mentioned by Curley, among other things to how Descartes' interweaving of his principles of physics into the *Meditations*' metaphysics compromises the effectiveness of some of his arguments.
11. Clarke, who like me emphasises the importance Descartes ascribed to science, also sees the *Meditations* as to some degree an attempt by Descartes to fulfil his duty in this area, but more than that as an 'attempt to reconcile his theologically suspect natural philosophy with an orthodox expression

of scholastic metaphysics' (2003, p. 12). Unlike Clarke, I do not think that Descartes tries to show in the *Meditations* that his natural philosophy agrees with Scholastic metaphysics: as we just saw in his letter to Mersenne, he thinks that his principles '*destroy* the principles of Aristotle'. The *Meditations* is an attempt to introduce these anti-Scholastic principles in a non-emphasised way so that readers will get used to them *despite* the impossibility of reconciliation with Scholastic ideas. Descartes is indeed interested to achieve through his *Meditations* the support of the theologians, but not by establishing such reconciliation.

12. In this my approach is different, for instance, from Janowski's (2004). Janowski compares the *Meditations* to so many of Augustine's writings, that one might get the impression Descartes was among the leading Augustine scholars of the day. Moreover, the textual parallels Janowski notes are occasionally quite minimal, and often between ideas found in many philosophical writings, from antiquity to Descartes' times; they cannot therefore be taken as evidence for Augustine's influence on Descartes, and certainly not as evidence for direct influence. All the same, Janowski's commentary contains much useful information on Augustinianism in France in Descartes' time and on the way his contemporaries saw the relation between the two.
13. Later in the century Cartesians will often refer to the coincidence between Augustine's and Descartes' ideas in order to defend Descartes. For instance, the subtitle of La Forge's apologetic Preface to his book, *Treatise on the Human Mind* (*Traitté de l'Esprit de l'Homme*, 1664), is 'In which the author shows the agreement between Saint Augustine's teaching concerning the nature of the soul and the views of Mr Descartes'.
14. See Rodis-Lewis (1998, p. 110 and note 38).
15. See van Berkel (2000).

7 The *Meditations*: Borrowed Themes with Original Variations

1. Descartes was later to explain to Burman (AT V 146) that by 'from the senses' he referred to beliefs acquired by sight, namely beliefs about colour, shape and such like. By 'through the senses', Burman reports, Descartes meant everything else, namely beliefs acquired through hearing, from his parents, teachers, and others.

   It is hard to believe that this was indeed Descartes' intention with these phrases. Why should sight have any priority over, say, smell? The former appears to teach us about the colour of things and the latter about their smell. And Descartes' criticism of the senses, as well as the kind of knowledge he eventually does allow them to convey, apply equally to sight and smell. On the other hand, hearing does not exclude sight as a source of transmitted knowledge: we not only hear what other people say but also read what they write. The content in this passage might be influenced both by Descartes' occasional impromptu responses to Burman (which we have already witnessed above) and perhaps by inadequate reporting on Burman's behalf, and cannot be taken as Descartes' considered intention.

A distinction that can, however, be reconstructed from this passage is as follows. Beliefs acquired from the senses are beliefs about what we seem to perceive, while beliefs acquired through the senses are beliefs that were transmitted to us by means of language. Criticising the validity of these beliefs would also undermine everything else that was built on them as foundations.

2. For discussions by editors of Descartes' texts of the dating of the dialogue, see references in CSM II 399, note 2 and Gaukroger (1995, p. 463, notes 29 & 30). Adam argued powerfully for the *Search*'s being in style closer to the works predating the *Meditations* and for the unlikelihood of a late date, although he then tried to describe it – quite unconvincingly, in my opinion – as partly depicting an actual dialogue that took place in late 1641 (AT X 529–532). Gaukroger suggested that the *Search* was composed as a draft of the *Meditations* (1995, p. 362), which would date it between the *Discourse* and the *Meditations*, as I do here. Unlike Gaukroger (ibid., p. 363), however, I find the alleged parallels between Epistemon's objections to the Cartesian ideas in the *Search* and those made by Bourdin in the seventh set of objections, which date from 1642, too insignificant to prefer that year as the date of composition or of the revision of an earlier composition (my view on these parallels is in agreement with CSM II 399). Moreover, after having published the *Meditations*, together with their long objections and replies, there is no use in repeating their argument in such detail in another composition, as is done in the *Search*; if a need to repeat the sceptical argument arises again, it is better to do that in a concise form and refer to the *Meditations* for further detail – as is done in the *Principles*. It seems more plausible that once he decided to publish a more detailed metaphysical treatise after having published the *Discourse*, Descartes first attempted a dialogue form, perhaps inspired by Galileo's *Two New Sciences*, which he has just read (1638). But first, the dialogue drags, unlike Descartes' usual prose, which would be one reason to abandon the form, never again attempted by Descartes; secondly, it is highly artificial: Polyander's effortless conversion to Cartesianism is unconvincing, as are other aspects of the work; thirdly, Descartes might have become dissatisfied with the dialogue form as he realised that a work in the form of private meditations is more appropriate for the first-person reflections of his metaphysics; and fourthly, the explicit confrontation the dialogue contains and encourages between Epistemon's Scholasticism and Eudoxus's Cartesianism is what Descartes came to see as something his treatise should avoid as much as possible. The dialogue was thus abandoned in the midst of a sentence it would have been impossible to complete convincingly – the naïve Polyander spontaneously providing a Cartesian characterisation of thought – and the project of the *Meditations* begun.
3. See also Menn (1998, p. 227) for a comparison of the two texts.

The *Meditations* is a little more articulate than the *Search* in rejecting the argument from the insane. In the *Search* the 'good man' is *indignant* if his beliefs are compared to the madmen's; in the *Meditations*, by contrast, instead of an emotional reaction to the comparison, we find the more rational argument that grounding doubts in our senses – in the reliability of our faculties – on the unreliability of the madmen's faculties would be madness in its own right. (This is perhaps the reason for not mentioning the madmen in the concise presentation of the sceptical argument in the *Principles*.) This slight

development again supports the claim that the *Meditations* was composed after the *Search*.

4. Again, once Descartes has formulated a powerful principle, he repeats it in the later work, and we have another reason for thinking that the *Search* was written before the *Meditations*.
5. I thus follow Wilson's interpretation of the dream argument (1978, pp. 17–31). Wilson argued powerfully for her interpretation and against an alternative epistemic one, as developed by Malcolm (1959, pp. 101–107), Frankfurt (1970, pp. 42, 46) and others. According to the latter interpretation, Descartes, at least in the *Meditations*, claims that we do not have sure signs that can decide *which* of our experiences are indeed had while we are awake. As we shall see below, this was Plato's version of the argument.
6. As noted above (p. 172), Descartes wrote in his letters that he deliberately did not explain in the *Discourse* in detail 'the falsehood or uncertainty to be found in all the judgements that depend on the senses and the imagination' because he was 'afraid that weak minds might avidly embrace the doubts and scruples which [he] would have had to propound, and afterwards be unable to follow as fully the arguments by which [he] would have endeavoured to remove them' (to Mersenne, Feb or Apr 1637, AT I 350, CSMK 53; cf. to Vatier, 22 Feb 1638, AT I 560). But there is no indication here that what he left out included scepticism that relies on God's omnipotence.
7. Groarke, trying to defend the possibility that Cicero influenced Descartes in this respect in view of Curley's doubts, claimed that the ancient sceptical argument may well have targeted mathematical principles as well (1984, pp. 287–288). Even if he is right in his claim, this is not how the argument is presented by Cicero and it is therefore unlikely that Descartes got this *application* of the argument from reading the *Academica*. But given the way the sceptical argument from God's omnipotence has developed in Descartes' writings, the influence claim is plausible even without this interpretation of Cicero.
8. This discussion in *On the Trinity* is part of a larger one, in which Plato's theory of recollection is examined in order to be transformed. Augustine mentions the questioning of the boy in the *Meno* (81*ff*) and rejects Plato's view that the boy recollects previous experiences. He does think, however, that the way the boy replies supports the view that God created our intellectual minds so that they possess 'a sort of incorporeal light' that enables us to understand intelligible things, in contrast to sensible things. This view is again similar to what is found in Descartes' writings. Moreover, like Augustine in *On the Trinity*, Descartes reinterprets in passing in the *Meditations* the phenomenon of a priori mathematical knowledge as indicating not recollection but innateness:

   > The truth of these matters is so open and so much in harmony with my nature, that on first discovering them it seems that I am not so much learning something new as remembering what I knew before; or it seems like noticing for the first time things which were long present within me although I had never turned my mental gaze on them before. (Fifth Meditation, AT VII 64, CSM II 44)

   In addition, Descartes will also mention approvingly the questioning of the boy in the *Meno* as demonstrating his own understanding of innate ideas (to Voetius, May 1643, AT VIIIB 166–167).

For more on Augustine on this kind of a priori knowledge, the way he initially used Plato's recollection theory at least metaphorically, and eventually transformed it into his own later theory, see O'Daly (1987, pp. 199–204).

9. These passages have indeed misled Gueroult, who was corrected by Curley (1978, p. 209).
10. On this passage, see also Curley (1978, pp. 208–210), for an analysis that adds to my comments below on how Descartes smuggles here into the *Meditations* elements of his physics.
11. This problem with the argument led Rozemond to argue that in fact the simple, universal things do include the sensory qualities, and that their list is incomplete: the 'and the like' [& *similia*] clause concluding the list is meant to refer to them (1996, pp. 38–42). The reasons she suggested for this peculiar omission were powerfully criticised by Bermúdez (1998).

    More recently, Cunning has followed Rozemond in claiming that the 'and the like' clause is meant to refer to the sensory qualities, but unlike her he argued that Descartes intentionally left this ambiguous so that different readers could interpret his claim differently: an Aristotelian reader would read the sensory qualities into this clause while a mechanist one will take them as having been eliminated (2010, pp. 56*ff*). However, if Descartes thought the Aristotelian's interpretation of the dream argument and the painter analogy is at this stage justified, why should he have left the mechanist's one open as well? After all, he (Descartes) intends to give later in the work sufficient reasons for eliminating the subjective sensory qualities from the physical world, so why allow and even imply at this stage an invalid interpretation of his argument, compromising the logic of a text that is meant to provide secure foundations to human knowledge? Moreover, in all his treatments of the doubt, Descartes, following the Platonic tradition, distinguishes the knowledge that originates in the senses, which is affected by the dream argument, from that founded in reason, which needs a separate argument in order to be cast in doubt. There is no justification for thinking that he temporarily (between *Discourse* and *Principles*) changed his mind on that and intended to hint at this new view by an ellipsis which prima facie implies the contrary interpretation.
12. Hatfield mentions this influence of Descartes' metaphysics on his argument (2003, pp. 78–80), but he does not note how this influence is incompatible with Descartes' declared project.
13. Gueroult also noticed (1984, p. 17) that 'the question of truth has changed along the way' from one about reality to one about relations between concepts, a change that he found 'so surprising at first'. He tried to justify this change by interpreting the text along Kantian lines, as if Descartes moves from particular representations to 'necessary, universal conditions of all possible representation …, imaginary as well as real'. But it is hard to see how this anachronistic interpretation is anchored in the text, or how it is supposed to resolve the difficulty.
14. The insane usually accompanied the dreaming in ancient sceptical arguments – see Plato, *Theaetetus* 158; Cicero, *Academica* II (Lucullus) XV.47–XVII.55 and XXVII.88–XXVIII.90; Sextus, *Adversus Mathematicos* 7.402–8. Their *presence* in Augustine's work therefore does not indicate his influence

on Descartes. The significant parallel is in the *use* of madness and dreams by both philosophers.

15. See also Curley (1978, pp. 208–210). Unlike Curley, I emphasise how Descartes' strained introduction of his conception of material nature compromises the cogency of his arguments.
16. See Sextus Empiricus, *Outlines of Pyrrhonism* I 104, where the dream and waking states are compared, and ibid., I 114, where the preference of one over the other is claimed to be in need of a proved criterion, 'proof' translating *apodeixis*. See also Sextus, *Adversus Mathematicos* 7.402–8, where the discussion of the indistinguishability of appearances in dream from those in the awaken state is done as part of the general sceptical argument for the rejection of a distinguishing criterion.
17. My discussion of Al-Ghazali is indebted to Groarke's (1984, § 4), but while he assimilates Al-Ghazali's dream argument to Descartes', I emphasise the distinctions between them, which are due to their different metaphysical positions.
18. Augustine is clearly *not* thinking of the world as an appearance in the mind but as the thing that appears to us; a phenomenal, Berkeleyan interpretation of his suggestion is unjustified (contrast Matthews (2005, p. 20)).
19. Both de Rijk and Moody (in Hyman and Walsh (1983, p. 657)) misleadingly translate 'external to the mind'.
20. De Rijk misleadingly translates 'in your direct surroundings', obscuring the contrast with the external; Moody (p. 659) correctly translates 'within'.
21. A fine point that needs clarification here concerns Descartes' claim that the subjective sensory qualities are *mixed* modes, instantiated in the mind only when it is united with a body (*Principles* I 48). As such they do not exist in a disembodied mind, and this seems to be in disagreement with my claim in the text, that Descartes was the first to think that they exist in the immaterial mind. We should remember, however, that Descartes thinks that what is an action in one subject is a passion in another (*Passions* I 1). An idea of sensation is thus according to him a passion of the soul but an action of the body, while an idea of imagination, an action of the soul, is a passion of the body (ibid., 19–23). Accordingly, the idea of sensation, as instantiated in the mind, is indeed a mode of an immaterial entity, although at the same time a mode of a body as well. But while we are ignorant of its bodily cause, as Descartes is at this stage of the *Meditations*, we know it only as the mode of something immaterial, and therefore we are still ignorant of the existence of any body. As far as we know, its cause might be a malicious demon.
22. See Fine (2000), § 8, especially pp. 228–229.
23. Williams seems to have later changed his view on these issues, claiming that Descartes' scepticism about the material world depends on God or a deceiving demon (2010, p. 303 'Third Obstacle' and p. 311). But as we saw, in the *Discourse*, *Search* and *Principles* this scepticism does not involve God; so Williams's interpretation, which relies only on an analysis of the argument of the *Meditations*, is unacceptable.
24. For the development of scepticism about the material world in France in the later seventeenth century, in the works of Huet, Foucher and Bayle, see Maia Neto (2011, pp. 241–246); for a survey of the debate between Malebranche and Arnauld on this issue, see Bayle (1991, Comment H on the entry on Zeno of Elea, pp. 373–377).

25. The last two references are taken from Kehr (1916, pp. 589, 591).
26. Matthews maintained that in these passages 'we must understand "life" and "alive" and their cognates, not in any specifically biological sense, but rather in the way we naturally understand "life" in the question "Is there life after death?" As that question is normally understood, an affirmative answer might be supported by evidence of some post-mortem form of conscious existence that failed to have any biological basis' (2005, p. 39). He thus both (i) denies to 'life' in this context a biological meaning and (ii) takes it as equivalent to existence as a mind. The second claim is explicitly rejected in the passage from the *On the Free Choice of the Will* I have just quoted, and cannot therefore be accepted. Moreover, the fact that Augustine infers existence, life and understanding at this place also shows that he distinguishes life from both existence and understanding. This does not entail, however, that he understands life as some physical-biological phenomenon, as Matthews seems to assume. I return in the text to Augustine's understanding of life.
27. Already Arnauld (letter to Descartes, 3 June 1648, AT V 186) and Malebranche (*On the Search for Truth*, First Book, Chapter 10, Section I, p. 49) recognised the similarity between the proofs of the immateriality of the soul found in these two places in Augustine's and Descartes' writings.
28. To Mersenne, 11 June 1640, AT III 84–85 and 6 Aug 1640, AT III 143; to Huygens, 10 Oct 1642, AT III 580 = 798; to Mesland, 2 May 1644, AT IV 414; Conversations with Burman, 16 Apr 1648, AT V 150; for [Arnauld], 4 June 1648, AT V 192–193.
29. For Descartes views on the intellectual memory, their development and their relation to his views on the corporeal memory, see Fóti (2000).
30. This clause was translated into French, 'in so far only as they are modes of thinking' [*en tant seulement qu'elles sont des façons de penser*] (AT IX 27), a translation tolerated by the Latin original, which emphasises the fact that for Descartes they are not only modes of thought.
31. Descartes' strategy here resembles Augustine's in Book 11 of *On the Trinity*, as described in its first chapter. Augustine would like to look for an image of the trinity in our rational souls. However, 'by the very order of our condition ... we apply ourselves more easily and, so to speak, more familiarly with visible than with intelligible things, since ... we perceive the former through the sense of the body, but the latter through the mind.' Consequently,

    > our thought has projected itself outwardly with so wonderful a proclivity towards these bodies, that when it has been withdrawn from the uncertain realm of bodies and fixes its attention on the much more certain and more stable knowledge of the spirit, it again takes refuge in these bodies and seeks rest there from the place where it drew its weakness.

    He accordingly concludes:

    > We must adjust ourselves to this weakness. If, then, we seek at any time to distinguish interior and spiritual things more aptly, and to intimate them more easily, we must take examples of likenesses from external and corporeal things.

    Augustine therefore begins his inquiry by searching for some likeness of the trinity in 'external and corporeal things', namely 'the outer man'.

32. Descartes does not use 'perception' as the term is often used today, to refer just to the operation of the senses, and certainly not to that operation to the extent that it is found in animals as well. For him, perception is 'the operation of the intellect', and 'sensation, imagination and pure understanding are simply various modes of perception' (*Principles* I 32). In this sense he often talks of 'clear and distinct perception', as also of his perception of God (e.g. AT VII 45).
33. See, for instance, the meticulous discussions by Williams (1978, Chapter 8) and Wilson (1978, Chapter II, §§ 4–6).
34. See Curley (1978, pp. 210–216) for more on these aspects of the wax discussion.
35. This conclusion is indeed quite weak: it is doubtful whether it makes any sense, and even granting that it does, one is very hard-pressed to see why it should follow from its premises. Similar doubts also apply to much of Descartes' proof of God's existence in the Third Meditation. But the important thing for our discussion, here and below, is not the soundness of Descartes' argument but the fact that he thinks it is sound.
36. Descartes introduces at this place the concept of an idea being *materially* false, a concept which he will mention only once again in the *Meditations* (AT VII 46). What he means by it and whether it can be made consistent with other things he maintains has remained unclear. The only objector who mentioned the concept was Arnauld, to whom it seemed 'inconsistent with the author's own principles' (AT VII 206), as he proceeded to argue. Descartes responded to Arnauld's criticisms over four AT pages (232–235), eventually explicitly relying on a Scholastic use of the term (Suarez's) to defend his own. But he himself may have remained unsatisfied with his efforts to clarify the concept, as he never used it again in later work (nor did he use it in his earlier works). For the different views of commentators on the concept and its compatibility with Descartes' other claims, see Wilson (1978, pp. 95*ff*), Alanen (1994), Nelson (1996) and Hatfield (2013).

    We don't need to take a stand here in the debate over the interpretation of the concept of material falsity. What is important to our purposes is Descartes' claim that the ideas of heat and cold contain very little clarity and distinctness, and the fact that he makes this claim is independent of the interpretation of that concept. In addition, as I proceed to argue in the next paragraph, the more strained his argument at this place is, the more likely it is that this passage is an unnecessary digression, meant to undermine in passing the Aristotelian conception of material nature. And Descartes' problematic apparent retraction of his view that falsity is in judgement alone, while relying on a newly introduced unclear concept which he will mention only once again in the whole work, clearly supports this view of the purpose of the passage.
37. For a more detailed discussion see Curley (1978, Chapter 8, §§ III–VI).

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