The Concept of Substance

Descartes

In Seventeenth Century

Spinoza

Metaphysics

Leibniz

R. S. Woolhouse

DESCARTES, SPINOZA, LEIBNIZ

'This book is both a fine introduction to the metaphysics of Descartes, Spinoza and Leibniz, and a rich and wide-ranging study of the interaction between natural sciences and metaphysics in the seventeenth century. The writing is clear and direct; competing interpretations are patiently developed and judiciously evaluated; and the author's chosen theme—the metaphysics of "substance"—ties the chapters closely together.… The book will be useful in intermediate and advanced undergraduate courses—in surveys of modern philosophy, surveys of rationalism, and seminars on Descartes, Spinoza, and Leibniz.'

Kenneth P.Winkler, *Wellesley College*

Roger Woolhouse is Reader in Philosophy at the University of York. He has taught previously at the Universities of California, Pennsylvania, Princeton and Wales. His earlier books include *Locke* (1983) and *The Empiricists* (1988). He also edited the Leibniz volumes for Routledge's Critical Assessments of Leading Philosophers series.

DESCARTES, SPINOZA, LEIBNIZ

The concept of substance in seventeenth-century metaphysics

R.S. Woolhouse

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Editions and Abbreviations

DESCARTES

Particular Works

B	'Conversation with Burman', as in John Cottingham (trans.) (1976) *Descartes' Conversation with Burman*, Oxford: Clarendon Press.
Med	*Meditations on First Philosophy*, as in CSM 2.
PP	*Principles of Philosophy*, as in CSM 1 and MM. (Unless indicated otherwise, all quotations from *PP* are from CSM 1.)
PS	*The Passions of the Soul*, as in CSM 1.
Rep	*Replies to Objections to the Meditations*, as in CSM 2.

Editions

AT:	Charles Adam and Paul Tannery (eds) (1897–1913) *Oeuvres de Descartes*, 13 vols., Paris: Cerf (reprinted (1957–8) Paris: Vrin).
CSM	John Cottingham, Robert Stoothoff, and Dugald Murdoch (trans.) (1985) *The Philosophical Writings of Descartes,* 2 vols, Cambridge: Cambridge University Press.
K	Anthony Kenny (trans. and ed.) (1970) *Descartes*: *Philosophical Letters*, Oxford: Oxford University Press.
MM	Valentine Rodger Miller and Reese P.Miller (trans. and eds.) (1983) *René Descartes*: *Principles of Philosophy*, Dordrecht: Reidel.

SPINOZA

Particular works

DPP	*Descartes*' '*Principles of Philosophy*', as in C.
E	*Ethics*, as in C. (References to this are of the form '2P13D', i.e. Demonstration of Proposition 13 of part 2. Other abbreviations are S, scholium; A, axiom; Pref, preface; Def, definition; C, corollary; E, explanation.
Ep	*Correspondence*, as in C (*Eps* 1–29) and W.
TGM	*Short Treatise on God and Man*, as in C.
TPT	*Theologico-Political Treatise*, as in El.

Editions

C	E.M.Curley (trans. and ed.) (1985) *The Collected Works of Spinoza*, vol. 1, Princeton, NJ: Princeton University Press.
El	R.H.M.Elwes (trans.) (1883) *The Chief Works of Spinoza*, 2 vols, London: Bell (reprinted (1951) New York: Dover).
W	A.Wolf (trans. and ed.) (1928) *The Correspondence of Spinoza*, London: Allen & Unwin.

LEIBNIZ

Particular works

DM	*Discourse on Metaphysics*, as in L.
LA	*Correspondence with Arnauld*, as in H.T.Mason (trans. and ed.) (1967) *The Leibniz—Arnauld Correspondence*, Manchester/New York: Manchester University Press/ Barnes & Noble.
NE	*New Essays on Human Understanding*, as in RB.
T	*Theodicy*, as in H.

Editions

AG	Roger Ariew and Daniel Garber (trans.) (1989) *G.W. Leibniz*: *Philosophical Essays,* Indianapolis and Cambridge, MA: Hackett.

E	J.E.Erdmann (ed.) (1840) *G.G.Leibnitii Opera Philosophiae Quae Extant*, 2 vols, Berlin, G.Eichler.
G	C.I.Gerhardt (ed.) (1875–90) *Philosophischen Schriften*, 7 vols, Berlin: Weidmann.
GM	C.I.Gerhardt (ed.) (1849–55) *Mathematische Schriften*, 7 vols, Berlin and Halle: H.W.Schmidt.
Gr	G.Grua (ed.) (1948) *G.W.Leibniz*: *Textes inédits*, 2 vols, Paris: Presses Universitaires de France.
H	E.M.Huggard (trans.) (1951) *Leibniz' Theodicy*: *Essays on the Goodness of God, the Freedom of Man, and the Origin of Evil*, London: Routledge & Kegan Paul.
L	Leroy L.Loemker (trans. and ed.) (1969) *Leibniz*: *Philosophical Papers and Letters*, 2nd edn, Dordrecht-Holland: Reidel.
La	Alfred Gideon Langley (trans.) (1949) *Leibniz*: *New Essays Concerning Human Understanding, Together with an Appendix Consisting of Some of his Shorter Pieces*, La Salle, IL: Open Court.
LP	G.H.R.Parkinson (trans. and ed.) (1966) *Leibniz*: *Logical Papers*, Oxford: Clarendon Press.
Lt	Robert Latta (trans. and ed.) (1898) *Leibniz*: *The Monadology and other Philosophical Writings*, London: Oxford University Press.
PM	G.H.R.Parkinson and Mary Morris (trans. and eds) (1973) *Leibniz*: *Philosophical Writings*, London: Dent.
RB	Peter Remnant and Jonathan Bennett (trans. and eds) (1981) *G.W.Leibniz*: *New Essays on Human Understanding*, Cambridge: Cambridge University Press.
Wi	Philip P.Wiener (trans. and ed.) (1951) *Leibniz*: *Selections*, New York: Scribner's.

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Introduction

Modern philosophy is usually taken to date from the seventeenth century, and René Descartes (1596–1650) is often named as its father. This need not mean that Descartes was *the* first noteworthy and identifiably 'modern' philosopher. Thomas Hobbes (1588–1679) has claims there too. What it does mean is that Descartes more than others was responsible for the style, the shape, and the content of much subsequent philosophy—at first on the Continent, and then in England.[1] His distinction between extended and thinking substance, his proofs of his own existence and of that of a good God, his account of the material world as one of extended matter in motion, all stirred up controversy and discussion whose waves rocked the remainder of the seventeenth century and troubled most of the eighteenth, and whose ripples are still discernible today. Contemporary reports, from both sides of the English Channel, testify to one aspect of his importance: his freshness and newness. According to Christian Huygens, the Dutch mathematician, astronomer, and physicist,

> What greatly pleased in the beginning when this philosophy began to appear is that one understood what M. des Cartes was saying, while the other philosophers gave us words that made nothing comprehensible, such as qualities, substantial forms, intentional species, etc. He rejected more universally than any other before him this irrelevant paraphernalia. But what especially recommended his philosophy, is that he did not stop short at giving a disgust for the old, but he dared to substitute causes that can be understood of all there is in nature.
>
> (trans. Dugas 1958:312)

It was to the same 'justly-admired gentleman' that John Locke said he owed 'the great obligation of my first deliverance from the unintelligible way of talking of the philosophy in use in the schools in his time' (1823:4.48).

In these testimonials to Descartes's influence on the seventeenth century his 'new' philosophy is contrasted with an 'official', Scholastic, or 'school' philosophy—a philosophy filled with ideas which had begun to seem unintelligible. This older philosophy belongs to a broadly Aristotelian tradition, and it is the explicit rejection of this tradition, and of the authority of Aristotle, that marks for Descartes, and for many of his contemporaries and successors, their own sense of their 'modernity'.

Two people for whom Descartes's philosophy set a new, post-Aristotelian scene were Benedict Spinoza (1632–77) and Gottfried Leibniz (1646–1716). Leibniz says that Spinoza 'only cultivated certain seeds in the philosophy of Descartes' (G 2.563) and that his philosophy is 'an exaggerated Cartesianism' (*T* 359). As for Descartes himself, he is someone 'whose genius is elevated almost above all praise'. He 'certainly began the true and right way', and said 'excellent and original things'. Yet Leibniz's praise had its limits: though going so far as to be 'the entrance hall to the truth', Descartes's philosophy 'missed the mark' and did not quite make it.[2] Leibniz's disagreements with it are deep. Spinoza too had his criticisms of Descartes,[3] and Descartes's own followers were keen, on theological grounds, to dispel any idea that Spinoza might be one of them.[4] None of this, however, prevented the development of a tradition which pictures both Spinoza and Leibniz as 'Cartesians'.[5]

In its discussion of the metaphysical views of these three important seventeenth-century philosophers this book supposes that there are intrinsic relations between them. But it formulates no general conclusions about whether Spinoza and Leibniz are or are not 'Cartesians'. It simply proceeds on the assumption—an assumption to be judged by its fruits—that the very shape or conceptual content, and not the mere verbal dress,[6] of many of Spinoza's ideas have Cartesian ones as a background; and that (whether directly, or indirectly via Spinoza) the same is true of Leibniz.

Spinoza was 18 when Descartes died, and they neither met nor corresponded. In 1663, however, he published an exposition of Descartes's influential *Principles of Philosophy* (1644). This

wasdesigned as tuition material for a pupil to whom, Spinoza says, 'I did not want to teach my own opinions openly' (*Ep* 13/C 207), and Spinoza agreed with friends that he should 'warn…Readers that I did not acknowledge all the opinions…as my own, *since I had written many things…which were the very opposite of what I held'* (*Ep* 13/C 207). Nevertheless its very existence betokens a deep understanding of, and concern with, Cartesianism. It is no surprise that Spinoza's *own* philosophy in his *Ethics* (1677) shows keen awareness of Descartes's.

Fourteen years younger than Spinoza, Leibniz was only 4 when Descartes died. They had quasi-personal contact when Leibniz met Descartes's friend and literary executor, Claude Clerselier, who showed him some of Descartes's unpublished papers.[7] But like any other European philosopher of the time, Leibniz read and studied Descartes, and in the 1690s he too had plans to publish an assessment of Descartes's *Principles of Philosophy*[8] This assessment would have brought together all the ways in which Descartes, so near to the truth, had yet 'missed the mark' (L 432), and all the criticisms Leibniz had developed over the years, and out of which his own positive views had emerged. His relationship to Descartes is well-summed up in a letter of 1680:

> I esteem Mr Descartes almost as much as one can esteem any man, and though there are among his opinions some which seem false to me…this does not keep me from saying that we owe nearly as much to Galileo and to him in philosophical matters as to the whole of antiquity.
>
> (L 273)

As for Spinoza and Leibniz, they both corresponded and met. In 1671, in an exchange of letters on optics,[9] Spinoza offered to send Leibniz his recently published *Tractatus Theologico-Politicus*. Later, in 1675, Leibniz was suggested to Spinoza as someone 'very expert in metaphysical studies' (*Ep* 70/W 339), and hence as someone to whom the manuscript of the *Ethics,* then circulating among Spinoza's friends, might usefully be shown. Spinoza, whose *Tractatus Theologico-Politicus* (1670) had already become infamous, considered 'it imprudent to entrust my writings to him so soon' (*Ep* 72/W 431), and asked that more be learnt about Leibniz's character. In the event, Leibniz met with Spinoza in Holland the next year and, he reported, 'spoke with him several

times and for very long' (L 167); according to notes he made at thetime, at least some of the discussion concerned *the Ethics*. Spinoza died the next year, and when the *Ethics* was eventually published Leibniz made further detailed notes.[10] Many of these are critical, as are most of the comments on Spinoza which are scattered through his writings. Like others at the time Leibniz thought that Spinoza's ideas were dangerous to religion; his view of the nature of God and creation in particular. He often explicitly contrasts his own doctrines with Spinoza's. A letter he wrote on the publication of Spinoza's *Ethics* gives an assessment of the relationship between their ideas:

> I have found there a number of excellent thoughts which agree with my own, as some of my friends know who have also learned from Spinoza. But there are also paradoxes which I do not find true or even plausible. As, for example, that there is only one substance, namely God; that creatures [created things] are modes or accidents of God.… I consider this book dangerous for those who wish to take the pains to master it.
>
> (L 195)

This book discusses the metaphysics of these three philosophers. Specifically, it focuses on what Descartes, Spinoza, and Leibniz say about 'substance'. '[F]ailure to understand the nature' of this is, says Leibniz, 'the cause of [Descartes's] errors' (L 433) and of Spinoza's 'paradoxes' (L 195). But what is 'metaphysics'? What is 'substance'?

The term 'metaphysics' originated as the title of some of Aristotle's books. Though Aristotle himself called the subject matter of these books 'first philosophy', it appears that in early editions of his works they were arranged in order after his book *Physics;* so they, and hence their subject matter, came to be known as *Metaphysics* ('after', 'above', or 'beyond' the *Physics*). One part of 'first philosophy' as conceived by Aristotle was the study of 'being as being' (*Met* 1003a20), a study which concerns the question what being is. This question, says Aristotle, 'was raised of old and is raised now and always, and is always the subject of doubt'; and he adds that the question 'What is being?' 'is just the question, what is substance?' (*Met* 1028b3). The questions are the same because the Greek for the English word 'substance' (Latin: *substantia*) is *ousia,* which comes from the Greek verb for 'to be'.

One natural way to understand the question what being or substance is, and one which fits much of what Aristotle says, is as a request for an account of what is real. 'What does reality comprise?' (Stead:66), a recent writer on Aristotle puts it. So, as Aristotle remarks, 'substance' or 'being' is 'thought to belong most obviously to bodies' (*Met* 1028b9); these are what are most naturally picked out as constitutive of reality. '[W]e say that not only animals and plants…are substances, but also natural bodies such as fire and water and earth.' But whether this initial, 'most obvious', thought is right, whether these *really are* substances, is, says Aristotle, something which 'must be considered' (*Met* 1028b8–16).

To a considerable extent Aristotle thinks the thought *is* correct, though on the way to this conclusion he gives a lengthy account of just what it is about animals, plants, and natural bodies that constitutes their being or substantiality. Moreover, as he points out, some people have thought otherwise. Various earlier Greek philosophers had thought that reality consists ultimately in something other than these things, something of which these things are merely the surface phenomena. Some had held that there is one basic substance or ultimately real being: according to Thales this is 'water'; according to Parmenides it is an everlasting, motionless, and homogeneous 'One'. Some had held that there is more than one basic substance or ultimately real being: according to Empedocles the world as we know it is produced from four 'roots' or 'elements'—Fire, Air, Earth, Water—worked on by the two principles of Love and Strife; according to the atomists such as Democritus it is a result of the chance movements and collisions of differently shaped indivisible atoms.

The ancient Greek interest in metaphysics, and its core question about substance or being, is shared by the philosophers of the seventeenth century. In fact it is one of their central concerns. According to Leibniz, 'the consideration of substance is of the greatest importance and fruitfulness for philosophy' (*NE* 151); and these words could serve as a motto not only for his work but also for that of Descartes and Spinoza. He also says, in an article 'On the correction of metaphysics and the concept of substance', that unlike Descartes's account, which led to error, *his* 'is so fruitful that there follow from it primary truths, even about God and minds and the nature of bodies—truths heretofore known in part though barely demonstrated, and unknown in part, but ofthe greatest

utility for the future in the other sciences' (L 433). Leibniz's estimation of the importance of the concept of substance is correct. What he says follows from his account is the heart of nearly the whole of his philosophy; and Spinoza's great work, the *Ethics,* is essentially nothing less than a lengthy elaboration of the definition of substance with which it all but opens. As for Descartes, though his writings are not so clearly structured as a metaphysics of substance, he certainly develops one at length, and many of his philosophical views connect with it; without it, Spinoza and Leibniz would not have written as they did.

Besides sharing an interest in the question what substance or being is, the philosophers of the seventeenth century also retain the original Aristotelian idea of metaphysics as 'first' or foundational philosophy. This is vividly presented in the preface to Descartes's *Principles of Philosophy,* where the whole of philosophy is portrayed as a tree: 'The roots are metaphysics, the trunk is physics, and the branches emerging from the trunk are all the other sciences' (CSM 1.186). The idea of metaphysics—'this regal science' (L 432)—as the foundation or source of other branches of knowledge is taken up by Leibniz too. Sciences such as physics depend on it: 'the laws of mechanics…flow…from metaphysical principles' (trans. MacDonald Ross:146); they 'cannot be advanced without metaphysical principles', principles without which 'general physics is entirely incomplete' (trans. MacDonald Ross:154).

Given the actual origin of the term 'metaphysics', it is just a coincidence that a main concern of 'first philosophy', as understood and developed not only by Aristotle but also in the seventeenth century, can be thought of as metaphysical or *beyond* physics in the sense of being more basic, abstract and general than physics. Physics, we might say, tells us about the details of the world's phenomena; metaphysics about what underlies those phenomena, what the reality, being, or substantiality of the world basically or ultimately consists in. Thus, to understand the detailed workings of the world, all the phenomena and appearances which it presents to us, is to understand them in terms of the properties and activities of the substances which constitute the world. But, in the context of the philosophy of the seventeenth century, it is a particularly nice coincidence. That century saw the emergence and development of what we now know as modern science. It saw the publication of Johannes Kepler's *New Astronomyor Celestial*

Physics (1609), William Harvey's *Anatomical Essay on the Motion of the Heart and Blood* (1628), Galileo Galilei's *Dialogues on the Two Chief Systems of the World* (1632), and Isaac Newton's *The Mathematical Principles of Natural Philosophy* (1687). It saw the development of the telescope and the microscope. It saw the foundation of scientific societies such as the Royal Society of London for the Advancement of Experimental Knowledge (1660s); and it saw the work of occupants of the 'Hall of Scientific Fame', such as Robert Boyle, Robert Hooke, and Christian Huygens. Later chapters of this book will show how the metaphysics of Descartes, Spinoza, and Leibniz not only provide general background conceptions of the world as described in detail by the more particular sciences, but also contribute quite directly to the theoretical foundations of seventeenth-century physics and mechanics.

Even though the rejection of Aristotle marks for the philosophers of the seventeenth century their own sense of their 'modernity', they hardly free themselves from the Scholastic tradition completely. Leaving aside the fact that Leibniz even wished to reinstate some elements of Aristotelianism, it is clear that the so-called 'new philosophers' inherited from Aristotle the general conception of a kind of investigation called 'first philosophy' or 'metaphysics', and, along with that conception, the idea that one of its central concerns is to give an account of what is ultimately real. Moreover, they did not just take up Aristotle's *question,* 'What is substance or being?' They were influenced by his *answers* too. Many of the features and much of the detail of Aristotle's doctrines on substance are present, often in a somewhat programmatic, sloganised form in the seventeenth-century discussions. So we need to have some impression of the 'Aristotelian' ideas they were familiar with before we turn to Descartes's, Spinoza's, and Leibniz's metaphysics of substance.

'Some impression' is all we can hope for here. For one thing, Aristotle's own discussions in his *Categories* and *Metaphysics* are lengthy, detailed, and written at different times. There is much scholarly dispute about them, and quite possibly there is no single, unified, coherent, and consistent interpretation to be given;[11] they are, after all, lecture notes rather than finished productions. For another thing, Aristotle did not speak directly to the seventeenth century. His ideas came down through the medium of centuriesof discussion, commentary, interpretation, amendment. Medieval

Scholastic philosophers, such as Ockham and, in particular, Aquinas, are central figures in this process.

One influential theme which came out of Aristotle (as at *Metaphysics* 1017bl4 and *Categories* 2all) is that of substance as that which is the subject of predicates and not itself the predicate of anything else. A variation of this is the idea—'the most distinctive mark of substance', Aristotle calls it (*Cat* 4al0)—that substances are what undergo or underlie change. '[O]ne and the self-same substance, while retaining its identity, is yet capable of admitting contrary qualities…at one time warm, at another cold' (*Cat* 4a 19–21).

Accordingly, particular things, such as the man Socrates or the horse Bucephalus, become prime examples of substances. 'Substances are most properly so called, because they underlie and are the subjects of everything else' (*Cat* 2b39). Socrates and Bucephalus have properties and qualities (they have things predicated of them), and are not themselves the properties or qualities of anything else. Moreover, their properties and qualities can change over time. Qualities could not exist without them; qualities get their reality by being qualities of other things which are substantial and real in themselves. The activity of walking, or the state of health, is not 'self-subsistent or capable of being separated from substance' (*Met* 1028a23). If substances 'did not exist, it would be impossible for anything else to exist' (*Cat* 2b6).

But though it thus leads to the idea of 'substance' as 'individual substance' (to the idea of the man Socrates, or the horse Bucephalus, as exemplifications of basic realities), the theme of substance as the subject of predicates and as what underlies change does not always stop there. A passage in the *Metaphysics* glosses the idea that substance is the subject of predication by talking of substance as 'the ultimate substratum, which is no longer predicated of anything else' (1017b23). This might be read as meaning not only that qualities, such as a horse's colour, are not substances, but also that the individual horse itself is not *ultimately* a substance either. The horse itself would then be the result of predicating the characteristics of equinity of some predicateless ultimate substratum. This certainly is the idea that has been taken from later passages in the *Metaphysics* where substance is 'the ultimate substratum [which] is of itself neither a particular thing nor of a particular quantity nor otherwise positively characterised' (1029a24). According to this conception of it, 'substance' would be

exemplified by what is called *matter*—of which Aristotle says, 'if this is not substance, it baffles us to say what else is. When all else is stripped off evidently nothing but matter remains' (*Met* 1029a10–11).

Elsewhere (in books Z and H of the *Metaphysics*) 'matter' figures, not as substance itself, conceived of as ultimate substratum, but as one element in a two-fold analysis of substance conceived of as individual substantiality. A particular thing, such as a house, is a composite, of *matter*, such as bricks and timber, disposed or arranged in or according to a certain *farm*; a bowl or statue is a composite of matter such as *bronze*, *formed in* a certain way. So far, of course, bronze is still matter of a certain kind; it is matter only relative to the form of the bowl. One might go further, therefore, and think of the bronze merely as 'secondary matter', matter which is itself a composite of more basic matter, and the form of bronze. Possibly Aristotle himself did not intend this, but it is certainly suggested by his talk of 'stripping all off until mere matter remains, and it is encouraged by Aquinas' later doctrine of ultimate, basic *materia prima*. This so-called 'hylomorphic' analysis of individual substances into matter (Greek: *hyle*) and form (*morphe*) was central to Aquinas' metaphysics in the middle ages, and a highly significant item of the intellectual inheritance of the seventeenth century. We should look into it further.

'Individual substances' are sometimes spoken of as 'primary' or 'first substances', as opposed to 'second substances', the kinds or species of which they are individuals—the individual substance Bucephalus is an individual of a secondary substance, the species 'horse'. The form of equinity, which is one aspect of him, is thus Bucephalus' *substantial form*. There are, however, *accidental forms* too. When a substance undergoes change—when, 'while retaining its identity, [it] is yet capable of admitting contrary qualities' (*Cat* 4a18–19)—there has been a change merely *of accidental form*; as, for example, when Bucephalus becomes warm through exercise. Warm or not, Bucephalus is still Bucephalus, but there could not be the self-same individual substance, Bucephalus, without the *substantial form*: it is because of being an individual substance of the species 'horse' that he has his identity as an individual substance at all.

Besides the accidental properties which an individual substance can change without there being loss of identity, and theproperties which constitute or define its substantial form, there were

supposed to be properties which follow from the substantial form, and which all individuals of that kind necessarily or essentially have.[12] Though all triangles have angles equal to two right angles, having this is no part of their essence or definition. The complete essence or form of a triangle is to be a three-sided plane figure. Nevertheless, even though having angles equal to two right angles is not part of a triangle's essence, it is because it is a three-sided figure that it has them. It is implicit in these last paragraphs that there are two important contexts in which substantial forms play a role: *identity and individuation*, and *explanation*. These are worth spelling out.

In fact forms are simply one of four factors, each of which was supposed to give an explanation or cause of why some individual substance is as it is.[13] In the case of a statue, for example, there is the *material cause*—the matter, the bronze, out of which it is made. There is *the formal cause*—the form according to which the matter is disposed into a statue. There is the *efficient cause*—the sculptor, who brought it about that the matter took on that form. Lastly, there is *the final* or *teleological cause*—the enhancement of a public place, which is the end *(telos)* or purpose for which the matter was given its form by the efficient cause.

But 'form' should not be thought of simply as 'shape'—as in the form of a bronze statue. The 'form'—or 'nature' or 'entelechy', as other terms have it—of an oak tree is not simply its visual shape. It encompasses its whole organisation: its various parts and their purposes, such as its leaves and bark and their functions; its characteristic activities, such as growth by synthesising water and other nutrients, and its production of fruit; its life-cycle from fruit to fruit bearer. It is in being organised and active in this way that the matter which constitutes an oak tree 'embodies' or is 'informed' by the substantial form 'oak'; it is only by virtue of this that it 'forms' an oak tree at all. The oak's properties and activities 'flow' or 'emanate', are 'formally caused' by its nature: 'a thing's characteristic operations derive from its substantial form' (*ST* 3a.75, 76), Aquinas says.

There is here, then, in this historically very important account, the conception of an individual substance as active, as something which 'embodies' in itself, as its 'nature', the principles of its development and change. To understand and explain why an individual substance is as it is, and does as it does, is—except when it is on the passive receiving end of the activities *of other*

substances—to understand how its properties and changing states 'flow' or 'emanate' from the nature, essence, or form of the kind of thing it is. 'There are', says a medieval commentary on Aristotle's *Physics,* 'individual and particular behaviours appropriate to each individual natural thing, as reasoning is to human beings, neighing to horses, heating to fire, and so on…. [T]hese behaviours… arise from the substantial form' (quoted Garber 1986:129).

Now, as was noted earlier, it is because of being an individual substance of the species 'horse' that Bucephalus has his identity as an individual substance at all. So besides offering explanation of at least many of an individual substance's properties and changes, an individual's form also accounts for its being an individual.

A unitary, individual substance is, to use the terminology, a *unum per se* ('a unity in itself)—an individual entity by *its nature.* This distinguishes it from anything which is not absolutely one, but one only *per accidens* (accidentally a unity).[14] A product of nature such as an individual human, or an animal, was a typical *unum per se*; but artifacts such as ships or houses, however complex, were not substances, but *entia per accidens* ('accidental beings'), like heaps of pebbles. It is, of course, in so far as it has substantial form that something is a true substance, a *unum per se*

The characteristic of an individual substance of 'being one' explains why materials such as lead or gold are sometimes, though not always, discounted as substances, amenable to a form/matter analysis. Even if a man-made machine, unlike an animal, is only accidentally one, a unity *per accidens,* it is at least an individual thing, *one* machine. But a piece of gold is just *some* gold, divisible into other pieces, other amounts; it has no coherence, no organisation, as an individual.

The substantial forms of living things, the prime examples of *entia per se,* were called, with a meaning much wider than ours, their 'souls' (*anima* in Aquinas' Latin; *psyche* in Aristotle's Greek). But the 'souls' of oak trees, of horses, and of human beings, even apart from their specific differences, form a hierarchy. All living things nourish themselves and reproduce, all except plants have sensation, and all except plants and animals are capable of rational thought and choice. The souls of oak trees and primroses are 'vegetative' or 'nutritive' souls; those of horses and elephants are 'sensory'; while those of humans are 'rational' or 'intellectual'. There was disagreement whether the last 'contains' the others, or whether humans have three separate souls.[15]

The various strands of this broadly Aristotelian or Scholastic metaphysics of substance make themselves felt, in various ways and varying degrees, in the thought of Descartes, Spinoza, and Leibniz. This will be immediately apparent in the next two chapters, which deal with the general outlines of Descartes's (chapter 2) and Spinoza's (chapter 3) accounts of substance. A common feature of these is the idea that 'extension' constitutes the essence of 'material substance'. This is something which Leibniz rejects and in place of which he reintroduces substantial forms or Aristotelian entelechies (chapter 4).

Sciences such as physics and mechanics are the trunk and branches of the Cartesian tree of knowledge, of which metaphysics is the root. The 'foundational' aspect of metaphysics will become clear in the way these accounts of material substance (chapter 5) provide the conceptual framework in terms of which these sciences develop in the seventeenth century (chapter 6). One problem which arose in this connection concerned the notion of 'force' and the nature of the efficient causality involved in mechanics (chapter 7).

Besides 'material substance', with its essence of extension, a second important player on the Cartesian stage is 'immaterial substance', with its essence of thought. Descartes, Spinoza, and Leibniz all have their characteristic things to say about this (chapter 8), as also about the relationship between the two (chapter 9).

Aristotle's view that the world is eternal and independent of God is clearly something that Aquinas, in his attempt to combine Aristotle and Christianity, had to amend. The question of the relation of God to creation is one about which he had much to say. It was of similar importance to the seventeenth century and will be discussed here in chapter 10.

The central distinction of this last chapter, between created and uncreated substance, in fact takes us full circle—for it is there at the beginning (in chapter 2) in Descartes's initial definition of substance. It can, moreover, be seen as an organising centre of the whole book. The crucial differences between Spinoza's and Descartes's metaphysical outlooks turn on it, and one of the more important of Leibniz's discussions of substance, in his *Discourse on Metaphysics,* is brought about by his wanting '[t]o distinguish the action of God from those of creatures' (L 307). His conclusions about this are directly opposed to the occasionalism of Nicolas Malebranche, which (see chapters 7 and 9) denies 'force' to

created things. To Leibniz's mind this would mean that only God, and nothing which he created, would be 'substance', a view which he rightly discerns in Spinoza.

NOTES

1 See Clarke 1989: *passim,* and Keeling: chap. 9 for the Continent; Nicolson: *passim,* and Lamprecht: *passim,* for England.
2 Quotations from L 152, 223, 655; see also 107, 273, 433.
3 See, for example, *Ep* 2, 81.
4 See Balz l951:218ff.
5 See Keeling:240 n. 1, Wolf 1928:31.
6 See Balz 1951:218.
7 Garber 1983a:115.
8 See L 383.
9 *Ep* 45, 46.
10 See L 196f.
11 See Stead:55–6.
12 Sometimes 'accident' is used for *anything* predicated of substance, so that there is then a simple and general opposition between substance on the one hand, and accidents on the other, and a distinction was made between separable and inseparable accidents.
13 *Met* bk 5, chap. 2; see also Hocutt: *passim*.
14 *Met* 1015b35, 1039a, 1041b.
15 See Adams: vol. 2, chap. 15, pt 3.

2

Descartes and Substance

Descartes's first major work was the unfinished Latin *Regulae ad Directionem Ingenii* or *Rules for the Direction of the Mind,* written in about 1628, but unpublished till 1684. Its concern is method and the route to knowledge. A year or so later he began *Le Monde,* or *The World,* which he had almost finished by 1633 but which, again, was not published until after his death, in 1664. It aims to explain, at least in outline, 'all the phenomena of nature, i.e. all of physics' (CSM 1.79). Its incomplete concluding section was published separately; known as *Traité de I'homme* or *Treatise on Man,* it deals with the particular natural phenomenon which is the human body. One of the first works which was published during Descartes's life, in 1637, was the anonymous *Discours de la méthode,* or *Discourse on Method;* besides containing reference to the then-unpublished *World* and *Treatise on Man* it has in it intellectual autobiography, a provisional moral code, and the outlines of some of Descartes's epistemological and metaphysical views. There are more details of these last in *Meditationes de Prima Philosophia,* or *Meditations on First Philosophy,* which came out in 1641 (French edn, 1647). Along with these went six sets of *Objections* (with Descartes's *Replies)* by scholars and philosophers, including Antoine Arnauld, Pierre Gassendi, Thomas Hobbes, and Marin Mersenne. The *Meditations* is perhaps the most popularly famous of Descartes's works, certainly one of the most easily readable; but his most important is the lengthy and more formal *Principia Philosophiae,* or *Principles of Philosophy,* which was published in 1644 (French version, 1647). Descartes hoped that this definitive and systematic textbook-like account of his philosophical ideas would result in their being generally accepted

and standardly taught in the universities. After some epistemological preliminaries, and building on his metaphysics as a foundation, it provides a theoretical structure for physics, and then a detailed physical explanation of the universe, the earth, terrestrial phenomena such as the tides, and magnetism (further parts on plants, animals, and man were never completed). Though the *Principles* is not the only source for Descartes's metaphysics of substance *(The World, Meditations,* and many of his letters are sources too), it is the most important, and, because of its systematic nature, it is worth being guided by its order of exposition.

It is often said that Descartes gives two different definitions of substance.[1] The more striking of these is in the *Principles of Philosophy* 1.51—in terms of a notion of independent existence. 'By *substance* we can understand nothing other than a thing which exists in such a way as to depend on no other thing for its existence.' Strictly speaking 'there is only one substance which can be understood to depend on no other thing whatsoever, namely God'. So what, then, about the things, both animate and inanimate, which God created—God's 'creatures', as they were called? Do they not qualify as substances, as they certainly did for Aristotle? So long as they 'need only the ordinary concurrence of God in order to exist' and are not additionally dependent on some God-dependent created thing, they do; but they are properly termed 'created substances'. Elsewhere Descartes does not mention the question of dependence on God and speaks of what plainly are created substances as 'capable of existing independently' (CSM 2.30), and as what 'exist on their own' (CSM 2.156) or 'subsist on their own' (CSM 2.157).

But Descartes also characterises 'substance' as what has properties, qualities, or attributes. In his *Replies* to the second set of *Objections* to the *Meditations* he says the term applies to 'every thing in which whatever we perceive immediately resides, as in a subject, or to every thing by means of which whatever we perceive exists'. 'Whatever we perceive' means 'any property, quality, or attribute of which we have a real idea' (CSM 2.114). This conception of substance as the bearer of, variously, 'properties', 'qualities', 'attributes', 'modes', 'accidents', or as what such things 'belong to' or 'inhere in' frequently appears elsewhere.[2] Are these two accounts so diverse that Descartes is in effect defining two different things? Or are they related—perhaps by capturing two separate features of the same thing, perhaps in some other way?

If anything is clear, it is that the *second* leans heavily on the Aristotelian characterisation (as in chapter 1) of substance as the subject of predicates. Properties, qualities, and the rest are all, generally speaking, characteristics of a substance, accidents which may be predicated of it.[3] But Aristotle glossed this by saying that substances (unlike properties) are 'self-subsistent', and this is clearly echoed by Descartes's *first* account, in which substances are 'independent' and 'subsist on their own'. This route between the two accounts is not spurious or coincidental; there is, as follows, a good textual basis for a clear link between the 'independent existence' of the first, and the 'being a subject of predicates' of the second.

If created substances depend only on God, and need only his concurrence to exist, the question arises whether there are things which depend not only on God, but also on created substances. An addition in the second, French edition of the *Principles* answers this. Created things are of two kinds: 'some are of such a nature that they cannot exist without other things, while some need only the ordinary concurrence of God in order to exist. We make this distinction by calling the latter "substances" and the former "qualities" or "attributes" of those substances' (1.51). So God depends on *no other thing* for his existence, created substances depend *on God* for theirs, and created attributes or qualities depend *on the created substance* whose attributes or qualities they are.

This leads us to think of an order of varying degrees of dependence or—recalling that Aristotle says that properties get their being from the being of substances—of varying degrees of reality. The idea would not be un-Cartesian—as is shown by an appeal made to it in the *Third Meditation*. In his *Objections* Thomas Hobbes did not find the idea obvious and suggested it needed reconsideration. 'Does reality admit of more and less?', he asked. '[Can] one thing…be more of a thing than another?' (CSM 2.130). Descartes explains his affirmative reply by reference to exactly the series to which we have been led: God; created substances; modes or qualities. It is 'quite clear how reality admits of more and less', he says. 'A substance is more a thing than a mode…[and] if there is an infinite and independent substance, it is more of a thing than a finite and dependent substance' (CSM 2.130).[4] The same idea, and the same series, crop up elsewhere, when Descartes says that '[t]here are various degrees of reality or

being: a substance has more reality than an accident or a mode; an infinite substance has more reality than a finite substance' (CSM 2.117).

So Descartes's two characterisations of 'substance'—as what 'exists in such a way as to depend on no other thing for its existence', and as the subject of properties—are really closely connected. Though at first sight quite disparate, it is no coincidence that they each echo the same Aristotelian characterisation of substance. Yet the connection between them does nevertheless involve some equivocation. It has been pointed out about Descartes's 'degrees of dependence' that

> the way in which modes depend on substance is not the same as that in which finite substances depend on the infinite substance. Modes are logically dependent on substance; they 'inhere in it as subject'…. Created substances are not logically, but causally, dependent on God. They do not inhere in God as subject, but are effects of God as creator.
>
> (Kenny 1968:134)

In short, Descartes's whole discussion involves 'no uniform property of independence which things might possess to a greater or less degree' (Kenny 1968:134).

But though Descartes does not explicitly distinguish these two senses of independence, and though his talk of degrees of reality all but invites us into confusing them, *he* did not confuse them. According to the second set of *Replies,* the modes of a created substance depend on God in just the way created substances do—they are created by him. This shows that Descartes is quite clear that modes have two kinds of dependency: one on created substances, the other on God.[5] There is no evidence that he confusedly thought that the dependence of created substances on God was of the same kind as that of modes on substances.

The Aristotelian idea of substances as the subject of properties can lead (as in chapter 1) from the idea of a man or a horse as an individual substance to the idea of substance as an underlying characterless substratum. This further idea seems to be present in Descartes too. A substance itself, he says in the *Principles,* cannot be known directly, for of itself it has no effect on us: 'We can, however, easily come to know a substance by one of its

attributes…. [I]f we perceive the presence of some attribute, we can infer that there must also be present an existing thing or substance to which it may be attributed' (1.53). Similarly he says elsewhere, '[i]n addition to the attribute which specifies the substance, one must think of the substance itself which is the substrate of that attribute' (*B* 25).[6]

Just how a substance is additional to, or distinct from, its attributes or its other properties such as its modes is made clearer when Descartes explains that things may be distinct from each other either 'really' (i.e. neither is dependent on the other for its reality), or 'modally', or 'conceptually'.[7] Given that substances 'subsist on their own' and are 'independent', it follows that they are independent of each other. So, in terms of this three-fold classification, there is 'a *real* distinction' between two substances, and 'we can perceive that two substances are really distinct simply from the fact that we can clearly and distinctly understand one apart from the other' (*PP* 1.60). The 'real distinction' between one substance and another contrasts sharply with the 'modal distinction' between a substance and its accidental modes, such as its particular shape. We can understand that substance without that mode, but we 'cannot…understand the mode apart from the substance' (*PP* 1.61); and this is quite in line with what we have already seen, namely that any reality modes have is a reality derived from the substances of which they are modes. It should be noted here, though, that when Descartes says of a mode that it cannot be understood apart from a substance, he does not just mean that square shapes cannot be understood except as the shape of extended things, things with spatial dimensions. He means also that the square shape of *this* thing, even if it is qualitatively the same as the square shape of *that,* is a different mode. Each square substance has its own mode. The same goes for modes of thought. You and I may desire the same thing, but my desire is one mode, dependent on me; yours is a second, dependent on you.

But even if modes and accidents need substances, don't substances also require modes? Can we, as Descartes says, 'clearly perceive a substance apart from the mode which we say differs from it' (1.61)? Descartes's point here is merely that substances do not require the particular modes that they happen to have. It is not that they do not require some modes or other. It is clear that they do; for modes are accidental variations of an attribute, and the

distinction between a substance and at least some of its attributes is so close as to be 'merely a conceptual one' (1.62). One substance can exist apart from another; it can exist apart from the particular modes it happens to have; but it cannot exist with no modes, for there are certain attributes without which substances are 'unintelligible'. For many substances the attribute of extension (the attribute of being spatially dimensioned or of having length, breadth, and depth) is one such. Though a given substance is intelligible without the particular modal shape it has, it will be unintelligible with no shape at all, for it is unintelligible apart from the attribute of extension. The attribute of thought provides an example for others. 'We have some difficulty in abstracting the notion of substance from the notions of thought and extension, since the distinction between these notions and the notion of substance itself is merely a conceptual distinction' (1.63).

So alongside of Descartes's remark (quoted above) that '[i]n addition to the attribute which specifies the substance, one must think of the substance itself which is the substrate of that attribute' (*B* 25), we have to put the clear, public, and official view of the *Principles,* that

> [t]hought and extension…must…be considered as nothing else but thinking substance itself and extended substance itself. …[I]t is much easier for us to have an understanding of extended substance or thinking substance than it is for us to understand substance on its own, leaving out the fact that it thinks or is extended.
>
> (1.63)[8]

What Descartes says here about extension and thought, and about extended and thinking substance, is of ultimate importance in his metaphysics. The fact that we cannot understand an extended or spatially dimensioned substance apart from its being extended means that extension is a very special property, namely one which 'constitutes the nature' (1.63) of a substance which is extended. This is explained ten sections earlier: a 'principal property' or 'principal attribute' is one 'which constitutes…[a substance's] nature and essence, and to which all its other properties are referred' (1.53),[9] and each substance has one of these. Immediately following this, two cases are given: 'extension in length, breadth and depth constitutes the nature of corporeal substance; and

thought constitutes the nature of thinking substance' (1.53). In elaboration of the first of these Descartes says that '[e]verything else which can be attributed to body presupposes extension, and is merely a mode of an extended thing…. For example, shape is unintelligible except in an extended thing; and motion is unintelligible except as motion in an extended space'(1.53).

Now just as a 'principal' property is one to which other properties are 'referred', so the characteristically Cartesian term 'mode' stands for the referred properties. Being square is referred to being extended, and squareness is a mode of extension. Perhaps, as Descartes's follower Rohault implies, the root idea is that something cannot be merely extended but must be some shape or other, e.g. square, and that being square is *a way of* being extended.[10] But this does not really chime with the idea that motion is a mode of extension too. Certainly motion is modally dependent on an extended moving thing such as a stone, and, as at 1.62, cannot be understood apart from it; but having this or that amount of motion or speed is not a way of being extended. However, Descartes also says of motion that it is 'unintelligible except as motion in an extended space' (1.53). Perhaps these differences between shapes and motions make themselves felt in Descartes's speaking not only of modes 'of extension but also of modes which 'belong to' extension (1.65).

As Descartes's metaphysics unfolds, this idea of some properties being referred to others which are 'principal' comes to echo the Aristotelian schema according to which some properties 'flow from' and are explained by reference to others. The impenetrability of material bodies is (as in chapter 4) supposed to follow from their being extended, and (as in chapters 5 and 6) all the phenomena of nature are explicable in terms of extended matter in motion.

In explanation of the second of his examples of the substance/principal property/mode schema Descartes says that whatever we find in the mind 'is simply one of the various modes of thinking…. [I]magination, sensation and will are intelligible only in a thinking thing' (1.53).[11] Since 'thought' has already been defined as 'everything which we are aware of as happening within us, in so far as we have awareness of it' (1.9), there is a clear parallel between sensory perceiving or denying (for example) as different ways of being conscious, and being square or round as different ways of being shaped.

For Descartes, 'thought' and 'extension' are not only *two* principal properties each of which constitutes the nature or essence of a substance, they are the only two. This is the basis for the common characterisation of him as a *dualist*. If (as in chapter 1) we understand Aristotle's question 'What is substance?' as 'What does reality comprise?', this dualism would amount to saying that there are two orders of reality or of existence: anything that exists or has some degree of reality—whether substance, attribute, or mode; whether created or uncreated; whether dependent or independent—exists either as body, as part of corporeal, extended reality, or as mind, as part of 'incorporeal' (K 239), 'spiritual' (K 107), thinking reality.[12] He never considers the possibility that there might be *more* than two kinds of substance. But there is no reason why he could not have considered on its merits any further suggestion for a principal attribute, with its own modal variations, which could constitute some third kind of substance or order of reality. His other views provide no reason why there *need* be just these two.

On the other hand, the suggestion that there are *fewer* than these two is one that Descartes does consider. Three of the authors of the *Objections* to the *Meditations* were sympathetic to, if not outright supportive of, a doctrine of materialism such as classically found in the ancient Greek philosophers Democritus and Epicurus. According to this doctrine the whole of reality is *material*. There is no *immaterial* spiritual God who created it, and no *immaterial* spiritual minds which have experience of it; if there are God and minds at all, their reality must be a material one too. In effect, then, materialism holds that all the properties which Descartes 'refers to' the supposed principal property of thought are, along with that property itself, merely modes of *material* substance. Hobbes suggested to Descartes 'that the thing that thinks is the subject to which mind, reason or intellect belong; and this subject may thus be something corporeal. The contrary is assumed, not proved' (CSM 2.122). Mind, he went on to say more positively, is 'nothing more than motion occurring in various parts of an organic body' (CSM 2.126). Mersenne asked Descartes, What if

> it turned out to be a body which, by its various motions and encounters, produces what we call thought?…. How do you demonstrate that a body is incapable of thinking, or that corporeal motions are not in fact thought? The whole system

> of your body, which you think you have excluded, or else some of its parts—for example those which make up the brain—may combine to produce the motions which we call thoughts.
>
> (CSM 2.88)

Finally, Gassendi put it to him that it was up to Descartes 'to prove that the power of thought is something so far beyond the nature of a body that neither a vapour nor any other mobile, pure and rarefied body can be organized in such a way as would make it capable of thought' (CSM 2.183). We will return at the end of this chapter to Descartes's support for the view that thought and extension really are two independent principal attributes.

A second suggestion against Descartes's dualism, but not one which he was made to face, would be that all those properties and modes which he traces back to corporeal substance and its principal attribute of extension are in fact dependent on mental substance and thought. Leibniz (as briefly in chapter 4) came to some such view towards the end of his life, and the later 'immaterialism' of George Berkeley (1685–1753) provides another example of it.

As regards one of Descartes's basic kinds of reality, immaterial or thinking reality, there are many individual substances of the kind, many individual minds. This is quite explicit at *Principles* 1.60: 'from the mere fact that each of us understands himself to be a thinking thing and is capable, in thought, of excluding from himself every other substance, whether thinking or extended', it follows, Descartes says, that 'it is certain that each of us, regarded in this way, is really distinct from every other thinking substance and from every corporeal substance'. But the individual things which might be thought to compose material reality are not so clearly individual *substances.* It is true that *Principles* 1.60 (just quoted) and 64 do speak of there being many corporeal substances, and that it is implied elsewhere that stones, and human bodies, are individual substances.[13] But at other times it seems that, unlike 'thinking substance', Cartesian 'corporeal substance' is analogous not to an Aristotelian second substance such as 'horse', with its individual substantial horses, but to matter, such as lead. The idea then seems to be that unlike human minds, human bodies (as also stones or horses) are not numerically different individual substances, but pieces of corporeal substance or body

as such, in the way that pieces of lead are just that—pieces of lead, and not 'leads'.

The 'Synopsis' of the *Meditations* makes a contrast of this sort between 'minds' and 'body', and it should be taken as Descartes's considered view. Discussing immortality he says that

> body, taken in the general sense, is a substance…. But the human body, in so far as it differs from other bodies, is simply made out of a certain configuration of limbs and other accidents of this sort; whereas the human mind is not made up of any accidents in this way, but is a pure substance. For even if all the accidents of mind change, so that it has… different desires and sensations, it does not on that account become a different mind; whereas a human body loses its identity merely as a result of a change in the shape of some of its parts.
>
> (CSM2.10)[14]

The fact that lead comes in chunks and not in 'leads' does not mean that there is only *one* lead; it means that there is only lead *as such*. Strictly speaking, therefore, Descartes's view that there are not many corporeal substances does not mean that there is only one, but that there is only corporeal substance as such. As Leibniz remarked, 'When Descartes and others say that "there is one substance for all corporeal beings", they mean one similar nature, and do not, I think, intend that all bodies together make one substance' (L 537).

We saw earlier that God is strictly the only substance for Descartes—it is by equivocation that we talk of 'created substances'. Some commentators say that this means that Descartes proposes three rather than two substances. When Descartes says we have 'clear and distinct notions of thinking substance, and of corporeal substance, and also of God' (*PP* 1.54) he has been supposed to mean that '[t]he universe consists of three substances, one uncreated and two created. God is an infinite substance Who creates finite mind and finite matter' (Watson 1987:47–8).[15]

But this is to be misled by Descartes's words, and it is unhelpful to repeat them in this way. The idea that there are *two* principal properties, each of which constitutes the nature of a substance, is the idea that substance is of two *kinds*. It is more like an Aristotelian claim about second substances than like one

about primary individual substances of those secondary kinds. Descartes clearly does not see God as a *third* kind. God is not a *kind.* He is an individual substance, and an individual of one of the given two—in fact *mind,* rather than *matter.* Descartes's proofs of the existence of God concern a supremely perfect and uncreated individual thinking substance, a substance which has intellect, understanding, and will.[16] As one individual infinite uncreated mind, God is not to be added to 'finite created mind' (to total two substances) but to 'finite minds' (to total considerably more than two).

As concerns mind or thinking substance Descartes holds, then, that there is (besides God, the infinite thinking substance) a large number of finite human minds, each of which has its own substantial identity. As concerns body, or extended substance, however, he holds that what God created was simply body as such. Each individual corporeal thing (such as a human body) is simply a temporary arrangement of 'body, taken in the general sense' (CSM2.10).

It has been suggested that this asymmetry is 'forced' on Descartes by 'the theological demand that each human soul be an independent individual' (Watson 1987:182). He is certainly keenly aware of the theological implications of the individual substantiality of human minds.[17] But there is no reason to suppose that he begins from any other than the surely quite natural thought that we are individually separate centres of consciousness, a thought which he expresses when he says that from the 'mere fact that each of us…is capable, in thought, of excluding from himself every other substance, whether thinking or extended, it is certain that each of us…is really distinct from every other thinking substance' (*PP* 1.60). When what he thinks about body is added to this, asymmetry is produced; but there is nothing objectionable in it.

Descartes's answer to Aristotle's question about substance rearranges the scenery set up in the Aristotelian tradition. Secondary substances (such as the species man, horse, oak) fade away, and what were individual substances of those kinds become merely differently modified pieces of corporeal substance. Cartesian 'mind', with its multiplicity of individual substantial immaterial minds, is somewhat akin to an Aristotelian second substance—except that, being composites of matter and form, the instances of an Aristotelian kind are all material. Given this, might there not be some kinship between Aristotelian and Cartesian

matter, and could Cartesian immaterial 'mind' have some relation to Aristotelian form?

The disappearance of Aristotelian secondary material substances is, first and foremost, the disappearance of a variety of substantial forms. So one could see Cartesian matter as the descendant of the Aristotelian prime matter which might be supposed to remain after this disappearance. Yet there are clear differences between them, and perhaps Cartesian matter is related more to forms: unlike Aristotelian matter, it has an essence or nature to which various modes or properties of material things are to be 'referred'—a function previously served by substantial forms.

As for Cartesian minds, they do in effect fulfil the function served by the specifically 'rational' part of that form which is the human soul. Along with all other forms, vegetative and sensitive souls are totally rejected, and their functions are served by Cartesian matter and its modes, the purely material mechanisms of plants, animals, and human bodies.

These broad comparisons are open to some correction by the further discussion of later chapters (particularly chapter 8). But, however it is to be seen in relation to what went before, Descartes's answer to Aristotle's question about substance is, at its most basic, that there are two fundamental kinds of reality or kinds of substance, material and immaterial. This is to say (in the language of the *Principles*) that there is a 'real distinction' (1.60) between corporeal and incorporeal things or (in the language of the second set of *Replies*) that some thing of the one kind 'can exist apart from' (CSM 2.114) any thing of the other.

Descartes's proof that there really is this distinction between, and possibility of independent existence of, corporeal and incorporeal substance is 'simply from the fact that we can clearly and distinctly understand one apart from the other' (*PP* 1.60). He claims in a number of places that we *can* 'clearly and distinctly understand them one apart from another'. In the *Discourse on Method,* for example, he reports that in pretending 'that I had no body and that there was no world and no place for me to be in' he was not pretending that he did not exist, but quite the contrary: 'from the mere fact that I thought of doubting the truth of other things, it followed quite evidently and certainly that I existed; whereas if I had merely ceased thinking…I should have had no reason to believe that I existed.' He could conclude from this, he said, that

> I knew I was a substance whose whole essence or nature is simply to think, and which does not require any place, or depend on any material thing, in order to exist. Accordingly this 'I'—that is, the soul by which I am what I am—is entirely distinct from the body…and would not fail to be whatever it is, even if the body did not exist.
>
> (CSM 1.127)[18]

This passage, Descartes reports, provoked from Mersenne the criticism 'that I have not explained at sufficient length how I know that the soul is a substance distinct from the body and that its nature is nothing but thought' (K 30–1), and he conceded both to Mersenne and to the reader of *the Meditations* that more explanation is possible.[19] It is not clear whether the argument as presented in the *Second Meditation* was meant to provide this (as Mersenne and Hobbes seemed to suppose), or whether Descartes meant the reader to wait till the *Sixth Meditation* (as Descartes claimed).[20]

One final point needs to be made about Descartes's dualism. The idea that there are two kinds of substance, material and immaterial, body and mind, is not identical to the idea that *extension* is the principal property of body and *thought* the principal property of mind. More, for example, agrees with Descartes (as against Hobbes) that body and mind are separate substances, but along with others (as in chapters 5 and 8) disagrees with him about what their essences are. Descartes explicitly says that he was 'the first to have regarded thought as the principal attribute of an incorporeal substance, and extension as the principal attribute of a corporeal substance' (CSM 1.297).

NOTES

1 Curley 1969:6, Kemp Smith:313.

2 CSM 1.124, 2.54, 124, 156, 249, K 121, *B* 25.

3 Choice between these terms often seems a matter of indifference, and Descartes says that he *sometimes* means by 'mode' what he *sometimes* means by 'attribute' or 'quality' (*PP* 1.56). But there is some attempt at systematisation (*PP* 1.56). 'Attributes' are general properties, e.g. being extended as opposed to being square. 'Modes' are 'accidental' variations of these, e.g. being square. Some attributes, e.g. extension, are essential to the substances which have them, and there is some tendency for the term to be used *only* of these (*B* 25, CSM 1.211, 297, K 186). A 'quality' is defined as a mode which enables a substance 'to be designated as a substance of such and such a kind' (PP 1.56). Clatterbaugh:382–4 has some useful things to say on this.

4 CSM 2.293 says firmly that accidents are *not* real; 2.251, more mildly, that 'no reality…can be attributed to accidents *unless* it is taken from the idea of substance' (my italics).
5 CSM 2.116–17.
6 See also CSM 1.196, 2.54, 124, 156, 249.
7 He sometimes runs the last two together (CSM 1.215, 2.85f.).
8 See also 2.9, CSM 1.297.
9 See also 1.48.
10 Rohault:15.
11 At *PP* 1.32 there are 'only two modes of thinking'—perceiving and willing; sensation and imagination being modes of these modes.
12 See Cottingham 1985, for a discussion of 'hybrid' cases.
13 CSM 1.299, 2.30.
14 See also PP 2.21–2, 25.
15 See also Machamer 1976:168.
16 CSM 1.5, 129, 199–201, 211, 2.31, 39–40, 98–9, 114.
17 See CSM 1.41, 2.3–10, 108–9, 161, K 87, 130; for discussion see Cottingham forthcoming, Loeb:124–6.
18 See also CSM 2.54, 119–20, 159, 412, 415, *B* 43.
19 K 30–1, CSM 2.7.
20 CSM 2.16–18, 54, 88, 95, 122–3.

3

Spinoza and Substance

Spinoza's metaphysics is primarily to be found in his mature masterpiece, *Ethica, Ordine Geometrico Demonstrate,* or *Ethics Demonstrated in Geometric Order.* Begun in the early 1660s, worked on into the 1670s, and published in the *Opera Posthuma* of 1677, it is a systematic treatment of the substantial nature of God and of the relationship to it of the human mind, emotions, and freedom. These topics echo the title of an earlier Dutch work, the *Short Treatise on God, Man, and His Well-Being.* Two other relevant works are the methodological *Tractatus de Intellectus Emendatione* (1677), or *Treatise on the Emendation of the Intellect,* and the *Tractatus Theologico-Politicus,* or *Theologico-Political Treatise* (published anonymously, 1670). Finally, Spinoza's correspondence and, though not completely reliable as a source of his own views, the exposition of *Descartes' Principles of Philosophy* (1663), with its appended *Metaphysical Thoughts,* are of help in understanding the *Ethics.*

The literary structure of the *Ethics* is not typical of a philosophical work. Quite without ado the book opens very formally, with *definitions* and *axioms,* from which various *propositions* are deduced on the basis of carefully constructed *demonstrations.* Leibniz was not overly troubled by this 'demonstration in the geometrical order' and refers, rather shrewishly, to 'an empty pretentious device' (L 202). But there is no doubt that many readers are. Often the reaction is that of Henri Bergson, who referred to Spinoza's method of presentation as 'that complication of machinery, that power to crush which causes the beginner in the presence of the *Ethics* to be struck with admiration and terror as though he were before a battleship of the Dreadnaught Class' (quoted Shmueli:197). The reader must cope with this unfamiliar

style even before he gets to the difficult content. In fact it helps with the content to have some understanding of the style.

The stylistic structure, the 'geometrical order', is that of the classical presentation of geometry in Euclid's *Elements* (c. 300 BC). In his introduction to Spinoza's *Descartes' Principles* Ludwig Meyer speaks of the 'mathematical manner' as being 'the style commonly used in Euclid's *Elements*…in which the Definitions, Postulates, and Axioms are set out first, followed by Propositions and their Demonstrations' (C 226). It is just such a structure of axioms, definitions, and demonstrations that Mersenne had in mind when he suggested in his *Objections* to Descartes that it would be worth while if he would 'set out the entire argument [of the *Meditations*] in geometrical fashion' (CSM 2.92).

But there must be something more to 'geometrical order' than simply 'the structure of presentation of Euclid's *Elements'.* After all, as Descartes in effect noted in his reply to Mersenne, there is no necessity even for geometry to be laid out in this way. So there must be some *further* rationale behind this surface form. Descartes's reply gives a clue to what this is, for it distinguishes two methods of demonstration, the *analytic* and the *synthetic,* and identifies Euclid's as *synthetic*.[1]

This traditional classification of method and discussion of it have as a background an Aristotelian idea that true knowledge, or 'science', is *knowledge of causes.* To have firm established scientific knowledge that something is so is to understand *why it must be so.* We may know that the external angle of a triangle is equal to the sum of its two internal opposites and yet not know or understand why this is so, not understand the causes of this property. It is possible, however, to work out why the triangle has this property, and so come to this understanding of causes. In so doing so we have moved *analytically,* from an effect to its cause.

This illustrates that some things (the property of the triangle) are known before other things (the cause of the triangle's having this property) and so may be said to be 'first in the order of knowledge'. It also illustrates that what is 'first in the order of knowledge' may not be so in the 'order of things'. Though we hit upon the explanation of the triangle's property *after* our knowledge of the property itself, it is natural to say that we 'worked backwards' to it: so, in 'the order of things', the cause or explanation is prior to or precedes the effect, or what it explains.

The order of knowledge and the order of things often run in opposite directions. I know that the postman has called because I see the letters on the mat; my knowledge that he has called is posterior to my seeing the letters. But it can hardly be that he has called because there are letters on the mat. Quite the reverse: the letters are there because he has called; it is his calling, not the letters' being on the mat, which came first in the order of things.

In contrast to the process of analysis, from (knowledge of) effects to (knowledge of) causes, is the process of synthesis. This follows the order of things, from causes to effects. In a geometrical proof of the properties of a triangle, one begins, as did Euclid, with various basic axioms and definitions and shows how these cause, or result in, the triangle's having them. Similarly, from my seeing the postman at the door, I may deduce that there will be letters on the mat, because that is the usual result.

Analysis, beginning as it does with what is first in the order of knowledge, is often described as the method of discovery; whereas synthesis, which begins with what is first in the order of things, is the method of proof. Which was the better method by which to present one's ideas was a common matter of debate. There seems to have been a seventeenth-century fashion for the 'geometrical' method of synthesis. Something of its power is testified to by John Aubrey's story of how Hobbes, enthralled by the rigour and clarity of the reasoning by which Euclid derived something as complex as Pythagoras' theorem from a small initial collection of obvious axioms and clear definitions, fell 'in love with geometry' (Aubrey:242). Similarly, Meyer says it is the 'best and surest Method': 'a certain and firm knowledge…must be laid down at the start, as a stable foundation on which to build the whole edifice of human knowledge; otherwise it will soon collapse of its own accord, or be destroyed by the slightest blow' (C 224–5). Descartes, too, allows that, given their systematic demonstrations, anyone who denies one of the conclusions of a process of synthesis 'can be shown at once that it is contained in what has gone before, and hence…however argumentative and stubborn he may be, is compelled to give his assent'. Nevertheless, like others, he prefers analysis as 'the best and truest method of instruction'. It is more 'satisfying' than synthesis, which fails to 'engage the minds of those who are eager to learn, since it does not show how the thing in question was discovered' (CSM 2.111).

Though one might *be* tempted into thinking otherwise, Spinoza did not begin by conjuring up his axioms and definitions and then continue by simply deducing conclusions from them come what may. The *Ethics* is not like Descartes's *Meditations,* which is perhaps a paradigm of *analytic* discovery. It is not an account of *how* Spinoza came to think various things; it is not a report of a process of discovery; it is not an attempt to lead the reader through the author's previous thought processes. Of course, Spinoza must have gone through such a process at some time. He must at some point have begun with various things we all know, and then worked backwards in an attempt to explain those things. But what he presents is *first,* the things that explain and make sense of other things, *and then* the things he is making sense of.

It is not clear why Spinoza chose this synthetic method of presentation for *the Ethics;* he said himself that it is 'cumbersome' (4P18S). It perhaps has some appropriateness to its subject matter, for when we follow it we are following the order of things, and our mind, as Spinoza says, 'reproduce[s] completely the likeness of Nature' (C 20). It is as just such a reproduction that we can see the *Ethics.* One central aim of that work is that we should be led to 'knowledge of the human Mind and its highest blessedness' (2Pref), and Spinoza thinks that to do this he has to give an account of God, the world, God's relation to the world, man's place in the world, and man's relation to God. He thinks, quite naturally, that of God, man, and the world, God comes first in the order of things. Everything else flows from and depends on God. If 'our mind [is] to reproduce completely the likeness of Nature', it must, Spinoza says, 'bring all of its ideas forth from that idea which represents the source and origin of the whole of Nature, so that that idea is also the source of the other ideas' (C 20). And, in effect, this is just what the *Ethics* does. Everything depends on God; so in the *Ethics* everything follows from what is said about God. The order of the deductions and demonstrations reflects the order of dependence of things on God. In reality everything follows from and stems from God, so, in the philosophical account of reality, the order of proof and demonstration starts with God and flows from that.[2]

The first part of the *Ethics,* 'On God', opens with definitions, the third of which is of substance: 'By substance I understand what is in itself and is conceived through itself, i.e. that whose concept does not require the concept of another thing, from which it must

be formed' (1Def3). Leibniz complained that this is 'obscure'; for one thing, the relationship between being 'in itself and being 'conceived through itself is not clear. Does Spinoza mean that any substance must have one or other of these properties; or does he mean that any substance must have both? Surely rightly, he seems to think Spinoza means the second. But he points out that Spinoza needs some proof, for 'men commonly' conceive of substances differently, as 'things which are in themselves though they are not conceived through themselves' (L 196).

Descartes has been suggested as one such man, for he can be described as thinking of a substance as 'in itself (since substances do not depend for their existence on anything—other than God), but not as thinking of it as 'conceived through itself (since he says, *at PP* 1.3, that substances are known by their attributes).[3] If this is right then Leibniz is evidently connecting Spinoza's 'what is in itself with the 'depends on no other thing' of one of Descartes's definitions of substance.[4] Though some commentators follow Leibniz in this,[5] the relation between Descartes's and Spinoza's definitions of substance really needs to be made in a different way. The latter aligns, rather than contrasts, with the former. To see this, we must take note of Spinoza's next definition too, that of 'attribute'. An attribute is what 'the intellect perceives of a substance, as constituting its essence' (1Def4); as such it is the Spinozan counterpart of a Cartesian principal attribute (what 'constitutes…[a substance's] nature and essence' (CSM 1.210)).

The point in considering 1Def3 and 1Def4 together is that, by itself, 1Def3 is an empty and merely formal characterisation of substance. We need to see that it is *by virtue of having attributes* that substance can be conceived through itself. It is not just as *substance,* as substance as such, but as *substance of this or that kind* that we can actually conceive of substance through itself. Given what is hinted or presupposed in part 1 and proved in part 2, that *thought* and *extension* are attributes which constitute a substance's nature or essence, it is *extended substance* or *thinking substance* that is 'conceived through itself. As Descartes said, we are hardly 'to understand substance on its own, leaving out the fact that it thinks or is extended' (*PP* 1.63).

What identifies some property as an 'attribute', as something which can constitute a substance's nature or essence? In Descartes's case (see chapter 1), it is our ability to form a clear and distinct conception of some property without reference to any other property which

suffices to show it to be a principal property, a property which marks out a kind of substance. It is the same with Spinoza. He writes in a letter that '[b]y attribute I understand whatever is conceived through itself and in itself, so that its concept does not involve the concept of another thing. For example, Extension is conceived through itself and in itself, but motion is not. For it is conceived in another and its concept involves Extension' (*Ep* 2/C 165). Something with some property is a substance and is conceived through itself (that is, the concept of that substance as having that property 'does not require the concept of another thing, from which it must be formed' (1Def3)), if that property can be perceived by the intellect as constituting a substantial essence (that is, if that property can be conceived through itself). This account of Spinoza's definition that substances are conceived through themselves reverses the *apparent* order of demonstration of 1P10, where the self-conceivability of substances is taken as a premise for the conclusion of the self-conceivability of attributes.

But Spinoza's substance is not only 'conceived through itself; it also is 'in itself. These two characteristics are simply different sides of the same coin. That something can be conceived through itself is the test or criterion, our way of finding out, whether it can exist or be in itself. In effect, Descartes explains the point well in his second set *of Replies* when he asks what 'more reliable criterion' there could be that thought and extension are two different principal properties and constitute two different kinds of substance, and that there is thus a 'real distinction' between body and mind, than that 'we clearly understand [them] apart' (CSM 2.95)?

For Descartes, attributes are not substances, nor are substances attributes: there is (see chapter 1) a conceptual distinction between them. As for Spinoza, however, it has been suggested that he 'does not distinguish attribute from substance' (Curley 1969:17).[6] Two reasons given for this are that the definition of attribute in an early letter has marked parallels with the later *Ethics* definition, 1Def3, of substance, and that a *post-Ethics* letter says the definition of 'substance' holds also of 'attribute'.[7] But given that it is *as substance with this or that attribute* that substance is conceived through itself (so that the self-conceivability of substance is to be understood via the self-conceivability of an attribute which constitutes its essence), the first two of these facts is hardly surprising. $

Spinoza need not be taken as obliterating the Cartesian 'conceptual distinction' between substance and attribute. It does not amount to much anyway. The recognition that there is 'merely' (as Descartes says) a conceptual distinction between a substance and the principal property which constitutes its essence leads him to say that since thought and extension constitute the natures of thinking and extended substance, 'they…must be considered as nothing else but thinking substance itself and extended substance itself (*PP* 1.63).

For Descartes there are just two principal attributes—thought and extension. For Spinoza, it seems, there are more. Perhaps the definition of God as 'a substance consisting of an infinity of attributes' (1Def6) means no more than that God has all possible attributes, and so it need not involve more than the Cartesian two. But in the *Short Treatise* Spinoza is sure that God does have more than two.[8] Moreover, when he was asked why 'we cannot know more attributes of God than thought and extension' (*Ep* 63/W 305), he took the question seriously; he did not say there are no more to be known.[9] Though Spinoza's answers are of interest, we should agree that there is nothing in the structure of his metaphysics which reflects there being more than two.[10]

So much for Spinoza's conception of 'substance'. What is there for him which answers to it? What substance or substances are there for him? To begin with, Spinoza demonstrates at 1P11 the necessary existence of a substance which has an infinity of attributes. Given the prior definition of God (1Def6), this amounts to saying that 'God, or a substance consisting of infinite attributes …necessarily exists.' As it turns out, this is 'to end with' too. It is demonstrated at 1P14 that 'except God, no substance can be or …be conceived'. In outline the demonstration is simple. When 1P11 (according to which a substance with all possible attributes, God, necessarily exists) is added to the earlier 1P5 (according to which no two substances can have an attribute in common), it immediately follows that there can be no other substance than that one with all the attributes. This conclusion is the basis for the common characterisation of Spinoza as a 'monist' about substance.

Does this 'monism' contrast directly with Descartes's 'dualism' described in the last chapter, his doctrine that there are two principal properties each of which constitutes the nature or essence of a substance? The question is important, and the answer to it is not straightforward.

In an interesting discussion of these matters, C.D.Broad[11] characterises Descartes as a 'differentiating attribute dualist'. By a 'differentiating attribute' he means something which makes for a kind of substance: so, in Descartes's case, immaterial substance is differentiated by the attribute of thought, and corporeal substance by the attribute of extension. It emerges that he is thinking of Descartes as what might more specifically be called an 'instantiated-attribute dualist'. That is to say, the dualism he has in mind is not simply that there are two attributes, thought and extension, of which there *may or may not* exist actual instantiations (call this 'attribute dualism'), but also that there *do in fact* exist instantiations of them both ('instantiated-attribute dualism'). Thus, if Descartes had not believed in the existence of corporeal substance—if, that is, he believed that God had not in fact created a material world—he would not have been an instantiated-attribute dualist. He could, however, still be said to have been an attribute dualist, in the more basic sense of nevertheless holding there to be two attributes (one of which—extension—is uninstantiated) which mark out two kinds into which existent substances, if there are any, will fall. According to attribute dualism there are two kinds of substance, two possibilities for actual substances. According to instantiated-attribute dualism, there actually are substances of each of these kinds.

As Broad points out, Descartes is also a 'pluralist', in the sense (call it 'instantiation pluralism') that he holds there to be a plurality of instantiations of these two attributes—thought is instantiated by the existence of the uncreated infinite mind which is God, and by a plurality of created minds; extension is instantiated by the created material world.[12]

The question of three paragraphs ago must therefore be rephrased: is Spinoza's 'monism' of 1P14 to be contrasted with Descartes's attribute dualism, or with his instantiated-attribute dualism, or with his instantiation pluralism? An initial and partial answer is: at least with Descartes's instantiation pluralism with respect to immaterial substance. For Descartes, the pieces of corporeal substance are not numerically different individual substances; whereas there are many substantial instances of thinking substance, many individual substantial minds. For Spinoza too, the pieces of the corporeal world are not individual substances; they are (as we will see later) what he calls 'finite modes' of extended substance. However, and in a parallel fashion,

Cartesian finite thinking substances too become 'finite modes' for Spinoza.

Spinoza's rejection of instantiation pluralism, both about corporeal substance (along with Descartes) and about mind (away from Descartes) comes from 1P5. This is one of the crucial premises of the 'monism' of IP 14, and according to it there can be no substances with an attribute in common. In his reading of an early draft of the *Ethics* Henry Oldenburg quite reasonably took this to mean, in Aristotelian terms, that there cannot be two individual substances of the same secondary kind. But surely, he protested, 'two men are two Substances and have the same attribute, since each has the capacity to reason…[and so] there are two Substances of the same attribute' (*Ep* 3/C 169). Spinoza's reply[13]—that men's bodies are simply rearrangements of extended matter—is an endorsement of Descartes's rejection of individual corporeal substances, but it is not a general argument. It says nothing to rule out a number of different thinking substances.

But the demonstration of 1P5 provides a more general argument. Apparently assuming that the difference between two individual substances cannot be *merely* numerical, it argues that it must be constituted either by a difference in their attributes or by one in their 'affections' or states. A difference in the latter already presupposes that there are *two* substances, and so the difference must arise from the former. For the proof to work it is (as Leibniz commented)[14] necessary to accept what Spinoza later denies, that substances have only one attribute (otherwise, as indeed Oldenberg said, things could be similar in some respects, different in others).

There is another general argument for 1P5, at 1P8S2.[15] It is not part of the definition of any kind of thing that any particular number of things of that kind should exist; so some external explanation is required of each thing of that kind why it exists. 'If 20 men exist in nature…there must necessarily be a cause why each exists…. [It] cannot be contained in human nature itself, since the true definition of man does not involve the number 20 …[and so] must necessarily be outside each of them' (1P8S2). But there can be no explanation outside of a substance why it exists: 'a substance cannot be produced by anything else' (1P6C). So a substantial kind cannot have a number of instances, and if there are many individual men, they cannot be individual substances but merely modes. So, if extended and thinking substance really are

kinds of substance, there cannot be a number of individuals of those kinds.

Spinoza's un-Cartesian rejection of instantiation pluralism with respect to mind, taken together with his Cartesian rejection of instantiation pluralism with respect to body, does not amount to his 'monism' of 1P14. Proposition 1P14 depends on 1P11 as well as on 1P5. But to understand what else the 1P14 'monism' might mean we should first note that the disappearance from the Cartesian schema of instantiation pluralism with respect to mind (which 1P5 achieves) actually leaves *three dualisms.* Even without that disappearance there are two to consider:

1 an attribute dualism, and
2 an instantiated-attribute dualism.

To these would be added

3 instantiation dualism (though, since 'being created' is not a principal property or substantial attribute, not an instantiated-*attribute* dualism) *with respect to created substance*

—for, when 1P5 has done its work, there is then created corporeal substance as such, and created immaterial substance as such. Associated with (3) would be

4 an instantiation trialism with respect to created or uncreated substance indifferently

—for besides created corporeal and created immaterial substances as such, there is also one individual uncreated immaterial substance (God).

Exactly which of these dualisms is ruled out by 1P14?

This question cannot be completely answered immediately, but it can at least be said that 1P14 rules out (4), and so has possible consequences for the dualism of (3). For 1P14 rules out the Cartesian contrast between created and uncreated substance. It is not that Spinoza makes no distinction between creator and created. It is rather that for him nothing created is a substance. So the 'created corporeal and created immaterial substances as such' of (3) and (4) are, in Spinoza's scheme, either still created and so

no longer substances, or are still substances and so no longer created. This second alternative would mean that God and the corporeal world (not to mention the world of mind) are identical. When combined with the assumption that Spinoza's God exists as an instantiation, either alternative would produce an instantiation monism. This—and typically in terms of the second alternative—is the usual view of what Spinoza's 'monism' is.[16]

According to 1P11, the other main premise of the 'monism' of 1P14, there is a substance with an infinite number of attributes. It therefore presupposes that a substance *can* have more than one attribute. This claim, which is explicitly made at 1P10S, is of the greatest importance in Spinoza's metaphysics. Quite apart from the crucial contribution it makes to 1P14, it is of interest because it is so radically non-Cartesian. For one commentator it marks 'the biggest difference' (Bennett:65) between Spinoza's metaphysics and Descartes's.

According to Descartes (see chapter 1) 'we can perceive that two substances are really distinct simply from the fact that we can clearly and distinctly understand one apart from the other' (*PP* 1.60). However, when we clearly and distinctly understand that two substances are really distinct we are, more basically, clearly and distinctly understanding that two attributes are principal attributes. According to Descartes, where there are two principal attributes there are two substances, and his view in effect is that no existent substance can instantiate more than one attribute, or be a substance of more than one kind.

Now 1P10S is very easily read as an explicit denial of this. Even given Spinoza's attribute pluralism, it can look as though it supports instantiation monism. Spinoza apparently accepts the Cartesian test for a differentiating attribute—'each of [a substance's]…attributes is conceived through itself—and then, fully aware of his anti-Cartesianism, explicitly denies that it follows that two attributes 'constitute two beings, or two different substances'. It is, he says, 'far from absurd to ascribe many attributes to one substance' (1P10S).

But why is it not absurd to think of an existent substance instantiating two attributes? How can some existent be really and essentially of *this* kind (e.g. extended) and also really and essentially of *that* kind (e.g. thinking)? Even if this *seemed* to happen, surely it would be, as Leibniz said, that 'these two attributes expressing the same thing in different ways can be

further analyzed, or at least one of them' (L 198). Various approaches have been adopted to explain how Spinoza might hold there to be one existent substance which instantiates more than one attribute.

One of these recalls something Descartes says when defending his opposite view, that an existent substance can have only one attribute. In *Comments on a Certain Broadsheet* he says that to suppose that two attributes or principal properties could be present in the same subject is to suppose 'that one and the same subject has two different natures—a statement that implies a contradiction'. He allows, however, that this does not mean that there could not be something which had both thought and extension: a human being would be just such a thing. But a thing such as a human being is not, he says, a 'simple' substance but rather a 'composite entity' which consists *of two* substances, a mind and a body(CSM 1.298)

It is by reference to a Cartesian human being that Martial Gueroult understands Spinoza's multi-attributed substance as 'a union of…substances of one attribute'.[17] 'Spinoza's infinite substance, as Gueroult understands it, is a magnification to infinity of Descartes' dual natured man' (Donagan 1980:101). Of course, as Gueroult carefully points out, the 'union' of these substances into one must be of a different order in the two cases, of Descartes's man and Spinoza's God. The body and mind of Cartesian man are contingently united and separate at death. The union of substances in the second case is 'absolutely necessary', being of the nature of God. Descartes's man is a 'composition' of 'finite component parts' which are merely 'fused' or 'juxtaposed'; Spinoza's God is a union of 'constituents' in *one* substance. It can, however, be doubted whether Gueroult either illuminates or explains how Spinoza might hold that a number of substances of one attribute can form one substance of many attributes.

Another approach to making sense of what might seem to be Spinoza's radically un-Cartesian doctrine that there is one existent substance which instantiates more than one attribute is via what its prime exponent, Wolfson, calls a 'subjective interpretation of attributes'.[18] This interpretation stresses that while Descartes says of attributes that they 'constitute the nature and essence of substance' (*PP* 1.53), Spinoza says they are 'what the intellect perceives of a substance, as constituting its essence' (1D4). The suggestion is that 'two attributes appear to the mind as being distinct from each other. In reality, however, they are one.' So if the attributes are 'only different words expressing the same reality', there can hardly

be a problem how the same existent substance can be characterised by more than one of them.

This 'subjective interpretation' does not square at all well with Spinoza's 'objective' language, even in the very passage which raises the initial problem. In claiming that it is 'far from absurd to ascribe many attributes to one substance' Spinoza speaks in terms which hardly make sense unless there *really are* many. He speaks of how 'all the attributes' of the single substance have 'always been in it together', of how the more attributes a being has the more reality it has, and of how an absolutely infinite being 'consists of infinite attributes' (1P10S).

Both these approaches try to explain, on Spinoza's behalf, how a substance *could have more than* one attribute; but while doing so, they both accept that a substance *could have only* one. Yet it is (I suggest) just this which Spinoza rejects. His difference from Descartes is not that a substance can but need not have all the attributes there are. It is, rather, that a substance has to have them all. He and Descartes have radically different views about the nature of attributes or principal properties, and of the relationship between various such attributes.

This will be clearer if we ask why Descartes thinks that the same substance could not have the attributes both of thought and of extension. On one occasion it seems that his idea is that the two attributes are directly incompatible or mutually contradictory, and so—*as with any pair of contradictory properties*—no substance could have them both. He says, in the 'Synopsis' of the *Meditations,* that

> we cannot understand a body except as being divisible, while by contrast we cannot understand a mind except as being indivisible. For we cannot conceive of half of a mind, while we can always conceive of half of a body, however small; and this leads us to recognize that the natures of mind and body are not only different, but in some way opposite. (CSM 2.9–10)[19]

As a result of this it has been suggested that Spinoza's difference from Descartes on the question of one substance/one attribute stems simply from his 'rejecting Descartes's thesis that [thought and extension] are *incompatible* notions' (Cottingham 1988:130). It is indeed true that Spinoza does deny that extended substance is divisible, but there is no evidence of his wanting to draw *as a*

consequence from this that thought and extension are therefore compatible and so can be attributes of the same substance.[20]

On other occasions, however, Descartes holds that it is their special status as *differentiating* attributes, as attributes that mark out different kinds of substance, that is crucial. In *Comments on a Certain Broadsheet* his thought is not that no substance could be of a kind which involved its being divisible and of a kind which involved its being indivisible; it is rather that no substance could be of two kinds as such. He is replying to the suggestion that since the attributes of thought and extension 'are not opposites but merely different, there is no reason why the mind should not… co-exist…with extension in the same subject' (CSM 1.294–5). He says that this is 'a contradiction', for 'when the question concerns attributes which constitute the essence of some substances, there can be no greater opposition between them than the fact that they are different'. He goes on to say that to suppose that thought and extension could be present in the same subject is to suppose 'that one and the same subject has two different natures—a statement that implies a contradiction' (CSM 1.298).

It is just here where Spinoza can be seen to part company with Descartes. For Descartes it is their status *as differentiating attributes* that stands in the way of thought and extension belonging to the same substance; for Spinoza it is this very status that allows them to do so. Since differentiating attributes are conceived through themselves, quite independently of each other, a substance's possession of one can hardly rule out its possession of another.[21] Moreover, Spinoza's thought seems to be not just that this does not stand in the way of different attributes belonging to the same substance but, more strongly, that it ultimately necessitates their doing so. His view is not merely that the one substance happens to have all the attributes; it is that it must have them all.

Spinoza was questioned on this matter by Simon de Vries. 'You seem to suppose', he said in comment on an early draft of the *Ethics,* 'that the nature of substance is so constituted that it can have more than one attribute, which you have not yet demonstrated'. In the absence of a proof, de Vries said, he would continue to suppose 'that, where there are two different attributes, there are two different substances' (*Ep* 8/C 193).

Spinoza produced two proofs in reply. In the first he argues that 'nothing is more evident to us than that we conceive each being under some attribute, and that the more reality or being a being

has the more attributes must be attributed to it; so a being absolutely infinite must be defined, etc.' (*Ep* 9/C 195).[22] Substantial attributes mark out ways of being, kinds of reality, so anything that is real exists as a thing of this or that kind. The thought is, then, that (as at 1P9) the amount of reality a thing has is in proportion to the number of its attributes, or to the number of ways in which it is real. God, who is most real, must therefore have all the attributes there are, and be real in all the ways there are of being real. '[T]he nature of God does not consist of a certain kind of being but of absolutely unlimited being' (*Ep* 36/W 225).

Spinoza's degrees of reality are not the same as Descartes's (see chapter 2). For Descartes, the amount of reality possessed by something (whether mode, created substance, or uncreated substance) is related to its degree of dependence. Spinoza relates it to the number of ways (as extended, as thinking) in which a substance is real. On the face of it his idea has some plausibility. Yet it does mean that for something to have two degrees of reality is, in Descartes's phrase, for 'one and the same subject to have two different natures' (CSM 1.295). And how this can be is surely just the question for which de Vries is seeking an answer.

In his second proof Spinoza explains that 'the more attributes I attribute to a being the more I am compelled to attribute existence to it; that is, the more I conceive it as true. It would be quite the contrary if I had feigned a Chimaera, or something like that' (C 195).[23] In other words, if we think of something with more than one attribute, we do not find ourselves thinking of something which is impossible or chimerical, which could not exist. On the contrary, the more attributes we think of something as having, the more we think of it as *having* to exist.

This too fails to provide the answer to de Vries' question. Despite Spinoza's claim, it may well still be felt that, in thinking of something with more than one attribute and hence of something with more than one nature, we *do* find ourselves thinking of something impossible and chimerical. Unless we understood what it could be for something to be in more than one of the ways in which it is possible to be, we *would* find ourselves imagining a chimera when we tried to think of something with more than one attribute.

De Vries saw Spinoza as supposing that a substance 'can have many attributes'. But (I suggest) Spinoza's position is stronger than this: it is that any substance must have them all. If this is so, then what he holds as against what has been called Descartes's

'incompatibilism' about differentiating attributes is not merely 'compatibilism', but what might be called 'implicationism'.[24] Some suggestions have been made about arguments which Spinoza had or could have had for it.

One commentator has Spinoza argue that 'if a substance possesses an infinite and eternal attribute, then it must be an absolutely infinite substance; and if it is an absolutely infinite substance, then it must possess *every* infinite and eternal attribute' (Delahunty:119). Moreover, since any attribute *is* 'infinite and eternal' for Spinoza, it would follow that a substance with any attribute must be a substance with all. Now Spinoza does accept the second of these premises: it is clear from 1Def6 that an absolutely infinite substance must have all attributes. But he would not accept the first premise: having an infinite attribute does involve being infinite *relative* to that attribute, but it does not involve the infinity of having all attributes. As Spinoza puts it, a substance which possesses an infinite and eternal attribute is 'infinite in its own kind' (1D6E), or in respect of that attribute, and not necessarily 'absolutely infinite', or possessing *all* attributes.

Another explanation of how it comes about that 'all the attributes it [substance] has have always been in it together' (1P10S) suggests that for Spinoza 'the existence of each of the attributes is necessary', and so it follows that 'it is not possible that one of them should exist without the others' (Curley 1988:30).[25] If the premise is granted that for any attribute there must be a substance with that attribute, then it does follow that there will not be a substance with a given attribute without there being a substance with any other. There is, then, a sense in which it can be said that no attribute 'exists without the others'; but this is a sense far weaker than is required for it to be true that 'all the attributes substance has have always been in it together'. For all the argument shows, there might be as many substances as there are attributes, each with one of those attributes, and not necessarily one substance with all those attributes.

The difference between these things is formally clear enough, but what in fact is the difference at the level of a substantive metaphysics? This crucial question has been raised in the course of a recent and very interesting discussion:

> if attributes are really distinct from one another and totally independent, would a world in which no substance is

> constituted by more than one attribute differ in any way from one in which those attributes all constitute the same substance? In other words, how does a substance constituted by really distinct attributes differ from a mere aggregation of substances of one attribute?
>
> (Donagan 1988:84)

According to the *Ethics* 'all the attributes…[substance] has have always been in it together' (1P10S), but it does not explain what reason there is for saying this or how things would otherwise have been. No doubt having this in mind, R.G.Collingwood commented that 'the two attributes of extension and thought are held together…so to speak, by main force: there is no reason that Spinoza can give why that which is extended should also think…. [T]he theory remains…a mere assertion of brute fact' (Collingwood:106). However, in his earlier *Short Treatise* Spinoza explains 'why we have said that all these attributes which are in Nature are only one, single being, and by no means different ones (though we can clearly and distinctly understand the one without the other' (C 69). At least partly it is

> [b]ecause of the unity which we see everywhere in Nature; if there were different beings in Nature, the one could not possibly unite with the other. (I.e., if there were different substances which were not related to one single being, then their union would be impossible, because we see clearly that they have absolutely nothing in common with one another—like thought and extension, of which we nevertheless consist.)
>
> (C70)

So, the difference between there being many substances each with one attribute and there being one with many is that the former situation lacks a 'unity' to be found in the latter; for the only way there could be any 'union' between two attributes is for them to belong to the same substance.

The 'unity' which Spinoza is thinking of is manifest in the union of mind and body in human beings. Something of how he understands this will be seen in chapters 8 and 9.

This discussion of Spinoza's doctrine of a multi-attributed substance arose out of the question how to construe the 'monism' of 1P14. The partial and conditional answer was earlier given to this

that if Spinoza's God is taken to be the instantiation of various attributes, then IP 14 contains at least an instantiation monism; and it was noted that this is how Spinoza's 'monism' is usually understood. Since then the focus of discussion has been the assumption of 1P14 that a substance can have more than one attribute; and I have suggested that Spinoza's actual, though perhaps not clearly stated, view is that a substance cannot have less than all the attributes there are, and that the nature of differentiating attributes as differentiating kinds of substance is such that they *must* go together. If this is right, then, despite the fact that Spinoza thinks there is more than one such differentiating attribute, his 1P14 monism must also involve a denial of attribute dualism, at least as straightforwardly understood. 'Implicationism' about differentiating attributes must produce a kind of attribute monism.

I suggest that this is what Spinoza's 'monism' is. At any rate, the common idea that IP 14 amounts to instantiation monism is a mistake. The assumption this makes, that Spinoza's God, his single substance, is an instantiation, often comes out in the idea that Spinoza's single substance is to be identified with the extended corporeal world. This assumption is seriously mistaken. For Spinoza, 'there is existent substance' means that, quite apart from there actually being any extended things, extension is something which can be not merely conceived but conceived through itself (i.e. it is a substantial attribute). If we put this by saying that in talking about extended substance Spinoza is talking about *possibility,* we need to be careful to realise that the actuality with which this contrasts is *not* that of *actual extended substance.* For Spinoza, anything which actually instantiates the substantial attribute of extension would not (as would be the case with Descartes) itself be extended *substance.* Rather it would be, as we shall see later on, what he calls a *mode* of extended substance. The reality of Spinoza's single substance is, I suggest, in no way that of an existent instantiation. It is, rather, a reality of a kind which makes it possible for there to be actual instantiations of extension, actual extended modes.

In explaining this it is convenient to simplify matters by leaving aside human thinking things, and to contrast Descartes's and Spinoza's metaphysical systems as follows. The former consists of an uncreated thinking substance (God), and the created extended substance of the corporeal world; the latter consists of an uncreated extended substance (which is also thinking) which

Spinoza identifies with God. Many people have found it natural in effect to equate Spinoza's extended substance with Descartes's extended substance, and hence to equate Spinoza's extended substance with the corporeal world and to take it that for Spinoza the corporeal world is God. Examples of this interpretation can be found from the earliest to the latest times.

According to John Harris, in 1698, Spinoza holds 'that the Deity is the whole Mass of Beings or of Matter in the Universe' (Harris:31). According to Samuel Clarke, in 1704, 'Spinoza… taught that there is no Difference of Substances, but that the whole and every Part *of the Material World* is a Necessarily-existing Being; and that there is no other God, but the Universe' (Clarke 1704:2.532). Rather more recently, Joachim has said that 'Spinoza follows Descartes…in calling the corporeal or material universe 'res extensa'. But the "res extensa" is no creation of God: it is God….God…is…an extended thing—a corporeal universe' (Joachim:68–9).[26]

The idea that Spinoza identifies God, or the one extended substance, with the corporeal world is sometimes fuelled by his rejection (see chapter 10) of Descartes's view that God is a so-called 'transitive cause' (1P18) of the corporeal world as a substantially different entity. In Descartes's case, because of the nature of transitive causation, and because his God is not corporeal, God is clearly differentiated from the corporeal world. But Spinoza's view that God is not a transitive but an immanent cause fogs the difference between the cause and the effect, a fogginess added to by the fact that Spinoza's God, as the cause of the extended corporeal world, is itself an extended corporeal substance (not a purely thinking substance, as is Descartes's). It is clearly the obscurity of the causal relation between Spinoza's God and the corporeal world that led Malebranche to say that 'not being able to understand the divine power and how God by his will alone could create the universe, [Spinoza] has taken the universe for his God' (1958–72:17(l).622).[27]

Behind this persistent misidentification of Spinoza's extended substance with Descartes's extended substance and with the extended corporeal world lies a failure to see that Descartes's and Spinoza's extended substances are realities of radically different sorts. When Spinoza says 'God exists' or 'extended substance exists', what he means, I believe, is something rather different from what Descartes means when he says 'God exists' or 'extended

substance exists'. As stated earlier, the reality of Spinoza's extended substance is not that of an existent instantiation of extension; it is a reality of a kind which underwrites the possibility of actual instantiations of extension, of actual extended things.

The idea that there are two kinds of reality is common in the seventeenth century. A very clear example is Descartes's distinction between the reality or existence of immmutable, eternal natures, essences or forms, and that of corporeal things in the material extended world.

> I find within me countless ideas of things which even though they may not exist anywhere outside me still cannot be called nothing; for…they are not my invention but have their own true and immutable natures. When, for example, I imagine a triangle, even if perhaps no such figure exists, or has ever existed, anywhere outside my thought, there is still a determinate nature, or essence, or form of the triangle which is immutable and eternal, and not invented by me or dependent on my mind.
>
> (CSM 2.44–5)[28]

This same distinction, that between eternal and immutable attributes which have a kind of reality different from that of their instantiations in the corporeal world, is made by Spinoza. In the *Metaphysical Thoughts* (C 304–5) Spinoza distinguishes between 'the being of essence', 'the being of existence', and 'the being of idea'. The 'being of existence' is the being of an instantiation of an essence; it is, says Spinoza, 'attributed to things after they have been created by God'. As to essence, there are, says Spinoza, certain questions usually raised about it: 'Whether essence is disinguished from existence? And if it is distinguished, whether it has any being outside the intellect?' To the first of these Spinoza replies that, except in the case of God, whose essence cannot be conceived without existence, 'in other things it [essence] does differ from and certainly can be conceived without existence'. To the second, whether an essence is anything different from an idea, he replies that 'a thing that is conceived clearly and distinctly, or truly…is something different from the idea'.

What then is it? Given that it is different from an idea, 'it must surely be granted', says Spinoza, that it 'has…being outside the intellect'. But in what way has it being outside the intellect? 'It

depends', says Spinoza, 'on the divine essence alone, in which all things are contained. So in this sense we agree with those who say that the essences of things are eternal.'

Less explicitly, but no less clearly, at 2P8 of the *Ethics* Spinoza has a distinction between 'formal essences' of modes, which 'exist …insofar as they are comprehended in God's attributes', and things which 'exist…insofar as they are said to have duration' (C 452). The same distinction is there at 5P29S (C 610), where things are said to be 'actual in two ways': first, 'insofar as they exist in relation to a certain time and place'; and, second, 'insofar as we conceive them to be contained in God'; in this second way in which they are 'true, or real' they involve 'the eternal and infinite essence of God'.

The same distinction, between eternal and immutable natures which have a kind of reality different from that of their instantiations in the corporeal world, is made by Leibniz. He suggests that propositions about the existence of some thing should not all be understood in the same way; in his terminology, some of them are 'existential' and some 'essential'. Thus 'A man liable to sin exists, i.e. is actually an entity' is existential, whereas 'A plane figure having a constant relation to some one point exists' is essential. In explaining essential existence, he says 'I say "exists": that is, it can be understood, it can be conceived, that among various figures there is one which also has this nature, just as if I were to say "A plane figure having a constant relation to some one point is an entity or thing"' (LP 80–1). So for it to be true that a man liable to sin exists (i.e. existentially, as an existent reality), there has actually to be in the corporeal world some man who is liable to sin. For it to be true that a plane figure having a constant relation to some one point exists (i.e. essentially, as an abstract reality), there need not actually be in the corporeal world some circular thing or circular arrangement of things. For the circle to exist it is sufficient that it be geometrically possible that things be figured in that way.[29]

Descartes's and Leibniz's 'essences', 'natures', 'forms' are not mental ideas. They are things of which we can have ideas. This is clear from Descartes's talk of 'ideas of things which…cannot be called nothing…[and] are not my invention but have their own true and immutable natures'. Similarly, Leibniz says that 'everlasting essences' (*NE* 296) are 'independent of our thinking' (*NE* 293). We can have ideas which we mistakenly think correspond to an essence, as when 'something appeared to be…[an essence] but really is not' (*NE* 293), as 'for example when

the parallelism of parabolas is contemplated, through the delusion that two parabolas can be found which are parallel to one another, like two straight lines or two circles' (*NE* 268).[30] On the other hand we can come to form ideas of already existing essences: '[t]he inventor's idea…has as its archetype a real possibility, or a divine idea' (*NE* 268).

Now when Descartes says 'God exists' and 'extended substance exists', he means these things 'existentially' rather than 'essentially'. His ontological proof of the existence of God draws a parallel between the immutable nature or essence of God and that of a triangle, and aims to show that that nature or essence is instantiated at least once.[31] According to Descartes the Divine essence differs from all others, in that it alone is necessarily instantiated; God's existence differs from that of all other things in that it alone is necessary existence. But, necessary though it be, Descartes's God is like a corporeal triangle in being the instantiation of an immutable essence or nature. Similarly the mode of existence of Cartesian extended substance too is like that of an instantiation of an immutable nature or essence. Descartes makes a sharp distinction between our having a 'clear and distinct perception of, some kind of matter, which is extended in length, breadth, and depth' and 'there exist[ing] something extended in length, breadth and depth…that we call "body" or "matter"' (*PP* 2.1).[32]

But for Spinoza the case is quite different. When he says 'God exists' or 'extended substance exists', he means it 'essentially' rather than 'existentially'.[33] It would not, however, be quite correct to say that Spinoza's extended substance or God actually is a nature or essence. It is rather (see chapter 4) that it is what supports natures or essences, or where they are located.

But if the corporeal extended world does not figure in Spinoza's system, as it does in Descartes's, as extended *substance,* then how does it figure? The quick answer is that it figures as a *mode*—specifically, as the so-called 'infinite mediate' mode of the attribute of extension. This requires explanation.

Spinoza's famous identification of God and nature in his phrase 'God, or Nature' ('Deus sive natura', 4Pref) does not mean that his extended substance is, after all, the corporeal extended world; for this identification needs to be seen against the background of his distinction between *natura naturans* and *natura naturata*. The first is 'nature' as active and creative, i.e. 'what is in itself and is conceived through itself, *or* such attributes of substance as express

an eternal and infinite essence, i.e.… God, in so far as he is considered as a free cause'; the latter is nature as passive and created, i.e. 'whatever follows from the necessity of God's nature, *or* from any of God's attributes, i.e., all the modes of God's attributes insofar as they are considered as things which are in God, and can neither be nor be conceived without God' (1P29S). The corporeal world is part of *natura naturata;* it is a mode of the attribute of extension, something which can neither be nor conceived without God as extended substance.

The definition of 'mode' comes immediately after those of 'substance' and of 'attribute'. Modes are 'the affections of a substance, *or* that which is in another through which it is also conceived' (1Def5). In Descartes's mouth this would be straightforward enough. For him, the square shape of a piece of extended substance would be one of its modes. It would be an 'affection' or property of the thing; and it would be inconceivable without it, not only because it can only be the shape of an *extended* thing, but also because it can only be the shape of *that* extended thing. But even apart from the fact that Descartes's extended substance is not Spinoza's, Spinoza's modes form a complex three-tiered structure. Considered abstractly, this is as follows.

Modes of the top two levels are 'eternal and infinite' (1P21–3). The topmost *directly* 'follow from the absolute nature of any of God's attributes' (1P21); those below follow from God's attributes *indirectly* and 'by some mediating modification' (1P23D), i.e. by one of the topmost modes, which *directly* follow. The topmost modes may conveniently be referred to as 'immediate, infinite modes', those just below as 'mediate, infinite modes'. There is one of each kind for each attribute. At the bottom of the structure are modes each of which is 'finite and has a determinate existence' (1P28). Not being infinite and eternal, they neither follow immediately from a divine attribute nor follow mediately from a mode which does follow immediately. They follow, not from modes of the level above, but from modes of their own sort, i.e. from 'an attribute of God insofar as it is modified by a modification which is finite and has a determinate existence' (1P28D). There are many of them for each attribute, and Spinoza calls them 'singular things'.

This three-fold modal system in the *Ethics* develops an earlier more straightforward two-fold one. *The Short Treatise* divides *natura naturata* into a 'universal' and a 'particular' aspect. The first

consists of eternal modes 'which immediately depend on, or have been created by God'; the second of 'singular things which are produced by the universal modes' (*TGM* 1.8, 9).[34]

Neither the finished *Ethics* nor, it seems, the draft which circulated amongst Spinoza's friends gave concrete cases of infinite modes. When requested he gave 'absolutely infinite understanding' and 'motion and rest' as the *immediate* modes of the attributes of thought and of extension respectively.[35] The infinite *mediate* mode of thought is left vague, but 'the body of the whole Universe' (trans. Curley 1988:149) is given as the *mediate* infinite mode of extension. On this last point Spinoza refers his correspondent to 2P13L7S, which explains how we can 'conceive that the whole of nature is one Individual, whose parts, i.e., all bodies, vary in infinite ways, without any change of the whole Individual'. As for finite modes, *the Ethics* itself makes quite clear that individual human minds are finite modes of thought, while our bodies and the material things which surround them are finite modes of extension.[36]

As remarked earlier, Spinoza's definition of modes, as what 'exist in' and are 'conceived through' substance, might seem straightforward enough, seen against the background of Descartes. But given the complexity of Spinoza's modal system, it must be doubtful whether a single unequivocal account could be given of the way in which modes are supposed to 'exist in' and be 'conceived through' substance. Moreover, Spinoza's finite modes seem to be of the wrong logical type to be understood in terms of Cartesian modes, which are properties.[37] Spinoza's modes will be discussed further in chapters 5, 6, 8, and 9.

NOTES

1 For historical accounts of these methods see Hintikka and *Remes: passim,* Lakatos: chap. 5.
2 For further discussion of the appropriateness of the geometrical order see Joachim: 9ff., Roth: 43–4, Wolfson: 1.44ff.
3 Curley 1969:15.
4 *PP* 1.51.
5 As do Jackson:205, Parkinson 1954:67.
6 See also Curley 1988:13.
7 See *Ep* 2/C 165 and *Ep* 9/C 195.
8 C64.
9 *Ep* 64; see also 65, 66.

10 Bennett: 78; but cf. Pollock: 169. On the topic in general see Bennett: sect. 19, Joachim: 41, Kline: 345–7, Pollock: 167f., Wolf 1972:24f.
11 Broad 1937:17–27.
12 With respect to thought Descartes is therefore a (created) instantiation pluralist and an (uncreated) instantiation monist; with respect to extension he is a (created) instantiation monist.
13 *Ep* 4/C 172.
14 L 198.
15 *Ep* 34 gives effectively the same argument for the conclusion that there is only one God. For other proofs of this conclusion about God see C 254, 318.
16 See Broad 1937:21, Bennett: 70.
17 For the quotations from Gueroult in this paragraph see 1970–4: 1.598, 232, 233, 237. For discussion of Geuroult see Curley 1974:240–1, Donagan 1973b:174–7, Donagan 1980:100–1.
18 For the quotations in this paragraph Wolfson: 1.153, 156. In general see 1.5(4); and, for discussion and criticism, Donagan 1973b:170–3, *Haserot.passim*.
19 See also CSM 2.59.
20 The argument against divisibility (1P5S) comes in defence of extension as an attribute of God, against the idea that divisibility cannot pertain to God. It is one of the more obscure parts of the *Ethics*. For some useful comments and discussion, both historical and philosophical, see Bennett: sect. 21, Koyré 1957:155, Wolfson:1, chap. 8.
21 See Donagan 1988:79–80 for this interpretation of 1P10S.
22 *E* 1 PI OS repeats the proof.
23 See also *E* 1P11S.
24 Broad 1937:24, and Delahunty: 106 speak of Spinoza as a 'compatibilist'. 'Implicationism' is almost from Delahunty: 120.
25 See also 148 n. 40, 1974:240–1.
26 See Colie: *passim,* for other earlier examples of this; as more recent examples see also Grant 1981:229, Pollock: 164, Scruton: 50. For a noteworthy exception to all of this see Kashap 1987:14–27, 42–3, and also Curley 1988:36f. Joachim (87) and Pollock (165) *also,* and inconsistently, identify the material world with the mediate infinite mode of extended substance.
27 See also, more recently, Schacht: 85.
28 See also 1.129; and Kenny 1968:147–55.
29 See also LP 115; and *NE* 293–4, where 'essences' are distinguished from 'things which actually occur in the world'.
30 See also *NE* 321.
31 CSM 1.197–8.
32 See also the parallel passage at C 261.
33 See Woolhouse 1990 for further discussion of this interpretation. Bennett provides a very clear example of the more standard idea that Spinoza's God exists as the instantiation of a nature. Referring to an earlier discussion of Frege's 'third realm' (roughly, the realm of Cartesian and Leibnizian essences and natures), he says Spinoza's God is 'a concrete object—something *other than* an inhabitant of the third

realm' (70, my italics). Similarly, he says that Spinoza's single substance is something which exists as the necessary instantiation of a nature (73, 74).

34 See also C 79.

35 *Ep* 64. In the simplified system of *TGM* 'Motion in matter" and 'Intellect in the thinking thing' are the 'universal, eternal' modes.

36 Some commentators suggest that Descartes too sometimes thinks of and refers to material things—which for him are merely pieces of material substance—as 'modes', but they give no supporting references (Keeling: 130 n. 1, Watson 1987:184, 187, 188; see also Cottingham 1988:86, Curley 1988:33).

37 Curley 1969:18, 1988:31.

4

Leibniz and Substance

Leibniz (as noted in chapter 1) remarked towards the end of his life that 'the consideration of substance is of the greatest importance and fruitfulness for philosophy' (*NE* 151). Indeed his own account of it, he says, is

> so fruitful that there follow from it primary truths, even about God and minds and the nature of bodies—truths heretofore known in part though barely demonstrated, and unknown in part, but of the greatest utility for the future in other sciences. (L 433)

Expounding this account is not easy, however. There are no one or two central master-works on which to focus, as there are with Descartes and Spinoza. Moreover his ideas underwent considerable changes with time.

Yet there is a *period* on which to focus, a period during which his philosophy first came, if not to conclusions which finally satisfied him, to some kind of resolution. To this so-called 'middle period' (roughly 1680–1700) there belong, most famously, the *Discourse on Metaphysics* (written 1685–6, though not published till the nineteenth century), together with the lengthy correspondence (1686–7, though not published till the nineteenth century) he had about it with Antoine Arnauld. There also belongs to these years Leibniz's first systematic *public* announcement of his mature ideas, his 'New system of the nature of substances' (1695), a short article which provoked much discussion and controversy. By the end of his life the ideas about substance which Leibniz had worked out in this period had undergone some radical changes,

and the metaphysical picture in the *Monadology* (1714), two years before he died, is importantly different from that described to Arnauld. There will be no space here to discuss these later developments; in any case, they involve no really new considerations so far as Leibniz's agreements and disagreements with Descartes go.[1]

At the centre of Leibniz's account is the idea of an *individual substance*—more specifically, perhaps, an individual *created* substance. Aristotle (see chapter 1) distinguished between second and first substances, between kinds and the individuals which belonged to them. When Aristotle says of substance that it has properties and is not itself the property of anything else, he is thinking of individual things; and it is with that that Leibniz begins in the *Discourse on Metaphysics*.

Descartes's God created substantial reality of two kinds: corporeal and incorporeal. But (see chapter 2) his scheme provides for *individual* created substances of only one of these kinds: there are individual substantial minds, but no individual substantial bodies. For Descartes, individual bodies are simply pieces of created extended substance, and not separate individual substances.

Because Cartesian extended substance does not provide for individual substances, Leibniz is not satisfied with it—so much so that he holds that in and of itself it is not a form of substantial reality. This does not mean that for Leibniz there are no corporeal substances. There are, and they are individual substances too. It means that their substantiality and individuality do not derive from their being corporeal or extended, but from their relation to an individual substantial mind, or something like one. Individual mental substances (which the Cartesian scheme does provide) are at the centre of the Leibnizian stage, and the very paradigm of a substance. '[R]eflection enables us to find the idea of substance within ourselves, who are substances' (*NE* 105). The idea that minds make corporeal substances possible was foreshadowed much earlier, in 1665, by the idea that 'the substance of body is union with a sustaining mind' (L 116). It itself foreshadows the later view of the *Monadology* that mind-like 'monads' are not merely the only substantial realities but the only reality of any kind, body being just a 'well-founded phenomenon'.

There is substantial reality of (at least) two kinds for Spinoza too. But he allows for individual substances of neither kind. He

agrees with Descartes that individual material bodies are not substances (they are finite modes); but he goes beyond Descartes and holds something similar of minds. In Leibniz's view this is quite the wrong direction in which to go. In the notes he made in 1678 on Spinoza's *Ethics,* he says (in connection with 1P14, that there is no substance but God), '[i]t does not yet seem certain to me that bodies are substances; with minds the case is different' (L 201): even if the case for individual material substances cannot be made (and with the help of minds it might be), the case for individual immaterial ones certainly can. In a passage which is reminiscent of Descartes's *Principles* 1.16, Leibniz says that 'experience…teaches that we are in ourselves something particular which thinks…and that we are distinguished from another being who thinks…. Otherwise we fall into the opinion of Spinoza…who hold[s] that there is only one substance, God' (L 559).

So much by way of a general outline. In order to flesh this out we must turn to the *Discourse on Metaphysics.* One question which concerned Leibniz in this, he said, was that of 'the co-operation of God with creatures [created things]' (L 302). Accordingly, at section 8, he makes an attempt '[t]o distinguish the actions of God from those of creatures'. To do this, and to understand the nature of created things, it is necessary, he thinks, to explain what an 'individual substance' is. What he says covers a fair amount of ground and needs to be taken in stages and with some circumspection.

'It is of course true', he begins, 'that when a number of predicates are attributed to a single subject while this subject is not attributed to any another, it is called an individual substance.' But though this is correct, it is only correct so far as it goes; it is, he says, only a nominal and superficial explanation of substance. It gives no insight into the matter, and does not tell us what it is for a substance to have an attribute. 'We must consider, then, what it means to be truly attributed to a certain subject.'

Leibniz's suggestion about this needs quoting in full:

> Now it is certain that every true predication has some basis in the nature of things, and when a proposition is not an identity, that is to say, when the predicate is not expressly contained in the subject, it must be included in it virtually. This is what the philosophers call *in-esse,* when they say that the predicate *is in* the subject. So the subject term must always include the predicate term in such a way that anyone

> who understands perfectly the concept of the subject will also know that the predicate pertains to it. This being premised, we can say it is the nature of an individual substance or complete being to have a concept so complete that it is sufficient to make us understand and deduce from it all the predicates of the subject to which the concept is attributed.
>
> (DM8)

The nominal definition with which Leibniz began is (see chapter 1) a traditional Aristotelian one. One problem about his deeper explanation is that he speaks as though it is traditional too. Another is that it is not immediately clear what it amounts to or exactly what it was meant to explain. What is Leibniz getting at when he asks 'what it means to be truly attributed to a certain subject'?

If we reconstruct his question from the answer he eventually gives, it would seem that Leibniz wanted to explain how it comes about that created substances have the properties they have. It may not be obvious from the question as it stands that this *is* what he wanted, but it certainly fits with his initial interest in determining the relative extents of the activities of created substances and of God. For the upshot of such an inquiry could be that created substances come to have the properties they do as a result of God's activity, or, alternatively, it could be that they have them as a result of their own activity. We will see eventually that Leibniz comes to the latter conclusion. But as it is not immediately clear that this *is* the direction in which he is aiming when he asks 'what it means to be truly attributed to a certain subject', we should follow him step by step.

A substance, Leibniz explains, is not simply the possessor of properties or predicates; it is also something with 'a concept so complete that it is sufficient to make us understand and deduce from it all the predicates of the subject to which the concept is attributed'. It follows, he goes on, that 'the entire nature of the body does not consist merely in extension, that is to say, in size, figure, and motion, but that there must necessarily be recognized in it something related to souls, which is commonly called a substantial form' (*DM* 12).[2] It is perhaps over-confident of him to suppose that 'anyone who will meditate about the nature of substance as I have explained it' (*DM* 12) will agree; but at least it is possible eventually to come to see what he means.

It is clear enough that the predicates of an individual substance, some particular person, say, will include the predicate of being blue-eyed, which he was throughout his life; the predicate of having a limp, which he had for a week following a fall on his fifth birthday; and the predicate of walking well, which he had at all other times. They will also include such things as the predicate of sitting down, which could be truly attributed to him intermittently through his life. But what is it for there to be a 'complete concept' (or 'nature' (DM 13)) of that person which 'contains' all these predicates? Why should it follow that the nature of body cannot consist solely in extension? What is the relation between a complete concept and a 'substantial form'? In one of his letters to Arnauld, Leibniz briefly repeated that if a person's body is substance it cannot consist of extension alone, and that there must therefore be 'something there' (*LA* 66) like substantial form or soul. Although Arnauld said he would 'like enlightenment' (*LA* 79) about this 'form', he would have been entirely familiar with its general provenance. We should pause for a moment to remind ourselves of it.

'Substantial forms' belong to the Aristotelian metaphysics of substance (see chapter 1), and they are picked out for special mention by Huygens (see chapter 1) as some of the 'irrelevant paraphernalia' which Descartes swept away. In the next chapter we will see the involvement of Descartes, Spinoza, and Leibniz in the development of the so-called 'mechanical philosophy'. In broad terms, this rejected any ideas of hylomorphism in physical explanations, and argued instead that natural phenomena were to be understood as the result of the motions and collisions of small material bodies, corpuscles or atoms. But if Leibniz is an advocate of this 'mechanical philosophy', why is he here appealing to 'substantial forms'?

Leibniz himself is aware that there is some oddity here. 'I know', he says, 'that I am advancing a great paradox in seeking to restore the old philosophy in some respects and to restore these almost-banished substantial forms' (*DM* 11). There will seem to be a 'paradox' only if it is supposed that Leibniz's restoration of substantial forms is a return to their use in physics and natural philosophy. But this it certainly is not. 'I am as corpuscular as one can be in the explanation of particular phenomena…. One must always explain nature along mathematical and mechanical lines' (*LA* 66). He agrees, he says,

> that the consideration of these forms serves no purpose in the details of physics and that they ought not to be used to explain particular phenomena.
>
> (DM 10)

Substantial forms *are* needed, however, Leibniz thinks, for any adequate *metaphysical* account of the world. Moreover, without an adequate metaphysics, physics will lack proper foundation and inevitably be unsatisfactory. Substantial forms are not necessary in detailed physical inquiries, but the metaphysical principles of these inquiries require them. Making clear to Arnauld that 'it is useless to mention the unity, concept or substantial form of bodies, when it is a question of explaining the particular phenomena of nature', Leibniz says that

> [t]hese matters are nonetheless important and significant in their place. All bodily phenomena can be explained mechanically, or by corpuscular philosophy, following certain principles of mechanics granted without troubling whether souls exist or not; but in the final analysis of the principles of physics and of mechanics even, it is found that these principles are not explicable purely by the modifications of extension, and the nature of force already requires something else.
>
> (LA 96)

The place Leibniz finds for substantial forms in the metaphysical foundations of physics will be discussed in chapters 5 and 6. We must concentrate here on their place in his account of substance. There are two aspects to this. One, to which this chapter will return later, relates to the traditional function (see chapter 1) of forms as the organising active natures of substances as they develop and change. The other, and the more immediately obvious in the *Discourse on Metaphysics* and correspondence with Arnauld, relates to the idea (also outlined in chapter 1) that substantial form produces the unity and individuality of individual corporeal substances, and makes them *entia per se*.

Leibniz's caution about the Cartesian principal attribute of extension is that, taken by itself, it cannot provide for individual extended substances. Extension, and therefore an extended thing *qua* extended, is essentially composite and divisible. Though this was not totally

explicit in the *Discourse,* Arnauld was in no doubt it was something Leibniz had in mind: 'it is the divisibility of extension into an infinite number of parts that gives one trouble in conceiving of its unity' (LA 80).[3] He was in no doubt either that it was precisely in order to make unified material substances possible that Leibniz wished to reinstate substantial forms. Though Arnauld was clear enough about Leibniz's motives, he did not share them. He is no more troubled than Descartes would have been by the reminder that his extended substance does not allow of individual substances. Just as Descartes might have done, he points out that even though the parts of a block of marble are not individual substances, they are surely substantial: they are not modes or states of being of some other substance. He accuses Leibniz of 'a quibble over words', and of setting up a special definition in saying that substance is 'that which has a true unity' (*LA* 107). Leibniz, quite rightly, retorted that the Scholastics have thought of it 'more or less in the same way' (*LA* 120).

Arnauld pressed Leibniz with questions and problems about 'substantial forms' and their supposed ability to produce unified material substances or, as the medievals put it, *entia per se.* Leibniz is quite candid that his answers are not always fully adequate, but he makes the general point that even if what he says about 'bodily substance' and 'substantial form' has its difficulties, the same is already true of 'extension'.[4]

What happens to its substantial form, Arnauld asked, when a marble tile is broken into two?[5] Leibniz replied that a tile does not have the kind of unity he has in mind, and for which he introduces substantial form. Like a heap of stones, a tile has no substantial form and has merely *accidental* unity. It is 'an entity united by accident or aggregation' (*LA* 66), and not one united *per se,* or in itself. Of course, there are obvious differences between the heap and the tile as to the degree of cohesion of their parts. But, like physical contact, mere physical connection, no matter how close or tight (as with diamonds set in a ring, fish in a frozen pond, a flock of bound sheep, a chain of links), cannot produce more than accidental unity.[6] Even ordered societies or machines, things whose parts 'conspire to one and the same end' (*LA* 127) and are connected in other than straightforwardly physical ways, are not substantial unities. Their unity is 'a fabrication of our minds' (*LA* 94); it exists 'by opinion, by convention' (*LA* 126). Leibniz 'accords substantial forms [only] to…bodily substances that are more than mechanically united' (*LA* 95).

Genuine unities or *entia per se* need to be 'animate machines whose soul or substantial form creates substantial unity independent of the external union of contiguity' (*LA* 95). Yet pressed by Arnauld about promising cases, such as trees and animals, Leibniz is not fully confident whether they have substantial forms. He is confident, though, that living human beings are certainly individual substances. They have substantial forms and are genuine substantial unities.[7]

Leibniz's ideas, as he explains them to Arnauld, quite clearly take up the earlier hylomorphic analysis of individual substances into 'matter' and 'form' (see chapter 1). According to this, a living person is a composite of substantial form or 'rational' soul, and bodily material such as flesh and blood. What makes a human body into a body is that its material is 'ensouled' or 'animated', organised by an entelechy or form. When, as on the death of the person, the body loses this organisation, it ceases, strictly speaking, to be a body at all, and is just a mass of material. Death, therefore, is something which happens to the composite, the human being as a whole; it is the disorganisation of the previously organised whole. Descartes, on the other hand (as discussed in more detail in chapter 8), understands a living human being quite differently, as a union of *two* substances, mind and body, rather than as *one* substantial composite of form and matter. For him, a dead body is just as much a body as a living one; the one is to the other as a working clock is to an unwound or broken one. Death is primarily something which happens to the body, not to the mind/ body unity. For the body to die is not for the mind to cease its union with it: it is for it to break, or run down as might a machine. It is *as a consequence* of that breakdown that the mind leaves.

Leibniz revives the pre-Cartesian ways of thinking. His view, he explains to Arnauld, is that a living human being is a composite of a soul, or substantial form, animating and organising a certain amount of material. As such, a living human being is, of course, an extended material substance; but its substantiality does not, as for Descartes, derive from its being material or extended, but from its organising form. Arnauld's Cartesian suggestion that '[o]ur body and soul are two substances which are really distinct' (*LA* 79), and that the one is therefore not the substantial form of the other, gets the reply that 'our body in itself, leaving the soul aside, i.e. the corpse, cannot be correctly called a substance' (*LA* 93).

Perfectly confident that human beings are individual substances, the embodiment of animating form in matter, Leibniz tends to think that other animals are too. '[I]t seems to me certain that if there are bodily substances, they do not belong to man alone, and it appears probable that animals have souls although they lack consciousness' (*LA* 90).[8] The alternative is to treat animals as Descartes (see chapter 8) does, as 'soulless' or 'inanimate' mechanisms.

Though Leibniz rejects Arnauld's Cartesian suggestion that 'our body and soul are two substances' (by saying that, considered apart from the soul, the body is not a substance), he does on the other hand think that, considered apart from the body, the soul *is* a substance. For Leibniz as for Descartes, minds or souls, taken by themselves, are individual immaterial or spiritual thinking substances.[9] This involves some departure from traditional hylomorphism. It is true that Aquinas, with immortality in mind, allowed that the specifically rational part of human souls could exist apart from matter; but this sits uneasily with the official teaching that neither matter nor form is a complete substance in its own right, and that only the composite whole is a substance. However, though Leibniz clearly holds that, in and of themselves, souls or forms are incorporeal substances, he also holds that there never are any forms which are not embodied in some matter, and so part of corporeal substances: 'I assume that there is naturally no soul without an animate body' (*LA* 159).[10]

Since it is its divisibility that unfits extension in Leibniz's eyes as a substantial attribute and brings about his reintroduction of substantial forms, it follows that substances are indivisible.[11] So far as immaterial substances or souls are concerned, this is a doctrine Leibniz shares with Descartes.[12] We will look at it again in chapter 9 in connection with immortality, or indestructibility, which Leibniz also attributes to substances. Arnauld is perfectly happy with the indivisibility and indestructibility of immaterial human souls,[13] but less happy about those of animals: '[i]f one of the houses where some hundred thousand silkworms are being nurtured were to catch fire, what would become of these one hundred thousand indestructible souls? Would they continue to exist separated from all matter, like our souls?' (*LA* 109).

As for corporeal substances, he accepts indivisibility in one case, namely the 'whole made up of soul and body that is called man', for 'it is indivisible in the sense that one cannot conceive of

half a man' (*LA* 110). But he will not accept other cases: 'what reply can one make about those worms which are cut into two, each part of which moves as before?' (*LA* 109). His point is that whereas the division of the composite whole of a man would not produce two other composite wholes, the division of a worm does produce other worms. There is a sense in which men are indivisible and worms are not. Leibniz's reply follows simply enough.[14] Even if they both move, the two halves of the original 'animated', 'ensouled', living substantial worm are *not* both 'animated', 'ensouled', living worms. Only one will be a living, substantial worm; the other will be simply matter. Though Leibniz does not put the point like this, one of the halves is analogous to the matter of an amputated limb, and the other to the still substantial human being from which that matter is now severed.

Though Arnauld accepts the indivisibility of corporeal substances in the one case of man, there is no case where he will accept their indestructibility. After all, even if the corporeal whole, the fleshly human being, is in a sense indivisible, it *does* 'perish when the soul is separated from the body' (*LA* 110). (After this destruction the body by itself and as separate from soul is, of course, no longer indivisible.) In Leibniz's view, however, souls do not become separated from bodies at what we call 'death'. The death of an 'animated' corporeal substance is not a separation of soul from body, but a transformation of the corporeal substance. When a living insect is torn up and destroyed, its 'soul' 'remain[s]…in a certain part that is still alive, which will always be as small as is necessary to be sheltered from whoever tears or scatters the body of this insect' (*LA* 125–6). When a living animal is burnt, the fire transforms it and reduces it in size; it does not totally destroy it and separate its soul from its body (as Arnauld supposed with the silkworms). 'There is something animate even in ashes' (*LA* 156). This too will be discussed further in chapter 9. What must be considered now is the status, for Leibniz, of the extended matter which forms the body of corporeal substances such as men, animals, worms. An appreciation of this status does in fact throw light on the idea that animal death is a transformation into 'organic little bodies, wrapped up as they are because of a sort of contraction from a larger body which has undergone corruption' (*LA* 156).

Since the substantiality of a material substance such as a living human being comes from its embodiment of substantial form,

Leibniz takes the orthodox Thomist view that a dead human body, or a human body considered in abstraction from a substantial form, is not a substance. But if a human body, taken by itself and purely as a material thing, is not a material substance, or even (as for Descartes) an arrangement of material substance, then what *is* it? What exactly is the status of matter for Leibniz? Bearing in mind that it was the divisibility of extension, and its consequent inability to provide unity, that ruled out his taking extended matter itself to be substance, the initial answer is that, like a heap of stones, the body is an aggregate, an *ens per accident*. '[O]ne will never find a body of which it may be said that it is truly one substance. It will always be an aggregate of many' (*LA* 88). But an aggregate of many what? Towards the end of his long correspondence with Arnauld, Leibniz said that '[t]he body is an aggregate *of substances'* (*LA* 170, my italics). But what substances are these? They cannot be the corporeal substances of which human bodies are, or were elements. They cannot be the immaterial substances, the souls, which are, or were the other element of those corporeal bodies. What Leibniz means needs to be worked towards.

Unless they are explained otherwise, the aggregated parts of extended body (whether a human or animal body, a watch, or a marble tile) will surely be smaller portions of extended body, and so mere aggregates themselves. Moreover, since 'entities made up by aggregatation have only as much reality as exists in their constituent parts' (*LA* 88), it will follow that extended body, considered by itself and apart from any form, will not even be 'a real entity' (*LA* 88). Aggregated extended matter, such as a soulless corpse, or a marble tile, has no independent reality as substance in its own right; so unless there are material substances for it to depend on and be an aggregate of, it will have no reality at all. Leibniz says, 'if there are no bodily substances [for them to be aggregated from]…it follows that bodies will be no more than true phenomena like the rainbow…. [E]very part of matter is …divided into other parts…and since it continues endlessly in this way, one will never arrive at a thing of which it may be said: "Here really is an entity"' (*LA* 95).

Arnauld raised the possibility that perhaps the division of matter does not 'continue endlessly', and that it culminates in material atoms, minutely extended but perfectly hard and indivisible. Their indivisibility would give them substantial unity and reality, a reality on which the larger aggregated bodies would depend for theirs. In

fact there are, he reminds Leibniz, 'Cartesians who, in order to find unity in bodies, have denied that matter was infinitely divisible, and [asserted] that one must admit indivisible atoms' (*LA* 81). In reply, Leibniz applauded what he saw as the motives of Gerauld de Cordemoy, who had taken the unorthodox line for a Cartesian of admitting material atoms: Cordemoy obviously thought that 'unity' was an important feature of substance and introduced atoms precisely in an attempt to have some genuine basic unity in extension, and hence to have extended substances. As Arnauld suspected, however, Leibniz does 'not share' (*LA* 81) Cordemoy's view: like Descartes himself, Leibniz too rejects material atoms.[15]

His own solution to the requirement for genuine substantial unities out of which material bodies such as human corpses, or marble tiles, can be aggregated can be seen as a combination of Cordemoy's purely material atoms with his own hylomorphic account of living corporeal substances, such as humans and animals. Extended matter for Descartes is continuous, homogeneous, potentially infinitely divisible, and has no ultimate parts; for Cordemoy, by contrast, it is actually divided into small, extended but indivisible atoms, ultimate material parts. Leibniz's view about it aligns him with Cordemoy: matter is actually divided into unitary parts. Yet it also aligns him with Descartes: matter is not divided into ultimate parts. Moreover, in agreement with neither Descartes nor Cordemoy, the non-ultimate parts of mere non-substantial matter are not themselves non-substantial.[16] All matter, whether marble tiles or human bodies, is divided into or aggregated out of small animated, living material substances. As Leibniz wrote to Bernoulli: 'I do not believe that there is any minimal animal or living being…whose body is not further divisible into more substances' (L 512). The substantial forms of these parts of a bodily aggregate are not, of course, minds—at any rate not human minds; but things conceived by analogy with minds. As for *their* matter, this too would be a mere phenomenon if it were not an aggregate of further individual material substances. Just where a chunk of non-substantial matter is actually divided into smaller corporeal substances is a matter of empirical investigation and not something which Leibniz's *theory* has to decide. 'How far a piece of flint must be divided in order to arrive at organic bodies…I do not know. But it is easy to see that our ignorance in these things does not prejudice the matter itself (L 512).

In later years, we have noted, Leibniz believed that there are no corporeal substances, that a bodily mass has no substantial parts from which it can derive its reality, and that therefore 'bodies… [*are*] no more than true phenomena like the rainbow' (*LA* 95). He had formed the idea by then that the whole of substantial reality consists of mind. But in the period that concerns us here his idea is that, just as a living human being is a composite of form and matter, so its matter—its body taken by itself, apart from its form and merely as extended matter—is an aggregate of parts *which are themselves* substantial composites of form and matter:

> I admit that the body apart, without the soul, has only a unity of aggregation, but the reality remaining to it comes from its constituent parts which retain their substantial unity because of the living bodies which are included in them without number.
>
> (*LA* 125)[17]

Every part of non-substantial extended matter is divided into corporeal substances: 'there is an almost infinite number of little animals in the smallest drop of water…matter is everywhere full of animate substances' (*LA* 156).

It is time to recall that in the *Discourse on Metaphysics,* section 8, Leibniz said that individual substances have complete concepts. Two sections later he said that it followed that body cannot consist merely in extension, and that substantial forms must be reinstated. The correspondence with Arnauld brought out that one thing in his mind was that, unlike extension, substantial form can provide for true unities or *entia per se.* But we have yet to see some link between the 'complete concepts' of section 8 and the substantial forms of section 10.

The doctrine of *the Discourse,* that an individual substance does not just have properties or predicates, but is something with a 'complete concept' which is sufficient for the deduction of all its predicates, echoes Leibniz's theory of truth. In considering 'what a clear concept of truth' would be, Leibniz concluded that 'in every true…proposition…the predicate inheres in the subject or that the concept of the predicate is in some way involved in the concept of the subject' (L 263–4).[18] Exactly how, both philosophically and temporally, these metaphysical and logical doctrines relate will not be discussed here; but it is perhaps by seeing the one in terms of

the other that some people have interpreted the metaphysical view in a quasi-logical, atemporal way. An example of this is Bertrand Russell's suggestion that Leibniz's doctrine that 'all the states of a substance are contained in its notion… amounts to no more than…the obvious fact that every proposition about the future is already determined either as true or as false, though we may be unable to decide the alternative' (Russell 1937:46).[19]

Russell's 'obvious fact' is evidently the idea that just as, at the end of his life, there are determinate truths about a person's past (truths which we may or may not know), so, at the beginning, there are determinate truths about his future: if he was unhappy on his fifth birthday, then, just as it would be true later that he was unhappy then, so it would be true earlier that he will be unhappy then. It is not part of this idea that the fifth-birthday unhappiness depends on the earlier truth about it; on the contrary, the earlier truth depends on the later unhappiness. The idea is simply that truth is timeless, and that if something is true at a certain time then it always was, and will be, true that it is true at that time.

Not everyone accepts this idea of timeless truth, or finds it so 'obvious' that there are determinate truths about the future.[20] But does Leibniz? Does it explain what he says about substances and their complete concepts? At one point it seems that it does. In supporting his claim that '[t]he complete or perfect concept of an individual substance involves all its predicates, past, present, and future', he says '[f]or certainly it is already true now that a future predicate will be a predicate in the future, and so it is contained in the concept of the thing' (L 268).

But this quasi-logical, atemporal account fails to provide any explanation of why the 'complete concepts' of substances are connected in Leibniz's mind with the quite evidently metaphysical idea of substantial forms. To do better we should, first, recognise that individual substances are things which exist in time and change their properties through it; they are not atemporal entities, like geometrical figures about which there really are unchanging truths. Second, we should recall that, besides providing the unity and individuality of individual corporeal substances, the substantial forms of the Aristotelian tradition were active, organising natures of substances as they develop and change through time. When Leibniz says that it is in the nature of an individual substance to have a complete concept which involves all its past, present, and future predicates, he has in mind that the

predicates which become true of a substance do so by virtue of its substantial form or nature. At any time its future is written into it, in just the way that its future as a mature oak is written into an acorn. '[T]here are at all times in the soul of Alexander traces of all that has happened to him and marks of all that will happen to him' (*DM* 8). '[Everything that has happened and will happen to [a substance]…come[s] from its own depths' (L 360), he told Arnauld. 'It is the very nature of substance that the present is big with the future' (L 613).

Following this route in Leibniz's mind from 'complete concepts' to 'substantial forms' takes us past and helps us to understand a couple of rather throw-away, undeveloped remarks he makes to Arnauld. He quite noticeably objects to extension as the essence of substance on the grounds that, unlike substantial forms, it cannot provide individual *entia per se*. But he also, and somewhat less noticeably, makes what amounts to the objection that, unlike substantial forms, extension can have nothing to do with the temporal development and change typical of an individual substance. 'Extension', he says, 'is an attribute which cannot make up a complete entity, no action or change can be deduced from it, it expresses only a present state, not at all the future and past as the concept of a substance must do' (*LA* 88); and then, referring to Cordemoy's atoms, '[i]f man contains only a figured mass of infinite hardness…he cannot in himself embrace all past and future states' (*LA* 96).[21]

One of the aims of the *Discourse on Metaphysics* was 'to distinguish the actions of God from those of creatures' (DM 8). This was why he needed, Leibniz said, to give an account of individual substances. Having reconstructed that account, we are now able to understand his conclusion that 'those who believe that God does everything' (*DM* 8) are wrong. For, quite to the contrary, there is in individual created substances 'a certain sufficiency which makes them the sources of their…actions' (L 644). *All* 'that has happened and will happen to a substance…comes from its own depths' (*LA* 170). This does not, of course, mean that God does nothing. It is quite obviously *'except* for dependence upon God' (*LA* 170, my italics) that all its actions come from itself. This dependence is partly a matter of initial creation, but it is not only that: God 'preserves [created substances] and indeed even produces them continually by a kind of emanation' (DM 14).[22]

The changes that happen to created substances and the predicates that become true of them are a development of their own 'natures' or 'forms', but God is nevertheless responsible for creating and for sustaining them with those natures. Leibniz explains to Arnauld that '[everything occurs in every substance as a consequence of the first state which God bestowed upon it when he created it, and, extraordinary concourse excepted, his ordinary concourse consists only of preserving the substance itself in conformity with its previous state and the changes that it bears' (*LA* 115). The originally Scholastic distinction between ordinary and extraordinary concourse was a seventeenth-century commonplace. In its terms, those who believe God does everything believe, Leibniz would have it, in his extraordinary concourse in all things. They believe that God regularly acts on substances in some '*other* way than by maintaining each substance in its course of action and in the laws established for it' (*LA* 65, my italics).

Firmly embedded in Leibniz's philosophy is a detailed answer to the question which might arise here about why God created substances as he did—why he created substances with *these* particular 'forms' and 'natures', rather than ones with others. According to it, this created world is merely one of many other possible worlds which might have been created. '[T]here is an infinity of possible universes in the ideas of God, but only one can exist' (L 648). We are taken from this infinity of possibilities to the one actual world, by God's wisdom, goodness, and, finally, his creativity. This actual world, says Leibniz, is the best of the possible worlds, 'which his wisdom causes God to know, his goodness makes him choose, and his power makes him produce' (L 648).

Now the bare idea that God chooses to create a certain world could be filled out in more than one way. Supposing the chosen world to be one in which the first man sins on the tenth day, we can ask what was it about it *on its eighth day* that made the actual world that one, and not some other in which the first man never sins. One answer could be that what made it so was that on the eighth day (as indeed from the start) *God's intentions* were to bring about, in an act of 'extraordinary concourse', that man's tenth-day sin himself. Someone who saw all events and changes in the world in this way would be one of those who 'believe that God does everything'.

Leibniz is referring here to his contemporary, Nicolas Malebranche, and to others who adopted the stand-point of what was called 'occasionalism'. Making a distinction between 'real', 'active', or 'primary' causation on the one hand, and 'occasional' or 'secondary' causation on the other, Malebranche (see chapter 7) held that God alone is a real or active cause. In the created world there are only 'secondary' or 'occasional' causes, and all change comes about from God's direct activity.

This occasionalist account of God's dealings with the world is quite clearly not Leibniz's. It goes against his view that individual created substances are themselves active, and in ways governed by their own natures or forms. According to his view of things, what *on its eighth day* made the actual world the chosen one, in which the first man was going on to sin, was not that on that day (as from the outset) God's intentions were to bring about that man's later sin. It was that that man embodied a 'form', whose development in time would bring about his later sin. On Leibniz's account of them, individual created substances are active and have 'a certain sufficiency' (L 644). Apart from the 'ordinary concourse' of God's 'sustaining them in their course', they are responsible themselves for the predicates that become true of them. In denying activity to created substances, the occasionalists, those 'who believe God does everything', in fact deny them substantiality. Of course, to deny that created things are substances, and to hold that God alone is substance, is effectively Spinoza's position. Leibniz himself makes this connection: 'Spinoza's error [of supposing no substance beyond God's own] comes entirely from his having pushed too far the consequences of the doctrine which denies force and action to creatures' (L 583). Occasionalism

> seems rather, like Spinoza, to make out of God the nature of the world itself, by causing created things to disappear into mere modifications of the one divine substance, since that which does not act, which lacks active force…can in no way be a substance.
>
> (L 507)[23]

Leibniz's objections to occasionalism will be discussed further in chapters 7 and 9. For the moment some more needs to be said about his own account of substance.

In restoring the earlier hylomorphism according to which individual substances have forms, which organise and systematise their functions and activities, Leibniz adds to it in two important and related ways. It was part of hylomorphism that many of the features and characteristics of an individual substance relate to the form it embodies; but it was not a part of it that all of them do. Its 'vegetative soul' was not supposed to guide the whole of an individual oak's destiny. Many things were supposed 'accidental' to it—the exact number of acorns it happens to produce, say. Many things were supposed to come to be true of it as a result of its being the passive recipient of some outside cause—the number of leaves it has after the recent gale, say. Moreover, though its form was supposed to govern the synthesising of water and other nutrients, these nutrients still needed to be provided to it from outside.

Now when Leibniz speaks of the complete concepts of individual substances, and of God's deciding which substances best to create, he has in mind that God leaves nothing to chance. When 'God sees fit to render his thought effective, and to produce…[a certain] substance', he has examined 'every aspect of the world in every possible manner' (L 312). No event, he says, 'however small it be, can be regarded as indifferent in respect of his wisdom and goodness. Jesus Christ has said divinely well that everything is numbered, even to the hairs of our head' (*T* 235). A substance's concept is '*so* complete that it is sufficient to make us understand and deduce from it *all*…[its] predicates' (DM 8, my italics).[24] But even though God leaves nothing to chance, need it follow that something may nevertheless not be chance with respect to some created substance? Might not something become true of a substance as a result of some *other* substance's activities, rather than through its own?

Leibniz rejects this possibility of inter-substantial causation. 'Each of these substances [which God creates] contains in its nature the law by which the series of its operations continue, and *all* that has happened and will happen to it…*all* its actions come from its *own* depths' (*LA* 170, my italics). Created substances are subject to change and these changes 'come from an *internal principle,*…an external cause could not influence their interior' (L 643–4).

This common interpretation of Leibniz has been contested in recent years. It has been argued that though none of what becomes true of a Leibnizian substance becomes true of it through

God's 'extraordinary concourse', it does not all become true solely because of its own activity and out of its own nature. On the contrary, some of it, it has been argued, becomes true because of interaction between it and other substances.

In order to formulate clearly what is at issue here we might impose a distinction on Leibniz's terminology. Though he speaks indifferently of them all, we can usefully distinguish between a substance's 'concept' on the one hand, and its 'form', 'nature', or 'soul' on the other. We can now think of the 'concepts' of individual substances as being the detailed pre-creation ideas in God's mind of various possible substances, and of 'natures' or 'souls' as the embodiments of these concepts in actually created substances.

In these terms, the common and traditional interpretation of Leibniz is that there is a total and complete correspondence between a given substance's nature and its concept: the one is an embodiment of the whole of the other. The recent and different interpretation is that there is only a partial correspondence between a substance's nature and its concept. Though a substance's concept relates to everything that God wants to become true of it, some of that becomes true, not through a substance's nature corresponding to that whole concept, but through mutual interaction between substances whose natures relate to only part of their concepts.[25]

The centrality of activity in Leibniz's account of substance can hardly be over-stressed. He insisted on it from the start. Writing in 1668, he repeated the traditional definition that *'substance* is being which subsists in itself, and then immediately added that *'being which subsists in itself is* that which has a principle of action within itself (L 115). Then, still ten years earlier than *the Discourse on Metaphysics,* he says that 'the essence of substances consists in the primitive force of action' (L 155). It was, moreover, hardly a view he gave up. Nearly fifteen years on from the *Discourse* he still insists that 'actions belong to substances. And hence I hold it also to be true that this is a reciprocal proposition, so that not only is everything that acts an individual substance but also every individual substance acts without interruption' (L 502).[26]

More and more frequently over the period we are considering Leibniz comes to think of the principle of action of substances, their form or soul, as *a primitive, active force, or power.* 'Active force' in fact becomes so basic in Leibniz's thought that, rather than

seeing it as a feature of substantial form, he begins to introduce and explain substantial form in terms of it. There is 'in all corporeal substance' an *'active…primitive* force, which…corresponds to the *soul* or *substantial form'* (L 436). '[T]here must be found in corporeal substance…a primitive motive force…. It is this substantial principle itself which is called the *soul* in living beings and *substantial form* in other beings' (L 503–4).

Though it is a feature of corporeal substances, this primitive active force or power does, of course, primarily relate to their form, rather than to the matter of their bodies. There is, however, another force or power possessed by corporeal substances—Leibniz calls it 'passive force' (La 701)—which does relate to their matter. But there is a complexity in this, at first sight simple, 'active force is to passive force as form is to matter' scheme, and it arises out of a distinction Leibniz makes between 'primary' and 'secondary' matter. The matter which constitutes the bodies of animated corporeal substances, or which is the matter of non-substantial marble tiles or watches, is secondary matter; and besides passive force (which primary matter has too), it also has an active force, one *derived* from the primitive active force of the corporeal substances out of which it is (as we have seen) aggregated. The meaning of all of this will be clearer in the next chapter.

NOTES

1 The later ideas involve the complete rejection of material substances. In supposing that this is not already true of the earlier ones I am in agreement with Broad 1975:67ff., Garber 1986: *passim,* Loeb: sects 32–3. Garber's discussion of this is particularly useful.
2 See also *LA* 66, 80.
3 Leibniz's earliest dissatisfaction with mere extension as a substantial nature was in connection with transubstantiation (see Brown 1984:136–7, Nason: 451–7).
4 LA 96.
5 LA 80.
6 LA 88, 94, 127–8.
7 For the course of the discussion see LA 88–9, 93–5, 107–10, 120.
8 See also LA 89, 123.
9 *DM* 23, 24, LA 159, AG 104.
10 See Broad 1975:83, Garber 1986:58, for Leibniz's motivation for this.
11 LA 93, 94, 88–9.
12 LA 150.
13 LA 80, 107, 110.

14 *LA* 125. But it goes against Aristotle's: 'each of the segments has a soul ink' (*De an* 411b20).
15 *LA* 96. See chapter 6 for more on Leibniz's rejection of atoms.
16 L 504.
17 See also LA 154, 170.
18 See also L 231–2, 267, PM 75, 96.
19 See also Broad 1975:22–4, Buchdahl: 454, Sellars: 39, and Hartshorne: 420–1. For a discussion see Woolhouse 1982: esp. 46–8.
20 Buchdahl: 454, Hartshorne: 420–1.
21 See also LA 94.
22 See also LA 51, 161, 167, L 312, 441, 535; though cf. L 387.
23 See also L 502, 559, 583, LA 167.
24 See also LA 19–20, 39–40, *T* 328.
25 Ishiguro 1977, 1979; for further references to this interpretation and a discussion of it, see Woolhouse 1985. This divergence of interpretation will crop up again, in chapters 7 and 9. Strong evidence against Ishiguro's interpretation is provided by passages in which Leibniz quite clearly thinks that causation between states of different substances is merely 'occasional' and quite different from the 'real' causation internal to a substance; see, for example, L 502, LA 114–15, PM80.
26 See also L 433.

5

Descartes, Spinoza, and Leibniz, and Extended Substance

INTRODUCTION

A common seventeenth-century tripartite division of 'philosophy' was into divinity or knowledge of God; knowledge of man; and knowledge of nature or 'natural philosophy', the study of the material world. This and the next chapter relate to the third of these areas, which we would call 'natural science'. Descartes, Spinoza and Leibniz were keenly aware of recent achievements in it.

A recent authority says that 'the major proportion of Descartes' extant writing is concerned with scientific questions'. A letter of 1629 reports that he is going to write a study of the rainbow, and is studying chemistry and anatomy, and 'the evidence of Descartes' correspondence between 1629 and 1637 suggests that he devoted almost all his time to scientific pursuits' (Clarke 1982:4–5).

Spinoza, too, had a close involvement with, or at least knowledge of, experimental natural philosophy. In an age which saw the beginning of the science of optics he made his living as a lens grinder; Leibniz sought his advice on problems in theoretical optics; he wrote a treatise on the rainbow; his correspondence contains lengthy discussion about Boyle's account of the chemistry of nitre. It is also clear that he had many scientific conversations with Huygens, of whom he was a near neighbour.[1]

Leibniz's involvement with detailed scientific work was even more extensive than Descartes's. His interests ranged from the technology of mining pumps through to the mathematics of the differential

calculus, and he corresponded with many of the leading scientists of the time.[2]

Our concern here, however, is Descartes's, Spinoza's, and Leibniz's ideas *about* natural philosophy and its results, rather than with any contribution they may have made to them. In the case of Descartes and Leibniz there is something of a continuum between the two. Nevertheless, the focus here is on the former, on the conceptual framework in terms of which they saw natural philosophy and thought its results should be understood.

Behind much of the detailed and experimental scientific work of the seventeenth century was a general picture of how the material world 'worked'. This was the picture drawn by the so-called 'mechanical philosophy'. It contrasted with that of Aristotelian metaphysics, according to which (see chapter 1) the material world was composed of substances, each with its essence, nature, or substantial form, which explained and made intelligible their properties and behaviour. Though the mechanical philosophy grew in popularity in the seventeenth century its essentials were not new, for they derived from the classical atomic theory of Democritus, Leucippus, and Epicurus. According to this theory, the properties of material things are to be explained by reference to atoms which make them up, rather than in terms of some 'substantial form' which they were supposed to embody. A thing's properties, and its actions and reactions with other things, are to be explained by reference to the shapes, sizes, and motion of its atomic parts, and to the mechanical collisions and interactions between them.[3]

Robert Boyle's *Origin of Forms and Qualities* gives a good account of this view that 'almost all sorts of qualities, most of which have been by the Schools either left unexplicated, or generally referred to I know not what incomprehensible forms, *may* be produced mechanically' (1666:17); for the world is nothing but matter in motion, and all the sciences ultimately reduce to mechanics. The scientist or 'naturalist'

> in explicating *particular phenomena* considers only the *size, shape, motion* (or *want of it*), *texture,* and the resulting qualities and attributes, of the small particles of matter. And thus in this great *automaton,* the world (as in a watch or clock)…the phenomena it exhibits are to be accounted for by the *number, bigness, proportion, shape, motion* (or *endeavour*), *rest, coaption* …of the…parts it is made up of. (Boyle 1666:71)

Descartes, Spinoza, and Leibniz are at one with many of their contemporaries in adopting a broadly 'mechanical philosophy', and in rejecting the Aristotelian metaphysics of substantial forms. In the *Principles of Philosophy* Descartes says that all the phenomena of nature are ultimately to be understood in terms of the shape, size, position and motion of particles of matter' (4.187). This, he says, is 'much better than explaining matters by inventing all sorts of strange objects which have no resemblance to what is perceived by the senses such as…"substantial forms"…which are harder to understand than the things they are supposed to explain' (*PP* 4.201).[4]

Particularly in his correspondence with Henry Oldenburg about Boyle's *Treatise on Nitre,* Spinoza shows the same general commitment. The doctrine of substantial forms is 'childish and frivolous' (C 208). It has been 'more than adequately demonstrated by…Bacon and later by Descartes' (C 179) that the 'Mechanical principles of Philosophy' (C 210) are the correct ones, and that 'all the variations of bodies happen according to the Laws of Mechanics' (C 210).[5] In 'the examination of natural phenomena', Spinoza says, 'we try first to investigate…motion and rest, and their laws and rules, which nature always observes, and through which she continually works' (*TPT,* chap. 7).

For his part too, Leibniz

> agree[s] with those contemporary philosophers who have revived Democritus and Epicurus, and whom Robert Boyle aptly calls corpuscular philosophers, such as Galileo, Bacon, Gassendi, Descartes, Hobbes, and Digby, that in explaining corporeal phenomena, we must not unnecessarily resort to …any…form…but that so far as can be done, everything should be derived from the nature of body and its primary qualities—magnitude, figure, and motion.
>
> (L 110)

It has 'become apparent', he says, 'that mechanical explanations—reasons from the figure and motion of bodies, as it were—can be given for most of the things which the ancients referred only to …some kind (I know not what) of incorporeal forms' (L 109–10).[6] The Scholastics, he said, thought 'that they could account for the properties of bodies by mentioning forms and qualities, without taking pains to examine the manner of their operation. This is as if one were content to say that a clock has a time-indicating property

proceeding from its form, without inquiring wherein this property consists' (L 308).

But even where there was agreement that the 'grand and most catholic principles of bodies, [are] matter and motion' (Boyle 1666:20), and not substantial forms, there was not complete agreement about the precise details of the preferred alternative. At the basis of the classical theory of Democritus were the twin ideas of indivisible atoms and of a void of empty space in which they moved; and though these were adopted by Gassendi and others of the 'new philosophers', Descartes, Spinoza, and Leibniz each reject them in favour of an infinitely divisible material plenum. There was disagreement about precisely what properties it was necessary to attribute to the matter of the corporeal world in order to explain and understand the various phenomena it displayed. Finally, there was disagreement whether parts of matter could act on other parts only by the physical contact of impact, or whether action at a distance was possible.[7]

The motions of parts of matter and the resulting collisions were, however, a basic feature of any even partly 'mechanical' view of the world. For this reason the study of these things became a central concern of seventeenth-century natural philosophy and its metaphysics. As Huygens said, 'if the whole of nature consists of certain particles, from the motion of which all the diversity of things arises…this examination [of nature] will seem to be helped no small amount if the true laws by which motion is transferred from body to body be made known' (quoted Westfall:147).

It is perhaps a misleading understatement to say of Descartes and of Leibniz simply that they are 'committed' to this world picture. It was hardly that, here and there, they simply expressed their agreement with it as an already developed system of ideas. On the contrary, they are foremost amongst those who worked it out and gave it detailed articulation. To a considerable extent, moreover, it is because of Descartes that the mechanical philosophy had its grip on the seventeenth-century mind. Their commitment to it is contained in their highly developed metaphysics of the material world. It is, in a word, contained in what they say about extended material substance.

DESCARTES AND EXTENDED SUBSTANCE

One element in Descartes's metaphysical scheme is (see chapter 2) created material substance. The essential or primary attribute of

body or matter is its spatial 'spreadoutness' or 'volumosity'—its being extended in the three dimensions of length, breadth, and depth. But extension is not merely *an* essential feature of material substance for Descartes. It is the *only* one:

> the nature of matter, or body…consists not in its being something which is hard or heavy or coloured, or which affects the senses in any way, but simply in its being something which is extended in length, breadth and depth…. [W]eight, colour, and all other such qualities that are perceived by the senses…can be removed from it, while the matter itself remains intact; it thus follows that its nature does not depend on any of these qualities.
>
> (*PP* 2.4)

Descartes has two different things in mind here when he says that all the qualities of matter except its being extended 'can be removed from it'. He says of a stone that its inessential qualities are removable '*either* because they are not thought of as being in the stone, *or* because if they change, the stone is not on that account reckoned to have lost its bodily nature' (*PP* 2.11, my italics). Hardness gets ruled out in the second of these ways: if 'stone is melted or pulverized it will lose its hardness without thereby ceasing to be a body' (*PP* 2.11). The same goes for colour and heaviness, 'since we have often seen stones so transparent as to lack colour', and 'since although fire is extremely light it is still thought of as being corporeal' (*PP* 2.11).

As for the first of the two ways in which qualities 'can be removed from' matter, Descartes has in mind that some qualities (commonly called 'secondary qualities', since Locke) are *not really* qualities of the objects which appear to have them. He refers, for example, to the 'ill-considered judgements' that

> the heat in a body is something exactly resembling the idea of heat which is in me; or that when a body is white or green, the selfsame whiteness or greenness which I perceive through my senses is present in the body; or that in a body which is bitter or sweet there is the selfsame taste which I experience.
>
> (CSM 2.56–7)

Though perceived whiteness or greenness are not really qualities of bodies, and so are hardly essential qualities, they nevertheless must depend on or derive from the quality or qualities which are

essential. So, in the *Principles,* Descartes claims to show, at least in outline, how light, colour, smell, taste, sound and tactile qualities 'which we perceive by our senses as being located outside us' are in fact 'nothing else in the objects' but the arrangements and movements of matter (4.199).[8] Colours and the rest are assimilated to sensations like pain:

> We clearly see, then, that the sensation of pain is excited in us merely by the local motion of some parts of our body in contact with another body; so we may conclude that the nature of our mind is such that it can be subject to all the other sensations merely as a result of other local motion.
>
> (*PP* 4.197)

Just as the mechanical philosophy in general replaces the Scholastic account of substances and their forms, so, in particular, this account of colour and colour perception replaces the earlier idea that colours are real qualities of objects, accidental forms which perception imprints on the mind.[9]

Descartes's doctrine that the 'true nature of body consists solely in extension' (*PP* 2.5) provoked a variety of objections.[10] If, contrary to the Scholastic account, corporeal substance is not *really* characterised by sensible qualities, then difficulties arise, some felt, for the Catholic Church teaching that in the Eucharist 'the substance of the bread is taken away…and only the accidents remain. These are extension, shape, colour, smell, taste and other qualities perceived by the senses' (CSM 2.153).[11]

Despite this, some people were prepared to see corporeal substance stripped of its sensible qualities. But even so, they were not prepared to see it stripped of all but extension. '[T]he objection of objections', as Descartes himself called it, was that in being purely extended his corporeal substance lacked something: it amounted to 'only an abstraction', and was quite different from 'real, solid…matter' (trans. Dugas 1958:175), which was what God actually created.

Henry More, for example, thought corporeal substance required some property which makes it *perceptible*—his preference was for 'tangibility'.[12] But given Descartes's thought that it should not be defined relative to our senses (since it 'could exist even though there were no men' (K 237)[13]), More had a second suggestion for a further property of corporeal substance: impenetrability. In fact it

is this property (sometimes called 'solidity') which was most commonly felt to be missing from Cartesian matter.[14] Leibniz insisted on it, and we will consider it below.

When he says that the nature of body consists solely in extension, Descartes does not mean there are no other properties which all body has. He thinks there certainly are,[15] and that they are a *consequence* of extension. He makes clear to More that in saying body is essentially just extension he is not saying it is *not* impenetrable. Impenetrability, he said, belongs not to the essence of body, but to the essence of extension. His idea, it seems, is that simply in being extended, body is consequently impenetrable; being impenetrable is part of what it is to be extended. 'It is impossible to conceive of one part of extended substance penetrating another equal part without *eo ipso* thinking that half the total extension is taken away or annihilated' (K 249).[16] Descartes was effectively following some medieval philosophers in thinking that impenetrability automatically follows from extension.[17] But Locke and (we shall see) Leibniz thought this got things quite the wrong way round: it is not that matter is impenetrable and excludes other bodies because it is extended and fills space; rather, it is extended and fills space because it is impenetrable.[18]

A further problem was that if the sole and whole nature of body is to be extended, and if a body's impenetrability follows from, rather than gives rise to, its being extended and filling space, then how does body *differ from* space? Descartes raises this himself as one of two possible reasons for doubting his conclusion about the nature of body. It is, he says, a '[p]reconceived opinion' concerning empty space that 'if we understand there to be nothing in a given place but extension in length, breadth and depth, we generally say not that there is body there, but simply that there is a space, or even an empty space' (*PP* 2.5). The wellknown passages of the *Principles* which deal with this are often misinterpreted. From the perspective of *our* usual view about the relationship between body and space, it is easy to think that Descartes answers this problem simply by ruling out the possibility of empty space on nothing other than the very grounds that it is indeed inconsistent with his doctrine about the nature of body.

But it is not Descartes's aim in these passages to reject the possibility of empty space simply by digging in his heels and reiterating what he has said about the nature of body. His aim is to

show that, quite *independently* of his account of body, there is no possibility of empty space. He does not beg the question, as has been suggested, and use 'the premise that matter is only extension …[to prove] that there can be no vacuum in nature' (Machamer 1976:173). He provides independent grounds for saying that even if matter were not only extension there still could be no vacuum. He rejects the 'preconceived opinion concerning empty space' on grounds other than its conflict with his view of matter.

The 'preconceived opinion' is, in effect, the idea that space is logically independent of body and can, so far as its nature goes, exist without body. It is part of this idea that, on the other hand, body is not logically independent of space, which 'contains' it. Essentially this idea of incorporeal extended space, conceptually separate from contained, extended body, is a feature of early atomism, and it can be traced through the years up to a classical expression of it in Newton's natural philosophy at the end of the seventeenth century. The kind of distinction it maintains between space and body would disappear if body were, as Descartes holds, essentially just extension.

Descartes himself thought of body and space in this way in *The World.* He speaks there as though the nature of space and its relation to body leaves open the possibility of empty space, and he appears to think of space as a three-dimensional 'container' which God first created, and then filled with matter. Space and matter are logically distinct and matter is 'a real, perfectly solid body which uniformly fills the entire length, breadth and depth of this huge space'(CSM 1.91).

But by the time of the *Principles* Descartes seems to have changed his mind, and he argues against this view. Quite independently of, and without presupposing, his account of the nature *of body,* he argues that the nature *of space and its relation to body* is not such that body is 'in' and 'occupies' space. To think that it is is to misconstrue the relation between corporeality and dimensionality, for (so Descartes argues from section 10 to section 15) corporeality has its own dimensionality, produces its own space. It needs no antecedent space to be 'in' or to 'occupy'.

His argument partly concerns the notions of 'internal' and 'external space'. These have their roots in Aristotle's discussion of 'place', the notion used in speaking of occupation of a place, and of displacement or change of place. Aristotle concludes that the place of a body is the inner surface of the body which contains it,

and in reaching that conclusion he rejects the view that place is the interval defined by that surface—a view which supposes an independence of place from body in that place and which, in effect, is the 'preconceived opinion' of which Descartes speaks.[19]

Though basically sympathetic to Aristotle's denial of the separateness of place and body, the sixteenth-century Scholastic Toletus felt that his account of 'place' attempted too much with too little. As a consequence he introduces a distinction between 'external' and 'internal place'. 'External place' is 'what surrounds the located itself, namely the containing body or its ultimate surface' (quoted Grant 1976:155); it is, as Toletus explicitly confirms, effectively Aristotle's 'place'.

The introduction of 'internal place' takes Toletus beyond Aristotle. 'Internal place', he says, is 'the place of the thing [or body, namely] the space itself, which the thing occupies within itself in accordance with its corpulence' (quoted Grant 1976:155). The space which a body occupies is, as it were, provided by that body itself. Body and space 'infer each other as a mutual consequence. For if there is body, there is a true space; and if there is a true space, there is a body in it' (quoted Grant 1976:156).

Clearly, this idea of internal place is completely at odds with the idea that extended bodies are 'contained in' an independent space, and it is foreign to many people who, no doubt under the influence of twentieth-century versions of late seventeenth-century Newtonian physics, automatically assume the 'container' view. But, like the Aristotelian world, with its connection between dimensionality and corporeality, the Newtonian world with its separation of the two was not here to stay. The earlier view can again be found in this early twentieth-century passage from Albert Einstein: 'Physical objects are not in space, but these objects are *spatially extended*. In this way the concept of 'empty space' loses its meaning' (quoted Grant 1981:273 n. 43).

This conception of the relationship between space and body, that spatiality is a function of corporeality, is what Descartes is proposing in his discussion about 'internal place', and it cannot be over-stressed that it is completely independent of any question about the essence of body. His claim that 'the extension in length, breadth and depth which constitutes a space is exactly the same as that which constitutes a body' (*PP* 2.10) is completely neutral with respect to his view that the essence of body consists solely in extension, and it does not depend on it.

The preconception about empty space is just one of two reasons which, Descartes says, might lead to doubt about that view. The other is a preconception about what was called the 'condensation and rarefaction' (i.e. becoming denser, and less dense) of matter. In arguing against it Descartes outlines an account of condensation in terms of an example of a sponge whose parts are rearranged. What he says is, of course, quite consistent with his view that the relation between space and body means there is no empty space. But what is the preconception about condensation he wants to reject? Perhaps following a lead from Leibniz, people often suppose that it is the ancient atomist view that condensation consists in the squeezing out of vacua between atoms. Descartes's real target, however, is a certain Scholastic account, also something to which Leibniz leads.[20]

Cartesian matter consists 'simply' *(PP* 2.4) or 'solely' (2.5) in extension. Yet, besides being *no more* than extended, it is also *no less*. So what Descartes says of it conflicts with any account according to which matter is not even essentially extended. The traditional Scholastic account of 'prime matter' is one such, and its accompanying conception of rarefaction and condensation is the second 'preconceived opinion' which Descartes says could be a reason for doubting what he says of matter.

In *The World* Descartes was at some pains to make clear that his material substance is different from the 'prime matter' (see chapter 1) of the Aristotelians. *Their* matter has been 'stripped so thoroughly of *all* its forms and qualities that *nothing* remains in it which can be clearly understood' (my italics), whereas *his* is still positively conceived, 'as a real, perfectly solid body which uniformly fills…space' (CSM 1.91). They distinguish theirs 'from its external extension—that is, from the property it has of occupying space', whereas he 'conceive[s] its extension, or the property it has of occupying space, not as an accident, but as its true form and essence' (CSM 1.92). So, the 'prime matter' of the Aristotelian tradition is matter which is even more 'stripped' than Descartes's. Even the property of occupying space is inessential to it.[21]

A sense of the account of rarefaction and condensation that goes with this merely accidentally extended and qualitied 'prime matter' can be got from Aristotle. Just as the same matter can be actually hot and potentially cold at one time, actually cold and potentially hot at another, so, Aristotle says, '[t]he same matter…

serves for both a large and a small body' (*Phys* 217a26). When, in rarefaction,

> air is produced from water, the same matter has become something different, not by an addition to it, but has become actually what it was potentially, and, again, water is produced from air in the same way, the change being sometimes from smallness to greatness, and sometimes from greatness to smallness. Similarly, therefore, if air which is large in extent comes to have a smaller volume, or becomes greater from being smaller, it is the matter which is potentially both that comes to be each of the two.
>
> (*Phys* 217a27–34)

So 'the greatness and smallness of the sensible volume are extended, not by the matter's acquiring anything new, but because the matter is potentially matter for both states; so that the same thing is dense and rare, and the two qualities have one matter' (*Phys* 2l7b8–ll).

The Aristotelian idea that in rarefaction the 'extended form' of a substance is destroyed and replaced by another, without there being any addition to the substance (as there is in growth), had its supporters and critics in the middle ages.[22] It is clearly 'the widespread belief of the *Principles* that 'bodies can be rarefied and condensed in such a way that when rarefied they possess more extension than when condensed' (i.e. the second 'preconceived opinion' and possible reason for doubting Descartes's view that 'the true nature of body consists solely in extension' (*PP* 2.5)).[23]

There are three corollaries which Descartes draws from his account of body. First, and as we saw earlier in this chapter, there can be no atoms, no 'pieces of matter that are by their very nature indivisible' (2.20); second, the world of corporeal substance is 'indefinite' in extent, and has 'no limits to its extension' (2.21); third, 'the earth and the heavens are composed of one and the same matter' (2.22).[24]

Matter is only one element in the mechanical philosophy's picture of the world. It is only one of Boyle's 'two grand and most catholic principles of bodies' (Boyle 1666:20). All the diversity, all 'the characteristics of which we are aware in experience' are a function of motion too:

> The matter existing in the entire universe is thus one and the same, and it is always recognized as matter simply in virtue

> of its being extended. All the properties which we clearly perceive in it are reducible to its divisibility and consequent mobility in respect of its parts, and its resulting capacity to be affected in all the ways which we perceive as being derivable from the movement of the parts.
>
> (*PP* 2.23)

Without motion in its parts, matter would be a static, unvaried whole. Without it, matter would have no actual parts anyway. What differentiates parts of matter from each other is their relative motion. As Descartes says, '[b]y "one body" or "one piece of matter" I mean whatever is transferred at a given time, even though this may in fact consist of many parts which have different motions relative to each other' (2.25). Making clear that parts are not separate because of space between them, he says that the differentiation of parts within matter consists 'wholly in the diversity of motion' (CSM 1.191) those parts have. One part of matter is different from another because of its motion relative to it.

Yet, having rejected empty space, can Descartes admit motion? Must there not be empty space if matter is to move? This had been debated since classical times, and Descartes added heat to the discussion. Arguing against Descartes, Gassendi and Locke agreed with the early Greek philosopher Parmenides, that motion requires empty space for body to move into; unlike Parmenides, however, they held that there is both empty space and motion. As against Parmenides' first premise, Empedocles had argued that empty space is not necessary—so long as things simultaneously move into each other's places, motion is possible in a plenum just as it is in a crowd. This was in fact Descartes's answer to the question. Motion is possible even though space and body are identical, for 'a body entering a given place expels another, and the expelled body moves on and expels another, and so on, until the body at the end of the sequence enters the place left by the first at the precise moment when the first body is leaving it' (*PP* 2.33).[25]

In the Aristotelian tradition, motion was a general notion which covered all kinds of change (change of quality, of quantity, of place). The motion of the mechanical philosophy, however, is specifically what was called 'local motion', i.e. change of place (*locus*)—it being part of that philosophy that all other kinds of motion or change are ultimately reducible to this.

Descartes first says of motion, in *The World,* that it is that 'which makes bodies pass from one place to another and successively occupy all the spaces which exist in between' (CSM 1.94). This characteristic, 'the action by which a body travels from one place to another' (*PP* 2.24), turns out, in the *Principles,* to capture 'motion' in the 'ordinary sense of the term'. In its 'strict sense' motion is the 'transfer of one piece of matter, or one body, from the vicinity of the other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies' (*PP* 2.25).[26]

One point about these two definitions is that the first talks of motion as what 'makes' a body get from place to place, or as an 'action' by which it does so. The second, as Descartes explicitly points out, talks of '"the transfer" as opposed to the force or action which brings about the transfer' (*PP* 2.25);[27] it talks only of the effect of motion in the first sense. The first definition, in its concern with the forces which cause motion, is *dynamical;* the second, in its concern solely with the spatial and temporal structure of motion, is *kinematical*. The distinction between the dynamical realities of motion and its kinematical, phenomenal appearance as spatial displacement will be of importance later in this chapter, and in the next two.

A second point is that while the first definition, in an entirely natural manner, mentions 'place', the second does not. *The World* does not elaborate on this, but we might suppose that the 'place' of an object is envisaged, either as its position in the space which (according to *The World*) is independent of the matter with which God filled it, or—less strictly—as its relation in that space to other objects. The *Principles,* on the other hand, does (as we saw earlier) discuss 'place'. In effect it contrasts 'place' as in the 'ordinary', 'popular' account of motion with place as it should properly be understood in relation to the 'strict' account of motion. This contrast effectively parallels that between what the *The World,* and what the *Principles* say about the relationship between space and body.

If, as might easily be supposed, the 'place' of an object is simply its spatial relation to other objects then, Descartes points out, a man on a ship may be both stationary (relative to the ship) and moving (relative to the shore); or he may have two different movements (relative to different things).[28] This consequence is avoided if, given the *Principles'* neo-Aristotelian account of the relationship between

space and body, the place of an object is understood as its 'external place', namely as 'the surface of the surrounding body' (2.15).[29] So Descartes arrives at his 'strict' definition of the motion of a body: 'transfer…from the vicinity of the other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies' (*PP* 2.25). This gives a body a 'proper' motion and prevents simultaneous motion and rest: motion is relative only to the contiguously surrounding body, and there cannot be more than one of these.[30]

One particular consequence of this definition is that the earth can be said really and properly to be at rest in its surrounding celestial material, while yet (in accordance with the mechanisms of Cartesian astronomy) being carried by that material round the sun.[31] This consequence is of interest, because Galileo's *Dialogues Concerning the Two Chief World Systems* (1632) had been condemned in 1633 by the Congregation of the Holy Office for teaching the movement of the earth—a motion which Descartes had simply assumed in *The World* of the same year. Descartes confesses to some fearfulness about this, and, like Henry More, some suspect that the consequence of a stationary earth was the reason for the change of definition of motion, and not merely a welcome consequence.[32]

Descartes points out that his definition says that the bodies contiguous to the moving body are *'regarded* as being at rest' (2.29, my italics), and he goes on to explain which bodies we so regard. This means that in itself, '[s]trictly in terms of its own nature' (2.29), and independent of our subjective 'regard', motion is reciprocal. When there is relative movement of two contiguous bodies, properly speaking both of them are moving. '[W]hatever is real and positive in moving bodies—that in virtue of which they are said to move—is also to be found in the other bodies which are contiguous with them, even though these are regarded merely as being at rest' (2.30).

SPINOZA AND EXTENDED SUBSTANCE

In outline—and he does not provide much more than that—Spinoza's conception of the material world which presents itself to the natural philosopher for study is basically Cartesian. The agreement is not merely the very general one that 'all the variations of bodies happen according to the Laws of Mechanics'

(C 210). It is also that for both philosophers the principal attribute in terms of which matter is to be understood is extension; and that there is no vacuum, or space empty of matter.[33] Furthermore, the individual things of the material world have their identity for Spinoza as they do for Descartes, by virtue of motion. '[E]ach particular corporeal thing', he says in the *Short Treatise,* 'is nothing but a certain proportion of motion and rest, so much so that [without motion and rest]…there could not be, or be indicated, in the whole of extension, any particular thing' (C 155). This means, as he says when making the same point in the *Ethics,* that bodies are not distinguished 'by reason of substance' (2P13L1); and this too follows Descartes, for whom material things are not individual extended substances. Spinoza, however, makes the same point more formally and starkly, by explicitly calling such things 'finite modes'. But behind this shared conception are two quite different metaphysical schemes. For Descartes the material world studied by natural philosophy is created extended substance; for Spinoza it is the infinite mediate mode of eternal self-caused extended substance. This difference is connected with important differences in the way they understand the relation between motion, extended substance, and the material world.

For Descartes, motion is not of the essence of matter, which is purely extension; nor does it follow from that essence, in the way that (he supposes) impenetrability does. In and of itself matter is motionless, and in creating extended substance God did not *thereby* create motion. But there *is* motion in matter, and God is its primary cause. 'In the beginning…[God] created matter, along with its motion and rest;…[he] imparted various motions to the parts of matter when he first created them' (*PP* 2.36). On the face of it Spinoza is in complete agreement with much of this. God is undoubtedly the cause of matter's being in motion for him too. 'God has immediately created motion in matter' (C 80, 91). As with any mode, motion is 'caused by' or 'follows from' God (1P16–23). But what he means is hugely different.

It is a piece of explicit doctrine for Spinoza that the motion of any piece of matter is always an effect of an earlier collision with another, and so on *back to infinity:* 'A body which moves or is at rest must be determined to motion or rest by another body, which has also been determined to motion or rest by another, and that again by another, and so on, to infinity' (2P13L3). This contrasts with what is more implicit in Descartes—that though the cause of

motion in a piece of matter is generally a previous collision, this was not always so. Some initial motions were caused by God, who 'imparted various motions to the parts of matter when he first created them' *(PP* 2.36).[34] From the Cartesian perspective, then, Spinoza's 2P13L3 would amount to saying that God is *not* the cause of motion.

But of course in many important respects Spinoza did not see things from the Cartesian perspective. It is as *extended* substance that his God 'causes motion'—extended substance has the 'power to produce' (C 131) motion as one of its 'immediate effects'; whereas it must be as *thinking* substance that Descartes's God 'causes motion'. Moreover, Spinoza's and Descartes's Gods differ (see chapter 3) in the manner of their existence. A third difference is that the motion which Descartes's God causes in the material world is a finite mode of finite things; for Spinoza its causation is as the immediate infinite mode of the substantial attribute of extension.

The specifically Spinozan doctrine that motion is the 'immediate infinite mode' of the attribute of extension does have Cartesian echoes nevertheless. For Descartes, motion is a 'mode' of extension: it cannot be understood apart from extended things and extended space; and in the course of outlining the simplified metaphysical scheme of the *Short Treatise* Spinoza says that motion 'can neither exist nor be understood through itself, but only through Extension' (C 92). Moreover, the idea that something might 'immediately' follow from extension is already there in Descartes's view that impenetrability, though not of the essence of substance, is of the essence of extension and follows from it.

It is, however, by no means clear what we are to make of Spinoza's doctrine that motion is an infinite mode which follows immediately from the attribute of extension. His readers from his time to ours have found it obscure. One thing it certainly is is an expression of the importance of motion as one of the two elements of the mechanical world picture. Spinoza is in absolute agreement with Descartes and others of the time that the intelligibility of the corporeal world depends on our understanding it as what it basically is—extended matter in motion. Further than this, however, it can be seen—or so I suggest—as the provision of a metaphysical foundation for that belief.[35]

The explanation in chapter 3 of what Spinoza means when he says 'extended substance exists" or 'God exists' made reference to

the idea of there being real and immutable essences of geometrical figures, essences which have an existence independent of any instantiation they might have in the corporeal world, and independent of any idea there might be of them in human minds. Descartes and Leibniz are quite explicit that these essences depend on God. When Gassendi suggested to him that in proposing such things he is setting up rivals to God, Descartes replied 'But …I do not think that the essences of things, and the mathematical truths which we can know concerning them, are independent of God' (CSM 2.261); and to Mersenne he said that '[t]he mathematical truths which you call eternal…depend on [God]' (K 11). Leibniz similarly says that 'the source…of essences is in God, insofar as these essences are real' (L 647), and that without God these essences and the 'eternal truths about them are fictitious' (L 488). These things are far less overt in Spinoza, but he is making the same kind of point when he speaks of 'formal essences' which exist 'insofar as they are comprehended in God's attributes' (2P8C) and of conceiving essences 'under a species of eternity' and as 'contained in God' (5P29S).

Not all of our ideas relate to immutable essences; some of them *are* 'fictitious'. As Leibniz says, we can have ideas which we mistakenly think correspond to an essence, as when 'something …appeared to be [an essence] but really is not—as that of a regular decahedron, a regular solid bounded by ten planes or surfaces, would be' (*NE* 293). We can mistakenly contemplate 'the parallelism of parabolas…through the delusion that two parabolas can be found which are parallel to each other, like two straight lines or two circles' (*NE* 268); we can confusedly 'explore the semicircle for a *centre of magnitude* like the *centre of gravity* which it actually has' (*NE* 321). So while there are (in God) such a figure as the circle and eternal truths concerning it, there is no such figure in God as the regular decahedron, or truths about it.

For Descartes and Leibniz, whose God is an immaterial thinking substance, these immutable essences exist in God as ideas or mental modes.[36] For Spinoza they exist, rather more appropriately for modes of extension, in God as extended substance. Rather more straightforwardly than for Descartes and Leibniz, it is because of the nature of extension that there *is no* such figure as the regular decahedron, and that there *are* such figures as the circle and the ellipse. Extended substance allows of no such figure as the first, and no such figure is contained in God's attribute of extension;

whereas the essences of the other two 'are comprehended in [extended substance] in such a way that they can be conceived through it' (1P8S2).

Were it not for God, therefore, *all* our ideas of geometrical figures would be fictitious, and the whole of geometry would be a confused delusion of the kind we would be under if we tried to work out the properties of the regular decahedron or to locate the centre of magnitude of the semicircle as well as of the circle. Descartes says to Gassendi that he has to accept that there are real and immutable natures dependent on God 'unless you are maintaining that the whole of geometry is…false' (CSM 2.262). And Leibniz says that 'if there were no God, geometry would have no object' (*T* 242). This way of thinking can also be found in Spinoza's discussion of how it is our conceiving of them through substance that explains 'how we can have true ideas of modifications which do not exist [in the corporeal world]' (1P8S2).

Leibniz provides a neat slogan for this way of thinking. 'If there were no eternal substance there would be no eternal truths' (PM 77). It is, however, not one which will be acceptable to many twentieth-century minds, who will insist that geometrical figures are merely, as Gassendi thought, abstractions from sensory experience, that '[t]he triangle is a kind of mental rule which you use to find out whether something deserves to be called a triangle' (CSM 2.223), and that eternal truths are merely consequences of these conventional mental rules. But what clearly follows from it, within the Spinozan framework, is that if eternal, extended substance did not exist, and if motion were not an immediate eternal mode 'produced by' it, then there would be no real and eternal truths about extension and motion. Yet unless there are such truths about them, and unless extension and motion are realities in the way the circle is, and not mere fictions in the way the regular decahedron is, then the terms in which the mechanical philosophy says the corporeal world should be explained and understood are fictions too, and the corporeal world is just not as is supposed. Just as two projectiles travelling in the same plane *cannot* follow parallel paths (for there is no such thing in God as the parallelism of parabolas), so (if there were to be no such thing as extended substance, with motion its immediate mode) the phenomena of the corporeal world *could not be* an elaboration of the motions of extended bodies, and the attempts of the

mechanical philosophers to understand it in this way would be mere delusion.

Even if this helps to explain what lies behind Spinoza's doctrine that motion 'follows immediately' from extended substance, and what purpose it might serve, it does not explain exactly what is meant by that 'following'. As noted earlier, this has always been obscure to his readers. It may be of interest to review some of their earliest reactions.

Towards the end of his life he was asked by Tschirnhaus how motion is supposed to follow from extension. How can the existence of individual bodies and movement 'be proved a priori, since there is nothing of this kind in Extension' (*Ep* 80/W 361)? Spinoza replied that indeed they cannot be—so long as extension is 'as Descartes conceives it…a quiescent mass' (*Ep 81/W* 363). Matter at rest will never set itself into motion. Consequently, says Spinoza, 'I did not hesitate to say once that Descartes' principles of natural things are useless, not to say absurd' (*Ep* 81/W 363). It was hardly Tschirnhaus' fault that this point was not clear to him, and he reminded Spinoza that Descartes had never thought otherwise about matter at rest, and had held that initially its motion 'was started by God'. He asked again how Spinoza thinks motion 'can be deduced a priori from the conception of Extension' (*Ep* 82/W 363).

It emerged from his next reply that Spinoza's point had been that since motion does not follow from extension *as Descartes conceived extension,* then that conception must be wrong. Extension or extended substance must not be understood as a quiescent mass. Understood in that way, then, 'matter is badly defined by Descartes as Extension'. Extension must be understood to be 'an attribute which expresses eternal and infinite essence' (*Ep* 83/W 365). The exchange of letters with Tchirnhaus ended with Spinoza hoping to discuss the matter further, so even he did not think he had yet satisfactorily explained how extended substance is the 'first cause' of motion. It is hardly surprising, then, that when the *Ethics* came to be published two of its early readers felt the same.

Samuel Clarke argues[37] that the only possible positions open to Spinoza are either that matter is able to put itself into motion, or that there has always been motion, which gets communicated in collisions from one part of matter to another. He concludes that Spinoza's actual position is the second, for 2P13L3 quite clearly

says that any moving body must have been caused to move by some other moving body 'and so on, to infinity'. Now Clarke is right that this provides no explanation of motion's 'first cause', but he is wrong to criticise Spinoza for that. Unable to recognise anywhere else in the *Ethics* to look for an explanation, he fails to see that 2P13L3 is not meant to provide one. The complexities of the situation got hidden from Clarke by a mistaken understanding of Spinoza as someone whose 'God' is nothing but the material world: he failed to see that what Spinoza means by the eternal nature of motion is not that, as a brute and unexplained fact, things have always been in motion (as at 2P13L3). He means that—obscure though this may be—it is an immediate mode of an eternal subtance which 'produces' it.

Clarke attributes the first of the two possible positions he outlines, that matter is able to initiate its own motion, to John Toland.[38] Toland, in fact, was another early critic of Spinoza's failure to explain the 'first cause' of motion. Like Clarke, he gets off on the wrong foot by supposing that Spinoza's God is simply the material world, and so he argues that Spinoza therefore cannot hold, as did the 'antient Sages of Greece', that 'the Divinity (which was acknowleg'd distinct from…Matter) communicated Motion to it' (142).[39] But Spinoza does hold, so Toland argues, that matter is 'of it self inactive' (142)—for it is obviously Spinoza's view that motion is not an attribute of substance; and anyway, *E* 2P13 clearly allows that bodies might be at rest.[40] In short, Toland holds, Spinoza simply has no explanation.

LEIBNIZ AND EXTENDED SUBSTANCE

Leibniz departed (see chapter 3) from the line laid down by Descartes, and followed, in his own way, by Spinoza, that extension is a principal attribute which constitutes a substantial essence. There *are* material substances for Leibniz, and they *are* extended, but it is not in virtue of being extended that they are substances. Their substantiality comes from the embodiment of a substantial form by their extended material. Considered by itself and apart from its embodied form, the material body of a human being is not itself substantial. Along with watches or marble tiles, it is an *en per accident*. But though not substances or *entia per se,* masses of material are not like rainbows, mere phenomena or

appearances. They have reality, and they derive it from being aggregates of material substances. Body, or mass, says Leibniz, 'is an aggregate of corporeal substances, as a cheese sometimes consists of a conflux of worms' (La 722).

Not only did he disagree with Descartes about the metaphysical status of body or matter, but Leibniz also disagreed about its physical properties too. He has no doubt that extension is *an* essential feature of it—'only what is thought of as extended can be called a body' (L 143), he says—but he holds that the central Cartesian doctrine that it is *the* '*principal attribute*' of body is a very grave mistake. For one thing (and as we shall see in some detail), it does not give rise to all the properties of body: 'neither motion or action nor resistance or passion can be derived from it. Nor do the natural laws which are observed in the motion and collision of bodies arise from the concept of extension alone' (L 390).[41] For another, it is not as basic as Descartes says.

Locke, we have seen, made this last point too: body cannot merely be extended; it must have some other quality for it to fill space. It is not simply, as perhaps Leibniz once thought,[42] that body must be something more than extension. It is that body must have some other property *in virtue of which* it is extended and fills space. Its extendedness is relative to something more basic than it. Extension presupposes something prior to it. It 'implies some quality, some attribute, some nature in the subject which is extended, which is expanded with the subject, which is continued. Extension is the diffusion of that quality or nature' (L 621). The 'extension or diffusion' of qualities such as whiteness through a quantity of milk, or of hardness through a diamond, is used by Leibniz to illustrate this thought that there must be some property—'materiality' (L 622), he once calls it—diffused through an extended thing in virtue of which it is extended and which, as it were, 'gives it body'.[43]

Leibniz variously characterises the property which constitutes 'materiality' and which therefore is 'the very form of corporeity' (L 95) as 'antitypy', 'impenetrability', 'materiality', 'resistance', 'solidity'.[44] He is lavish with his terminology, and from it I shall choose 'impenetrability', or 'solidity'. He is also a bit haphazard; 'resistance', for example, is sometimes used for 'inertia', another and quite different property (see below and chapter 6). What is being focused on here, however, is the property in virtue of which two bodies cannot simultaneously occupy the same place, the

property which underlies 'the fact that a body does not give place to another body…unless it can move elsewhere' (L 392). Leibniz thinks that Descartes comes to eliminate this (in *PP* 2.4) as part of the nature of body as a result of confusing it with hardness. A hard body is one which will not yield its shape under pressure. Hardness is not an essential property; some bodies have it, while others are soft, fluid, or flexible. Solidity, on the other hand, is what makes it impossible for two bodies, hard or soft, to be in the same place together. It is an essential property, possessed by all bodies.[45] Descartes was not completely unaware of the importance of impenetrability, of course. There is, we saw, a clear recognition of it in his correspondence with More; his view being that it follows from, rather than is presupposed by, extension.

Unless bodies were mutually impenetrable they would not displace each other in the collisions and exchanges of motion which, according to the mechanical philosophy, are what lie at the basis of natural phenomena. They would not have that movability which Leibniz calls their 'mobility': 'one body could not be pushed or moved by another' (L 622).[46] In his insistence on impenetrability or solidity as a property of material body, Leibniz is in company with Boyle, Locke, More, and Newton (see section 2). But, with the possible exception of Newton, he goes beyond them in insisting on a further property too.

The mechanical philosophy conceived of the world as ultimately one of collisions between moving material bodies. It naturally supposed that what happens in these collisions is not arbitrary, but law-governed and regular; and much intellectual effort was devoted (as we shall see in chapter 6) to the discovery and formulation of these rules. According to Descartes they could, at least in their generalities, be deduced from the nature of God. At one extreme from this, Malebranche (see in chapter 10) held them to be a voluntaristic result of God's choice. At the other extreme however, Leibniz held that they must arise out of the nature of matter itself; and this means that matter must be of a nature suited to the kind of regularities which we can discover, or can reasonably suppose, it to be subject to. Consequently matter must, in Leibniz's view, not only be extended and solid, but also have the property of what he called 'inertia'. I can show, he said, 'that far different laws of motion follow from…[body] than would be the case if the body, or matter itself, possessed only impenetrability with extension' (L 503). We will look at this in detail in chapter 6.

The two properties of extended material body, 'impenetrability' and 'inertia', mean that they have what Leibniz characterises as 'passive force of resistance' or 'passive power'. Moreover, he calls matter in so far as it is extended, impenetrable, and inert 'prime' or 'primary matter'.[47] It is (see the end of the last chapter) thus distinct from 'secondary matter'. Now 'primary matter', material body in so far as it is possessed of 'passive force', is, for Leibniz, actually no more than a schematic and incomplete abstraction. It is not yet the matter which makes up human bodies, clocks, or marble tiles, the matter which Leibniz calls 'secondary'. We might think of it as merely 'the first stage' in an account of material body. The reason for this relates back to Leibniz's disagreement with Descartes about the *metaphysical* status of material body: matter would be a phenomenon were it not an aggregate of substances, each of which embodies a substantial form and has 'active force'. According to Leibniz, this aggregated body or 'secondary matter' has not only the 'passive force' of impenetrability and inertia, but also an 'active force' or 'power', a 'derivative force' which comes from the 'active force' of the forms of the substances out of which it is aggregated.[48]

Though the active force of matter is therefore a derived force, its passive force is not. At any rate this seems to be so during the period when Leibniz held there to be corporeal substances out of which matter is aggregated.[49] When, later, Leibniz held that all substances are immaterial, and that body is merely a phenomenon somehow constructed out of their perceptions, the passive force of matter *is* a 'derived' one, 'derived' from a passivity, a kind of mental confusion, of those immaterial substances.[50]

But, whatever the case with passive force, the active force of material body *is* derived. Yet exactly how it arises from, or relates to, the primitive active force which characterises substantial form is not clear. Leibniz says little more than that it is 'exercised in various ways through a limitation of primitive force resulting from the conflict of bodies with each other' (L 436).[51] Far far clearer than how the 'active force' of material bodies is 'derived' is what it actually is. It is a force connected with their motion; and we should look at this now.

'[A]s far as phenomena are concerned', that is considered merely as a kinematical appearance, motion, says Leibniz, 'consists in a mere relation' (La 685). This, he says, is recognised by Descartes in his definition of motion as 'translation'. Thus, as we saw earlier in

this chapter, Descartes says that it follows from his definition of motion as transfer that considering motion 'strictly in terms of its own nature, without reference to anything else, then in the case of two contiguous bodies being transferred in opposite directions…we should say that there was just as much motion in the one body as in the other' (2.29).

Now there must, Leibniz goes on to say, be underlying 'causes' (La 685), some dynamical reality beneath the kinematical phenomena. His clear implication, both here and elsewhere (L 393), that Descartes did not recognise this is mistaken. As we saw earlier, Descartes does acknowledge not only motion as spatial transfer but also motion as a force, or cause of motion. It may be that Leibniz took Descartes's phrase 'strictly in terms of its own nature' (see above) to mean that motion is no more than a kinematical phenomenon. He may, however, just be engaging in polemic, for (unlike Leibniz) Descartes provides no detailed arguments why motion cannot just be spatial transfer, and why it must have an underlying dynamical cause or force. Unlike Leibniz, Descartes gives the force of motion no conspicuous and central role in his metaphysics.

A first reason Leibniz gives why motion must be something more than spatial transfer is that we otherwise could not say which of two reciprocally moving bodies is *really* moving. 'If motion is nothing but the change of contact or of immediate vicinity, it follows that we can never define which thing is moved…. [I]n order to say that something is moving, we will require not only that it change its position with respect to other things but also that there be within itself a cause of change, a force, an action' (L 393).[52]

A second, rather less developed, line along which Leibniz argues that there must be a dynamical force underlying motion is by way of the thought that, considered purely kinematically, motion consists in bodies being in different places at different times, and by occupying the intermediate places at intermediate times. At a point in time there thus appears to be no difference between a stationary body and a moving one. Movement understood as change of place essentially happens *over a period*. Yet there must, Leibniz argues, be something true of moving bodies at an instant, and not merely over a period of time, and this is that at each instant it possesses a moving force. 'As for *motion,* that which is real in it is *force* or power, namely, something in the present state which carries with it a change for the future. The rest is only phenomena and relations' (L 496).[53]

An important feature of Leibniz's metaphysics of extended substance is a dynamical 'active force' which, in moving bodies, is what sustains their motion. This does not mean that for Leibniz, any more than for Descartes or Spinoza, God is not the original cause of motion: 'motions must be attributed originally to the general cause of things,—God' (La 702). What it does mean is that—as in Descartes's rather more muted account—when it is considered 'immediately' and 'specifically', motions 'must be attributed to the force placed in things by God' (La 702).[54]

NOTES

1 See Lachterman: 77–8, Maull, Savan, Siebrand.
2 See Aiton: *passim*.
3 See Alexander: chap. 2, for an excellent account of the two kinds of explanation as the seventeenth century saw them.
4 See also CSM 1.285–8, K 59.
5 See also C 173–8.
6 See also L 94, 97.
7 We have already seen in the last chapter that Leibniz thought that substantial forms were not to be wholly despised and needed reinstating in metaphysics. This connects, we shall see, with his belief that magnitude, figure, and motion are not sufficient in physics, and that force is necessary too. Some (e.g. More) thought some phenomena (e.g. magnetism, gravity) were inexplicable by any combination of natural properties (and required, e.g. a spirit of nature; see Jammer 1957:150–7, Koyré 1957:127–34). See Hesse: 153–6, 156–70, Suppes, for action at a distance.
8 See also CSM 2.297.
9 See Kenny 1968:210f., 217f.
10 A lot of these were to the effect that matter is surely *more* than extension. Yet there were accounts according to which matter is *less* than this, extension being held to be *accidental* to it (see below).
11 See Laymon, Watson 1982.
12 In 1671 Leibniz too (L 143), and apparently with this exchange in mind, makes a connection between body and perceptibility.
13 See also *PP* 2.4.
14 Boyle 1666:18, Clarke 1723:2.24, Locke 1690:II.iv, III.vi.21, Newton: 399. More's dissatisfaction with extension by itself as a characterisation of corporeal substance stems partly from his somewhat idiosyncratic view that *any* substance, material or immaterial, is extended (see Gabbey 1971:8, Koyré 1957:111).
15 *PP* 2.23, 64.
16 See also CSM 2.17, 298. There is useful historical and philosophical discussion at, respectively, Gabbey 1971:7 n. 27, and Williams: 229.

17 See Adams: 1.170–2.
18 Locke 1690:II.iv.2, 5.
19 *Phys,* chap. 4; see also Grant 1976:137–8.
20 L 392, La 699, *NE* 124.
21 Despite the sense of revolution one feels in Descartes, his insistence on extension as essential to matter is not original. Though themselves embodied in the Aristotelian tradition, medievals such as Ockham, and Buridan, had argued against Aquinas' view that extension is distinct from any substance which is accidentally extended (see Adams:l.chap. 6).
22 Middleton is an example of the former, Ockham of the latter (Adams: 1.178; also Grant 1981:71–3).
23 For a fuller discussion of the two 'preconceived opinions' see Woolhouse forthcoming.
24 Descartes discusses this divergence from the ancient atomism of Democritus at *PP* 4.202. The world is merely 'indefinite' because 'infinity' pertains only to God *(PP* 1.27; More questioned Descartes about this—see Koyré 1957:105–9, llOff.). The third corollary is contrary to the Aristotelian belief that the heavens beyond the moon are made of a pure unchanging quintessence, different from sublunary matter.
25 See also CSM 1.86–7, Locke 1690:II.iv.2; for Gassendi, see Dugas 1958:105.
26 See also 3.28.
27 See also 1.65, 2.27.
28 2.13.
29 See also 25, 28.
30 PP 2.28, 31.
31 PP 3.15–30.
32 CSM 1.142; see Dugas 1958:172, Gabbey 1982:216, Koyré 1965:81, Westfall:57–8. It should be remembered, though, that Descartes argues that 'no motion should be attributed to the earth *even if "motion" is taken in the loose sense' (PP* 3.29, my italics).
33 There is disagreement whether Spinoza is speaking for himself at C 268 (see C 423 n. 41, Bennett: 99).
34 As we will see in chapter 9, Descartes thinks motion can be initiated by the human mind too.
35 For some elaboration of the argument that follows, see Woolhouse 1990:36ff.
36 Though see chapter 10, n. 3 for some difference between Descartes and Leibniz on this.
37 1704:2.531–4, 547–8.
38 Though less absurd than the second position, Clarke thinks this is unsatisfactory too. It has the unacceptable and incompatible consequences that not only could a body never be at rest, but also it would have to move in all, and therefore in no, directions at once.
39 Toland mentions the ancient Greek philosopher Anaxagoras. But the classical Epicurean view (adopted in the seventeenth century by Gassendi) was that, because of their own weight, atoms had an inherent motion downwards.

40 Toland: 139, 143, 145. As Clarke reported, Toland's own view is that matter is *not* inactive. The Cartesian definition solely in terms of extension is, he holds, unsatisfactory—not merely because impenetrability is required too, but also because the power of self-movement is 'as inseparable from its Nature as impenetrability or Extension' (2.159). The common seventeenth-century view, which Toland combats, according to which 'dull, stupid and sensless Matter …could never move it self (Stillingfleet:16;see also Gildon:49), was obviously perceived by its proponents as an important bulwark against atheism, in that it required an incorporeal God as the first cause of motion (see also Harris 1698: *passim,* Clarke 1704:2.531, 533, 548). Toland claims, however, that his view is not atheistical, for God is still needed to create this self-moved matter (161). (Toland's views were influenced by Leibniz; see Heinemann).
41 See also L 111–12.
42 L 143.
43 L 390, 621, La 700.
44 L 95, 100, 101, 112, 143, 392, 437, 622, La 722.
45 L 392. In his insistence on solidity as essential to body Locke too is quite clear about its difference from hardness (1690:II.iv.4).
46 See also Locke 1690:II.iv.2, xiii.ll.
47 L437, 503, 517, La 701.
48 See L 433, 436–7, 503–4, 517, La 701–2.
49 See, for example, La 701; but contrast L 437.
50 L 365, 598, 647.
51 See also L 433, 503. For some discussion see Broad 1975:65, Buchdahl: 420–1, Garber 1986:83–5.
52 See also L 315, 418, 419, 706.
53 See also L 435–6, 505, La 689.
54 See also L 435.

6

Descartes, Spinoza, and Leibniz, and the Mechanics of Extended Substance

DESCARTES

According to Descartes (see chapter 4), God '[i]n the beginning …created matter along with its motion and rest'. Moreover, because of God's 'operating in a manner that is always utterly constant and immutable' (PP 2.36), there are 'certain rules or laws of nature' which govern 'the various motions we see in particular bodies' (PP 2.37). Descartes elicits from God's perfection and immutability not only that there must be some such laws, but also *what* they actually are.[1]

This section will be devoted to these three laws of motion, their associated notion of 'force', and, in the latter half, to the constraints they put on collisions between moving bodies. In later sections, Spinoza and Leibniz will need to be located with respect to them. The laws are at the heart of Descartes's philosophy of science and, as such, are a part of the history of the science of mechanics, one climax of which was Newton's *Mathematical Principles of Natural Philosophy* of 1687.[2] Since our present-day understanding of mechanics is very likely to be 'Newtonian', it may be easier to approach Descartes from that direction. It need be no surprise if Descartes turns out to be significantly pre-Newtonian.

Classical Newtonian mechanics begins from three laws of motion and the inverse square law of gravitational attraction. One of its most important ideas is the principle of inertia, which appears as the first of the laws of motion. According to this principle, unless it is acted on by an outside force such as may be produced by collision, a body will remain at rest, or in uniform

motion in a straight line. There are two elements to this. First: unless acted on by an external force, a body at rest will remain at rest, and a moving body will remain in motion. Second: unless acted on by an external force, a moving body will move in a straight line. These two elements are quite clearly distinct in Newton's earlier thought, where they are stated separately.

The principle of inertia, Newton's first law of motion, has roots not only in his earlier thought, but also in Descartes's 'rules or laws of nature', which govern the movements of bodies. A precursor of the first element of Newton's law appears as the first law of nature of the *Principles,* and as the first of the 'two or three of the principal rules according to which…God causes the nature of this…world to operate' (CSM 1.93) in *The World.* If, says Descartes, a piece of matter 'is at rest, we hold that it will never begin to move unless it is pushed into motion by some cause. And if it moves, there is equally no reason for thinking it will ever lose this motion of its own accord without being checked by something else' (*PP* 2.37).

Descartes admits that experience might seem to conflict with part of his claim, a claim which goes back to Galileo earlier in the century.[3] Having seen many motions coming to an end we might conclude 'that it is in the very nature of motion to come to an end, or to tend towards a state of rest' (*PP* 2.37). Of course a twentieth-century schoolchild would have an answer to this, an answer in fact modelled on Descartes's own. These motions 'are in fact stopped by causes unknown…[and do not] come to an end of their own accord' (*PP* 2.37). Alluding to an earlier Scholastic conception according to which at least many motions are 'unnatural' and so do come to an end, Descartes wrote to More that motion does no violence to bodies.[4]

As Descartes saw it, one of the significant features of his study of motion was its concentration on what to the Scholastics was merely one kind of motion (local motion) amongst others, and its supposition that other kinds of motion are reducible to this (see chapter 5). So it is worth noting that, in marked contrast with this, it is only as a special case that Descartes's law applies to change of place. Both in *The World* and the *Principles* the 'states' in which a piece of matter is supposed to remain 'as far as it can' include its shape and its size as well as its rest or its motion.

The second element of Newton's principle of inertia has roots in another of Descartes's three laws of nature: namely 'that every piece of matter, considered in itself, always tends to continue

moving…in a straight line' (*PP* 2.39). Though motion is 'in itself rectilinear' (*PP* 2.39), it is recognised (see chapter 4) that given there is no empty space, all actual motion is ultimately in a circle. Descartes illustrates the idea of the natural rectilinearity of motion by a stone in a sling; it marks a move away from the earlier conception, that of Kepler, for example, that circular motion (as of the planets) is completely natural and unforced.[5]

In Descartes's *World* the two elements (i.e. constancy of state and rectilinearity of motion) of Newton's first law of motion appear as the first and the third of three laws of motion. In the later *Principles* they appear as the first two. This difference does not mean that by the time of the *Principles* Descartes had begun to see what Newton later recognised, that the two elements go to form a natural conceptual unity in the foundations of mechanics.[6] Their juxtaposition in the *Principles* seems to reflect no more than that they both concern the motion of single bodies (whereas the third law concerns inter-body collisions). Moreover, consideration of some other of Descartes's ideas about motion (in the second law of *The World,* and in the third law and its preliminary material in the *Principles*) shows how much of a gap there is between his laws and those of the final Newtonian mechanics.

The core of these other ideas is a 'law' according to which the same amount of motion is conserved in the universe even though collisions between bodies redistribute it. God, says Descartes, 'always preserves the same quantity of motion' amongst bodies in the world, so that 'if one part slows down, we must suppose that some other part of equal size speeds up by the same amount' (PP 2.36). At first sight it is very plausible that, in a world in which corporeal matter is not static but in which bodies collide with each other in various ways and move off at various different speeds and directions, the sum total of all this motion should neither decrease nor (unless God adds to it) increase. But, in its detail, Descartes's 'law' is mistaken. This will be seen if, again, we approach it from the direction of its more familiar Newtonian descendant.

Newton's principle of conservation of 'motion' is a corollary of his third law. For Newton, the 'quantity of motion' possessed by a body (what we now call its 'momentum') is the product of its mass multiplied by its velocity.[7] Velocity is a *vectorial,* directed quantity which is carefully to be distinguished from speed, a *scalar* non-directional quantity: a stone swung round in a sling has a constant speed but, relative to any given direction, a constantly changing

velocity. Now it follows from Newton's first law that it takes something like a collision to change a body's momentum (either by changing its speed or by changing the direction of motion); and it follows from the principle of conservation of momentum that this change relates to a corresponding change in the other body: the total momentum of the two bodies taken together must be the same both before and after their collision.

Descartes's law of conservation of motion is crucially different from Newton's law of conservation of momentum, for while momentum is a function of the directional vector, velocity, Descartes's 'motion' is a function of the non-directional scalar, speed. The quantity which for Descartes is a constant in the universe, and which is redistributed amongst bodies in collisions, relates simply to their speeds. As Descartes explains it, the 'quantity of motion' of a body is its size times its speed. '[I]f one part of matter moves twice as fast as another which is twice as large, we must consider that there is the same quantity of motion in each part' (*PP* 2.36).

Though it follows from Descartes's laws, just as it does from Newton's, that a body left to itself will not change either the speed or the direction of its motion, and so—in effect—will not change its velocity, his conservation law (unlike Newton's) relates only to change of speed; it does not also relate to change of direction, and so—in effect—not to momentum. In discussing the before-and-after situations of various collisions, Descartes does in fact describe and explain the changes of 'determination', or direction of motion; nevertheless changes are immaterial to his conservation law. '[M]otion', he explains to Mersenne, 'is different from the determination bodies have to move in one direction rather than other…and…properly speaking force is needed only to move bodies and not to determine the direction in which they ought to move' (trans. Westfall:64). As Westfall comments in the course of his marvellous discussion of this, Descartes puts 'changes of direction in the anomalous status of changes that are not changes, changes that involve no act' (67). For Descartes, it is quite possible that all bodies be first moving in one direction and then, with unchanged speed, all in another; for Newton this is not possible. Like Newton's law of inertia, two of Descartes's three laws of motion relate both to change of speed and to change of direction; but, unlike Newton's, his conservation law relates only to speed and not also to direction (in effect, that is, it does not relate to

velocity). Though he has both the notion of the speed of a body, and the notion of the direction of its motion, Descartes never fuses these into the notion of velocity.[8] The fact that the two strands of Newton's law of inertia are juxtaposed in the *Principles* as the first and second laws does not mean that Descartes was any closer than in the earlier *World* to Newton's law itself.

A recent physics text-book says that the 'modern "principle of inertia"', that bodies 'do not change the character of their motions in the absence of force', can be found in Descartes and Newton. It also explains that the principle 'is in direct opposition to the Greek view that force is necessary to maintain motion. In the entire absence of force, according to the view of the Greek philosophers, all motion…must ultimately cease.'[9] This is a mistake. Though this opposition to the early Greek view is a feature of Newton's *Principia,* it is not one of Descartes's ideas, nor, at first, of Newton's:[10] these ideas are in fact not 'modern' in the sense the textbook explains.

According to Aristotle, '[everything that is in motion must be moved by something. For if it has not the source of its motion itself, it is evident that it is moved by something other than itself (*Phys* 241b24–6).[11] A moving thing needs to be continuously 'carried along', either by an 'internal' source of motion (as in 'natural' motion) or by an 'external' source (as in 'unnatural' or 'violent' motion.)

The motion of a hand-thrown javelin was seen as 'unnatural', for if 'left to itself, and simply dropped, its natural movement would be directly downwards to the earth's surface. So in its movement through the air it must have a continuous 'external' source of motion. In the period between Aristotle and Descartes there were various ideas about this external source.[12]

According to the theory of antiperistasis, the javelin is continuously pushed along by air which comes round from its front end to its rear.[13] Another idea, also found in Aristotle, is that the air gets from the hand the ability to act as a mover, an ability which is then communicated from one parcel of air to another. Just as the javelin would move if passed from hand to hand, so it moves by being successively passed to different parcels of air. A third idea, suggested in the sixth century by Philoponus, is that the javelin itself (rather than the air through which it passes) gets from the hand a force which, until it expends itself, continuously sustains the movement.[14]

Something like this last idea was popular in the fourteenth century, as part of the so-called *impetus* theory. According to Buridan, one of its prime proponents, in a projectile 'there is impressed something which is the motive force of that projectile …the motor [i.e. the source of motion] in moving a moving body impresses in it a certain impetus or a certain moving force of the moving body…. It is by that impetus that the stone is moved after the projector ceases to move' (trans. Clagett:523).[15] He adds that the 'impetus is continually decreased by the resisting air'; so it does not naturally expend itself and, but for the air, would continue in the moving body for ever.[16]

Newton's account of motion, as contained in the three laws of the *Principia,* has no place for any such notion of force as what continuously sustains a body's motion. This is what the recent physics text-book had in mind. The *Principia* has no force to explain why moving bodies *keep on moving,* or why bodies at rest *remain so;* there is no force involved in the 'inertial' motion of the first law. The 'force' is one which explains change of motion or rest and not its continuation. It brings about a change from rest to motion, or an increase in motion, or a change of direction of motion. But once such changes have come about, and a body is set in its new way, there is no force involved in sustaining it. Yet though Newton's classical account of inertial motion rejects any 'motor force' which continues motion, as in the medieval impetus theory, it would be wrong to think that any force of this kind is automatically rejected by the mere idea that, unless acted on from outside, bodies will 'continue on their way' (either at rest, or moving at a certain speed in a certain direction). The idea of a steady 'inertial' motion is implicitly already there in Buridan, but the crucial point is that here it is one *sustained* by or produced by a 'motive force'. Indeed this is how unchanged motion is understood and explained in Newton's earlier thought; and it is how it is understood by Descartes.

Some commentators in fact suggest otherwise.[17] Lecrivain says that when Descartes thinks of causes of motion he thinks of what causes *change,* not of what *sustains* or *preserves.* Barbour gives as the main reason for what he calls the 'striking modernity' of Descartes that he was the first 'to see clearly (or perhaps, rather, the first to say so unambiguously) that laws of motion are needed, not so much to describe motion itself, as to describe *change of motion'.* But these suggestions are a mistake. Descartes's 'principle of inertia' has behind

it something which is more like the impetus theory's 'motive force', which acts as a sustaining internal 'motor', than it is like the 'modern' Newtonian conception of force which *changes*.[18]

This difference between Descartes and the mature Newton underlies any apparent similarity between Descartes's statement that a body will not change its state of rest or motion 'except as a result of external causes' (*PP* 2.37), and the first law of Newton's *Principia* that it will not change it 'unless it is compelled to…by force impressed upon it' (quoted Jammer 1957:123). In the still partially medieval Cartesian world, a body which is now moving more quickly than it was previously is doing so, and was caused to do so, because its present sustaining motive force is greater than its previous sustaining motive force. The change took place on the acquisition 'from outside' of further motive force. But in the 'modern' world, which we inherited from Newton's *Principia,* there is no motive force involved in the sustenance of the present greater motion, just as there was none in the sustenance of the earlier lesser motion. So the increase in motion is not explained by an increase in such a force. A 'modern' Newtonian force, impressed from outside, *changes* and *accelerates*. It does not relate directly to quantity of motion or momentum or to the size of changes in it, but to the *rate* of those changes. It no longer still acts, as did a pre-modern force, after the acquisition of the change.

Descartes's notion of the force involved in motion was mentioned in the last chapter in connection with his distinction between motion as 'transfer' and 'the force or action which brings about the transfer' (*PP* 2.25). It is the notion of a sustaining 'motor', a persisting 'moving force' which, *if increased,* produces acceleration, and not the later Newtonian notion of a force which *exists only in* acceleration. Referring to it, he speaks of a moving body's having a 'force of motion' (CSM 1.95), 'a power of persisting in motion' (PP 2.43) which it has acquired from impacting bodies. He speaks of this force of motion being 'lost' by one body, 'imparted to another', of being 'mutually transferred when collisions occur' (PP 2.42). He talks of the 'virtue or power of [a body's] self-movement' (CSM 1.85); and of a stone's having a 'power of moving' (PP 3.57).[19] This 'motive force' of a moving body is, of course, to be measured by its 'quantity of motion'—by its size multiplied by its speed.

Descartes's 'quantity of motion' differs from Newton's momentum, as it came to be called, in two respects. One of these

(that it depends on scalar speed and not on vector velocity) has now had sufficient discussion. The other (that it also depends on 'size', and not on 'mass') deserves some consideration.

Newton's *Principia* identifies 'mass' with 'quantity of matter', whose measure is the 'density' of a body multiplied by its 'bulk' or physical magnitude. It explains that 'a body twice as dense in twice the space is quadruple in quantity of matter', i.e. in mass.[20] The details of Newton's idea of 'density' and his idea that the same mass, the same quantity of matter can occupy different volumes are not of much concern here.[21] What is of concern is that Descartes's understanding of matter or corporeal substance (as essentially extension) means that 'density' is not a notion which is readily available to him. That understanding seems to have no room for any idea of 'density', and our intuitive idea of the quantity of matter of a body would seem to reduce to that of the magnitude of its extension (what Newton calls its 'bulk'). He nevertheless appealed to such an idea when he wrote to Mersenne that 'if two bodies travel equal distances in the same time, one says that they have the same speed; but whichever of the two contains more matter, either because it is more solid, or because it is larger, requires more force and motion to travel as fast as the other one' (trans. Clarke 1982:216). Perhaps his explanation of condensation and rarefaction in terms of the rearrangement of a body's parts (see chapter 5) could provide him with the basis of a notion of 'density' (or 'solidity') and so of a difference between the amount of matter in a body and its physical magnitude.[22]

But even if the Cartesian 'size' of a body gets as close as this to its Newtonian 'mass', there are still very crucial differences between Descartes and Newton. These relate to already partially noted differences between their notions of force. To see what they are we should first notice some anachronism in saying that Descartes's first two laws of motion constitute a 'principle of inertia'.

As Descartes understood the term 'inertia' this is precisely what they do *not*.[23] He meant by 'inertia' a property of the kind that Kepler[24] attributed to bodies, according to which their natural state was one of rest, and a main point of his first two laws is that what is 'natural' to a body is *whatever* state it happens to be in, be it one of rest or one of motion.[25]

What lies behind the anachronistic description of Newton's first law of motion (and hence of two of Descartes's laws) as a 'principle of inertia' is that in the *Principia* Newton explains the

fact that bodies obey it because, having 'mass', they possess an inactivity: 'A body, from the inert nature of matter, is not without difficulty put out of its state of rest or motion' (2).[26] He speaks of this inactivity or inertia as a 'force' (*vis inertia*), but it is not to be confused with his earlier, and Descartes's, 'force of motion'. The latter, like the medieval impetus, was a force which continuously sustains a body in its motion, and, as we have seen, there are no such sustaining forces in Newton's mature scheme. Just as 'force' in that scheme is something which changes or accelerates motion rather than sustains it, so there is no *vis inertia* in play during uniform motion or rest. As Newton says in the *Principia*: 'a body only exerts this force [i.e. *vis inertia*] when another force [i.e. an accelerating force], impressed upon it, endeavors to change its condition' (2).

We should now turn to the general constraints which Descartes's three laws put on the motions of pieces of his extended substance and on the resulting collisions between them. In an illuminating discussion of these matters, Gabbey says that the picture through much of the seventeenth century was one of collisions between bodies 'as contests between opposing forces, the larger forces being the winners, the smaller forces being the losers' (1971:16). The 'evident anthropomorphic origin' of a picture like this might suggest that to lose must be to be robbed of force and brought to a standstill. For Descartes, though, 'losing' is being made to change direction, or being carried along, perhaps at a faster rate and with increased force, by the winner. In Cartesian 'contests between opposing forces' of colliding bodies, motion and force is transferred *from* the 'stronger' winning body *to* the losing 'weaker'.[27]

As we might suppose, the 'strength' or 'weakness' of a body has to do with its 'power…to act on, or resist the action of, another body' (*PP* 2.43). But how exactly are these 'strengths' and 'weaknesses' computed? The power or force which a *moving body* has to *act* on or resist another body is, of course, essentially, the force of its motion; as such it is measured by its 'quantity of motion' and so depends on its 'size' and the 'speed of its motion' (*PP* 2.43). In ideal cases, the ones actually discussed by Descartes, of co-linear collisions between two perfectly hard, isolated bodies, this is all there is to it. But in the real world, where not all bodies are perfectly hard and motion takes place in crowded plenum, a body's 'force' depends also on 'the size of the surface which

separates it from other bodies' (*PP* 2.43),[28] and the non-co-linearity of its collisions needs to be taken into account in computing how it will act.[29]

What of *stationary* bodies? Here the case is far less straightforward, and there are difficulties and complexities of interpretation. The 'false premise' that such bodies have the power to act on or resist the force of moving bodies which run into them is, according to Malebranche, what 'damages Descartes' physics most' (1674–5:526). This force of rest is related to a kind of inertia which—despite his rejection of inertia as then properly understood, i.e. Keplerian inertia—Descartes does accept. Explaining this inertia to Debeaune he says that, 'if one of two unequal bodies receives as much motion as the other, this equal quantity of motion does not give as much speed to the larger as it does to the smaller; so one can say that in this sense the more matter a body contains the more *natural inertia* it has' (trans. Gabbey 1971:54). Because of its 'size' a stationary body would, if it *were* moving with (say) two units of speed, have a certain force, and that same amount of force is required to get it to move with that speed. Descartes's thought is, then, that a stationary body resists motion with the amount of force which would be required to give it that motion.[30] So a stationary body's force is a variable which is measured by the amount of motion the body in fact gets from another body which sets it in motion. Its 'force of resistance' is not a resistance to being set in motion as such; rather it is a resistance to receiving the amount of motion that another body eventually gives it. When he says that bodies lose motion in accordance with how much the resistance of another body is overcome,[31] Descartes does not mean that there is an absolute measure of the resistance of a stationary body. Its resistance is a quantity which varies according to what the body which opposes it eventually gets it to do.

At any rate, this is how two of Descartes's most careful commentators understand him.[32] And their account is supported by, or at least consistent with, one way of taking the explanations of his 'force of rest' which Descartes added in the second edition of the *Principles* of 1647 and in a letter to Clerselier in 1645: there are clear indications here that a body's resistance to motion is a variable which increases in proportion to the motion being forced on it. The account fits perfectly, moreover, with Descartes's statement to Mersenne in 1639 that when a moving body, B, strikes

a stationary one, C, it carries it along with it at a reduced speed such that the final joint quantity of motion of the two bodies moving along together is equal to B's original quantity.[33] He explains that this will happen *whatever the relative sizes of B and C*; for even when C is larger than B, the quantity of motion it has in its new joint movement with it (and so its force of resistance at rest) must, since B is still moving after the collision, be less than B's initial force of motion.

But this account of Descartes's force of rest does not fit with what he says in the *Principles* 2.49 about the particular case of a smaller moving body colliding with a larger stationary one. Here he says that no matter how fast it is moving (and therefore whatever its force) the *smaller* body can never get the *larger* to move. It is this completely counter-intuitive consequence which Malebranche had in mind in saying that Descartes's force of rest 'spoilt' his physics. It is, moreover, flatly inconsistent with what Descartes had said to Mersenne, and it requires some change to how, following Clarke and Gabbey, we have been interpreting Descartes.

The examples Descartes gives about this to Clerselier and in the second edition of the *Principles* suggest to Clarke[34] the addition of a proviso about exchange of motion, to the effect that a stronger and moving body cannot pass on more than half its power to a stationary and weaker body. Descartes says to Clerselier that the changes involved in a collision are 'always the least possible' (quoted Clarke 1982:225), and the idea would be that for a smaller and moving body to rebound from a larger stationary body with no loss of motion involves less change than for it to give up more than half of its motion.[35] (Though why this should not apply to *any* loss of motion to stationary bodies is not clear.)

It is a feature of all of this that the force a 'weaker' body has to resist a 'stronger' is calculated quite differently according to whether it is at rest or not. If at rest, its force of resistance is equal to its post-collision force of motion; if moving, it is equal to its pre-collision force of motion.[36] A further feature is that it is therefore the absolute and not the relative speed of colliding bodies that matters. This is of real importance in Descartes's scheme, for there can be no constant 'quantity of motion' in the world as a whole unless it is absolute motions which are being dealt with.[37]

These features make Cartesian mechanics different from later and more successful ones. When (as in the last chapter) Leibniz

criticised Descartes for not going beyond a purely kinematic definition of motion as spatial transfer, he unfairly failed to acknowledge that Descartes does have a dynamical force of motion too. Yet a further criticism he made is quite fair.[38] In trying to work out the results of various kinds of collisions Descartes forgot, Leibniz pointed out, his own corollary of that definition—namely that at the kinematical level motions can be considered as reciprocal and relative to each other. It was (as we shall see) by imaginatively taking this relativity seriously that Huygens came to formulate correct collision rules. Moreover, the recognition of dynamical forces need not be inconsistent with a kinematic relativism; since Newton's force is an accelerating one and pertains to change of motion, it matters not to him whether a body is initially at rest or in motion.

One example of a difficulty into which Descartes was led is in the third law of motion in *the Principles* (2.40). This describes what happens in the supposedly different cases where one body hits a weaker body and where it hits a stronger. But, unless we are to see a difference between hitting and being hit, these 'two' cases really concern the same collision from two points of view.

Another difficulty lies in the fact that the result given (*PP* 2.46) for a collision between two bodies of equal size moving in opposite directions with equal unit velocity is different from that given (*PP* 2.51) for one between two such bodies when one is at rest and the other moving with two units of velocity. Huygens was able to see that these two collisions are effectively the same. Finally, collisions where a larger moving body hits a smaller stationary one, and where a smaller moving one hits a larger stationary one, are effectively the same too. Yet Descartes concludes that a moving larger will always move a stationary smaller (*PP* 2.50), but that a moving smaller will never move a stationary larger (PP 2.49). In fact all but the first of the seven 'rules' (PP 2.46–52)—derived by reasoning rather than by simple observation (PP 2.52–4)—for the results of collisions of various detailed sorts are incorrect. All Descartes gets right is that two perfectly hard bodies of equal size which meet with the same speed will rebound with their meeting speeds. Even if it were pretended that the rules were for soft bodies, still only one would be correct.[39]

As already mentioned, the particular, idealised collisions discussed by Descartes are between perfectly 'hard' or 'solid' bodies, bodies which are able to resist a change of shape.[40] This means that they are not compressed or deformed by collisions,

and that there is no place for the notion of a body's being 'elastic' (deformable temporarily) or 'inelastic' (deformable permanently). In its turn this means that Descartes cannot consider what happens *during* a collision. Yet since the 'before and after' of a perfectly hard collision is actually the same as the 'before and after' of a perfectly elastic one, there is some justification for the sometimes-made assumption that by 'hard' Descartes *really* means 'elastic'.[41] There is a good reason for Descartes to have considered perfectly hard, perfectly elastic bodies, for when soft and perfectly inelastic bodies collide the 'quantity of motion' is not conserved.[42] The first rule is correct only for bodies which are hard and elastic; two hard inelastic bodies would bring each other to a standstill.

The fact that perfectly hard bodies are not deformed by impact (either temporarily or permanently), and that therefore there are only a 'before' and an 'after' and no process 'during' a Cartesian collision means that there are no forces involved in deformations and restitutions, and no decelerations and accelerations. A perfectly hard body which rebounds is not first brought to a halt before reversing direction, and one made to move acquires its final velocity instantaneously, without passing through the various speeds intermediate between its pre- and post-collision speed.[43] To Leibniz's mind such consequences were absurd. They contravened a law of continuity according to which nature is supposed to do nothing by leaps.[44] He therefore concluded that there can be no perfectly hard bodies in nature: no matter how hard, things must always be to some degree flexible and elastic.[45]

Leibniz's law of continuity requires that collisions must be elastic: there must be a period *during* them in which impacting bodies first compress and gradually come to standstill, and then restore their shape and accelerate away.

> [E]very body which collides with another must, before it is repelled, first reduce its advance, then come to a stop, and only then be turned back, and must thus pass from one direction to the opposite, not by a leap but by degrees…. We must recognize that, no matter how hard, every body is nevertheless flexible and elastic to some degree; like a ball inflated with air which gives way a little when it falls to the floor…until…[it] resumes its shape…[and] rebounds by itself from the floor.
>
> (L397)[46]

Leibniz shows in detail how Descartes's rules for particular collisions go wrong because they err against this law.[47]

SPINOZA

Before looking further at Leibniz's ideas on these matters we should pay some attention to Spinoza. His contribution to the development of mechanics and dynamics is far less extensive than either Descartes's or Leibniz's. He never fully revealed his views on motion or wrote the 'General Physics' which one of his correspondents suggested.[48] But it is worth noting some of the ways in which, in *his Descartes' Principles* and in the 'Physical digression' of book 2 of the *Ethics,* he diverges from his predecessor.[49]

One noticeable difference is that whereas Descartes speaks separately of 'motion' and of 'rest', Spinoza tends to speak conjointly of 'motion and rest'. He refers to the conservation, not of the same quantity of motion, but of 'the same proportion of motion and rest' (*Ep* 32/W 211); parts of the extended world have their integrity for him through being 'a certain proportion of motion and rest' (C 155); 'motion and rest' (*Ep* 64/W 308) is given as an example of something directly produced by God; and reference is made to the laws and rules of 'motion and rest' (El 1.104). It is true that Descartes moves from saying God 'preserves the same quantity of motion' to saying he 'preserves the same amount of motion and rest' (*PP* 2.36). But whilst this could be just rhetoric,[50] there does seem more to it in Spinoza's case: he says, for example, that God conserves not simply the same *amount,* but rather the same *proportion* of 'motion and rest'. But how such a ratio could be computed is not clear. We would first need to know exactly what 'motion and rest' is for Spinoza, and what conservation law he is proposing when he says that their ratio is a constant.

According to Hampshire 'motion-and-rest' is best understood as 'energy'. A similar, and equally anachronistic, suggestion is developed by Pollock, who points out that if we took 'motion' and 'rest' to be kinetic and potential energy, then what Spinoza says about the conservation of 'motion and rest' would be 'fairly plausible'.[51] There is, however, no good reason to think that Spinoza does other than follow Descartes in his understanding of

'quantity of motion'.[52] Moreover, what he says of 'rest' when discussing collisions involving a stationary body[53] is quite compatible with the Cartesian idea of a force of rest which is dependent partly on a body's size, partly also on the speed with which *another* body happens to hit it. But something more absolute and less variable than this would be required to make sense of 'the same *proportion* of motion and rest'.

Besides maintaining something at least related to Descartes's law of conservation of motion[54] Spinoza seems to agree also with two other of Descartes's 'laws of nature', those which might be said to constitute a 'principle of inertia'. He certainly says on his own account that a body in motion (or at rest) will remain so unless determined otherwise;[55] and when expounding Descartes he adds his own proof that motion is naturally rectilinear.[56] Again in conformity with Descartes, he talks of 'quantity of motion' as a 'force',[57] and there is no reason to think he understands this other than in terms of a pre-Newtonian sustaining 'moving force'.

Though Spinoza thus shows general agreement with Descartes's three basic 'laws of nature', there is some unclarity about his attitude to Descartes's seven detailed collision rules, in which these laws are applied. Henry Oldenburg seemed to remember that Spinoza had intimated to him that they are 'nearly all false' (*Ep* 31/W 207). Oldenburg could not in fact remember whether this had actually been shown in the exposition of Descartes, but in any case he wished Spinoza would publish his own thoughts on the matter.

We do not know what Spinoza had said to Oldenburg in the first place, for the relevant parts of his previous letter to him are now lost. But he replied to Oldenburg that he had said only that *Huygens* thought Descartes's rules almost completely deficient. For his own part, Spinoza says, he did not 'say that any law is false except the sixth Law of Descartes, and even about that I said that I think Huygens too is mistaken' (*Ep* 32/W 212).[58]

LEIBNIZ

In seeming to back Descartes against Huygens (who had been a neighbour since 1663), Spinoza was on the wrong horse: the fact that all but the first of Descartes's rules are wrong, and how they should be corrected, had been quite clear to Huygens since about 1658. Realising, as we have seen, that the establishment of the new

'mechanical' view of the world crucially required a set of collision rules, he had come to see the faults in Descartes's, then the best developed set. He began work on the matter in the early 1650s, but did not publicly reveal his results or ideas till the 1660s, or publish them till 1669.[59] He is an important link between Descartes and Leibniz, and we should briefly review those of his results which are relevant for what follows.

Like Descartes, Huygens considered perfectly hard bodies, and, on the basis of Descartes's first rule (that equal bodies meeting with equal speeds are reflected back with the same equal speeds), he was able to prove that the other six must be wrong. His imaginative strategy, which involves a serious acceptance of kinematic relativity, was to work out how the same collision would appear to different observers moving relative to it; and in this way he also proved that the Cartesian principle of conservation of motion had exceptions to it. Descartes was right that the quantity of motion of one body in a collision could change only if there was some change in that of the other, but wrong that these changes must be equal. It was possible for one body to lose less motion than another gains.[60] Furthermore, not only might the combined post-collision Cartesian 'quantity of motion' of two bodies not be the same as the pre-collision value, but also there is no absolute value in either case. What to a moving observer is a two-unit-sized ball running with two units of speed towards a stationary one-unit ball is, to a stationary observer, a two-unit ball and a one-unit ball, each with one unit of speed, running towards each other. Yet the moving observer would calculate the total quantity of motion as four units, the stationary observer as three.

Though Cartesian motion is not always conserved in collisions, Huygens demonstrated that various other things always *are*. He showed that after a collision the centre of gravity of a pair of bodies continues in the same direction with the same speed as before.[61] This in effect means that Cartesian motion *is* conserved *from the point of view* of an observer moving along with the centre of gravity. So, for example, the centre of gravity of a two-unit-sized body moving from west to east with four units of speed, combined with a one-unit body moving from east to west with two units of speed, is moving from west to east with two units of speed. After a perfectly hard collision the first body will be stationary and the second moving from west to east with six units of speed, and so their centre of gravity will still be moving from west to east with two units of

speed.[62] From the point of view of an observer moving with the centre of gravity this collision will appear to be between a two-unit body moving from west to east with two units of speed, and a one-unit body moving from east to west with four units of speed, and to have the result that the first body then moves from east to west with two units of speed and the other from west to east with four units of speed. In the collision as thus observed there are eight units of Cartesian motion both before and after: in the collision as seen by a stationary observer there are ten units before and six after.

Huygens showed also—and as a consequence of the first result—that the pre- and post-collision values for the sum total quantity of Cartesian motion *in a given direction* possessed by a pair of bodies are always the same. In the above example, for instance, the pre-collision value is eight minus two units in a west to east direction, and the post-collision value is zero plus six units in a west to east direction. When the collision is seen from the point of a view of the centre of gravity the pre-collision value is four minus four, and the post-collision value is four minus four. Of course, to consider Cartesian motion in a given direction is, in effect, to turn it into momentum. But, other than noting its conservation, Huygens made nothing of this quantity and continued to think in terms of non-directed Cartesian motion.[63]

Huygens showed, finally, that the sum total of the quantities got by multiplying the size of each body by the square of its speed, is always the same after a collision as before. In the above case this sum is thirty-two plus four units before, and zero plus thirty-six units after. When the collision is adjusted to have a stationary centre of gravity, the first sum is eight plus sixteen, and the second is eight plus sixteen.

When Leibniz was in Paris between 1672 and 1676, he studied under Huygens. He had already interested himself in the all-important question of motion. He had read the work on collisions presented by Huygens and others to the Royal Society, and had himself published a two-part work on motion, 'A new physical hypothesis' (1671). He was still only 25; but, rather than trace the development of his ideas on this matter, we will immediately move forward to a time when his thoughts about Descartes's views on motion have become crystallised, and when he has assimilated Huygens' work. A good place to begin is about twenty years later with his 'Critical thoughts on the general part of the Principles of Descartes' (1692), a collection of notes towards a complete account of all he had by

then found wrong with Descartes. We need to look at his reactions to Descartes's three laws of motion and their associated notion of 'force', and to his account of collisions between moving bodies.

Pointing out that he did not originate it ('Galileo and Gassendi, and several others as well, have long held' it), Leibniz agrees that Descartes's first law, that unless caused to do otherwise, a body 'always persists in the same state', is 'a very true and indubitable law of nature' (L 395). Like Descartes he takes this to be a fundamental law: no theory of antiperistasis of the air is required to explain continued motion;[64] but, again like Descartes, he thinks of continued motion in terms of a sustaining 'motor', a 'force of motion'. Though Newton's *Principia* had been published four years earlier, Leibniz did not, any more than did Descartes, think in terms of a purely accelerating force. He talks of 'motive force' as being 'the impression which a body receives by impulse, by whose aid projectiles continue their motion' (La 702).[65]

Leibniz is in complete agreement with the second law of the *Principles* too, the law that unless caused otherwise, the motion of a body is rectilinear. He points out that Kepler also had held this, making good use of it in his astronomy. But though Descartes 'rightly affirmed it', and even 'brilliantly expounded it' (L 396), he did not, Leibniz claims, prove it, as one would have expected.[66]

We saw earlier that though these two laws might be paired together to constitute a 'principle of inertia', Descartes's law of conservation of motion—unlike Newton's law of conservation of momentum—pertains only to the first. The *direction* of Cartesian motion does not enter into its conserved quantity. We also saw that though Huygens had realised that what in fact is conserved is what came to be called 'directed motion' (momentum, in effect), he made nothing of this and still thought in Cartesian terms which did not require any force to change this direction. Leibniz is closer to Newton in this respect, for he sees that forces are required to change direction too.[67] As we might expect from this, Leibniz's position on the conservation of the force of motion, the topic of Descartes's third law, is profoundly different from Descartes's. But before turning to this we should first look at what he says about 'force of rest', and about a body's 'inertia'.

In chapter 5 Leibniz's account of corporeal substance was traced up to his claim that extension is insufficient as the essence of body, since impenetrability and what he calls 'inertia' cannot follow from, and need to be added to, it. Now impenetrability means that one

body cannot come into the place of another unless that other body moves. But by itself it gives no reason why a moving body of small extension, colliding with a stationary body of large extension, might not carry it along with undiminished speed. Such a world, in which the motion of bodies is restricted only by their impenetrability, is, Leibniz thinks, perfectly possible. '[A] world in which matter at rest would obey the moving body without any resistance' (L 516–17) is, he said to de Volder in 1699, perfectly imaginable. Indeed, in the abstract part of his early 'New physical hypothesis' he had tried to work out what its laws of motion would be.[68] But he came to see that such a world would be chaotic. If it were 'no more difficult to move a large body than a small one…there would be action without reaction…no estimation of power would be possible…everything could be accomplished by anything' (L 440). So we have to realise not only that a stationary body is impenetrable by another, but also that it 'forms an obstacle to it, and it is endowed at the same time with a certain laziness, so to speak, that is, repugnance to motion, and does not indeed suffer itself to be set in motion unless by the somewhat broken force of the active body' (La 673).[69] We must recognise that a material body 'resists motion by a certain *natural inertia*', which needs to be overcome by, and at some cost to, another body which gets it to move. Matter 'is not indifferent to motion and rest, as is generally supposed, but needs, in order to move, an active force proportional to its size' (trans. Russell 1937:230–1).[70] Somewhat misleadingly, Leibniz sometimes refers to this 'repugnance to motion' as 'resistance', a term which, we observed in the last chapter, he also uses for impenetrability. It is clear, however, that there are, as he says, 'two resistances' (La 701), *impenetrability* and *inertia*.

Just as Leibniz was at pains to distance himself from Descartes and to lay much stress on the point that a body's being impenetrable cannot follow from its merely being extended, so he carefully did the same with inertia.[71] By contrast, Descartes's published pronouncements about the nature of body fail even to mention either impenetrability or inertia, and when he does discuss these matters, his reasoning as to how these properties do follow from extension alone is less than persuasive. But it would be a parody of Descartes to suppose, as is sometimes done, that he has no recognition of them.

Though they accord it differing degrees of importance, and though they disagree about how it relates to extension, Leibniz

and Descartes mean the same by 'impenetrability'. But, besides being considerably more prominent than it, Leibniz's 'inertia' does not fit squarely with Descartes's. An initial puzzle about how they relate is that, apparently failing to notice that Descartes explicitly *distinguishes* his 'natural inertia' from Kepler's, Leibniz says that 'following Kepler's example' Descartes 'has acknowledged that there is inertia in matter' (L 516), and that he is doing the same.[72]

One difference between the two is that Descartes's 'natural inertia' relates only to the force of rest. For Leibniz, however, it has effect in moving bodies too. 'Since matter in itself therefore resists motion by a general passive force of resistance but is set in motion by a special force of action, or entelechy, it follows that inertia also constantly resists the entelechy or motive force during its motion' (L517).

As we have seen in the previous chapter, matter as characterised by the 'passive', 'resisting' elements of impenetrability and inertia is simply an incomplete abstraction, primary matter. Secondary matter, the matter of human bodies, watches, and marble tiles, the matter with which physics deals, has another force too, an active force, correlative with the 'resisting', 'passive' force. Over the years this 'active force' of motion takes different names: 'motive force', 'moving force', or 'motor force' (*vis matrix,* L 297, 503; *force mouvante, L* 418); 'livingforce' (v*is viva, L 4*38; *force vive,* La 660); 'absolute force' *(force absolue,* L 639, La 659); 'absolute living force' (*force vive absolue,* L 660); 'active force' (*vis activa,* L 436, La 701); 'power' (*virtus,* L 436; *potentia,* La 701).[73]

Though, as we have noted, Leibniz's derivative active force of motion is far more deeply rooted in his metaphysics of extended substance than is Descartes's force of motion, there are basic parallels between them. Like Descartes's force, Leibniz's can cause, increase, and sustain motion—this third characteristic making it different from Newtonian accelerating force and akin to the medieval impetus. It is 'the force by which bodies actually act and are acted upon by each other…[it is] that force which is connected with motion…and which in turn tends to produce further…motion' (L 437). Moreover besides getting redistributed during collisions, Leibnizian force is further like its Cartesian predecessor in being conserved as a constant amount in the universe as a whole. '[I]t is reasonable that the same sum of *motive force* should be conserved in nature and not be diminished—since we never see force lost by one body without being transferred to another—or augmented' (L 296).[74]

Although, in the role it plays, derived active force is the appearance on the Leibnizian stage of Descartes's force of motion, it appears there significantly metamorphosed. There is a *hint* of this when, in the very act of applauding Descartes's thought that since God is supremely constant and unchangeable the created world will contain a constant amount of 'force', Leibniz points out that that leaves it open *what exactly the dimensions of this 'force' are and how it is to be measured*.[75] This is just a hint; for there is hardly anything more prominent in Leibniz's writings than the repeated insistence that Descartes is completely wrong to measure the motive force of a body by its 'quantity of motion'. The claim first appears in 'A brief demonstration of an error of Descartes', a short but very important article which he published in 1686. The error, which is attributed not merely to Descartes but also to 'a number of mathematicians', is of supposing that 'the force of motion [should be estimated] by the quantity of motion or by the product of the body and its velocity'. In a word, Descartes's error was his identification of a body's 'force of motion' with its 'quantity of motion' (L 296).

Leibniz begins his 'brief demonstration' of this by making two assumptions, both of which, he says, will be admitted by 'Cartesians as well as other philosophers and mathematicians of our times' (L 296). First, a body acquires in falling exactly the amount of motive force which would be required to take it (by rolling up a slope, for example) back to its original height. Second, the force required to take a body of one pound to a height of four yards is the same as that required to take one of four pounds to a height of one yard. It follows that in falling from a height of four yards a body of one pound will acquire the same force as a body of four pounds in falling one yard. The question now is: do two such bodies, after their respective descents, have the same quantity of Cartesian motion as each other? Results obtained by Galileo some years earlier, in experiments on bodies rolling down slopes, show that they do not. According to Galileo the velocity acquired by the first body in its fall of four yards will be twice that acquired by the second in its fall of one yard; and from this it follows that the quantity of motion of the second body will (since it is one-quarter the size of the second) be *half that* of the first. Yet their forces have been agreed to be the same. It follows that force of motion cannot be the same as quantity of Cartesian motion, and that Descartes was in error to have supposed that it was. So,

contrary to what 'may seem plausible at first view and has in fact usually been held' (L 298), Leibniz concludes that the motive force of a moving body is not to be measured by its speed but by the effect which its speed can produce, in terms of the vertical height to which it could take the body up an inclined plane.[76]

Though he does not do so in this article, Leibniz could have worked out from Galileo's results that this height is in fact proportional to the square of the speed. He is *in effect,* therefore, putting against the Cartesian error of taking the motive force of a body to be directly proportional to its speed the claim that it is in fact proportional to the square of its speed. This upshot was not lost on Huygens, who noted it when he read Leibniz's article. Repeating Leibniz's conclusion that motive forces 'are in a ratio composed not of bodies and speeds as such, but of bodies and heights which produce speed' he adds, 'that is to say, [of bodies] and square of speeds' (Huygens 1686:164). At any rate by the early 1690s[77] Leibniz had realised this himself, and, by 1695, it is quite clearly his preferred way of understanding motive force: 'we can conclude…that the forces of bodies in general are proportional, compositely, to their simple masses and the squares of their velocities' (L 443). It was for motive force specifically as understood in this way that Leibniz came to use the term *vis viva* or 'living force'.[78]

Huygens was in a good position immediately to realise that Leibniz's 'Brief demonstration' was *in effect* claiming that motive force is proportional to the square of speed, because (as we saw at the beginning of this section) he had already discovered that the sums of the quantities got by multiplying the sizes of two colliding bodies by the square of their speeds are always the same after a collision as before. But what to Huygens was just a numerical constant was for Leibniz a central feature of his dynamics and a vital link between it and his metaphysics of material substance.

Leibniz's criticism of 'quantity of motion' as a measure of 'motive force' precipitated the so-called *'vis viva* controversy', which lasted till well into the next century.[79] Descartes's followers came to his defence and insisted that, Leibniz's argument notwithstanding, 'quantity of motion' was an adequate measure of force. It was possible, for example, to accept Leibniz's basic idea of measuring force by the effect it could produce in expending itself, and yet reject his identification of that effect. Why take the effect to be the vertical height to which a moving body could raise itself

in expending its motion? Why not, as the Cartesian Abbé Catalan preferred, take the effect to be the time it takes for the motion to be expended in reaching that height (or, equivalently, in falling from it)? If one did this, then it should be expected that the fourpound body, as in the 'Brief demonstration', has twice as much Cartesian motion as the one-pound body (for all bodies fall at the same rate and take twice as long to fall four yards as to fall one.)[80]

Besides measuring a moving body's force by its 'quantity of motion' Descartes supposed that the total 'quantity of motion', both in any collision and in the world as a whole, was a constant. Huygens (who had shown Leibniz that these suppositions are false) is quite mistaken that this is what Leibniz had in mind in 1686 as the 'fundamental error of Descartes';[81] Leibniz was nevertheless convinced by that time that the doctrine of conservation of motion was yet another Cartesian error. Writing in 1680 he says to a correspondent that it is 'acknowledged by the ablest people in France and England' that Descartes's rules of motion are mostly false, as is 'his great principle, that the same quantity of motion is conserved in the world' (quoted Dugas 1958:647).[82] One person in France Leibniz did *not* have in mind was Nicolas Malebranche. The last chapter of the first four editions (1674–5, 1676, 1678, 1688) of his *Search after Truth* do contain criticisms of some of Descartes's rules, criticisms which are based on Malebranche's rejection of Descartes's force of rest. But they do not question the principle of conservation of motion. In an article published in February 1687[83] (in reply to one by the Abbé Catalan, which criticised his 'Brief demonstration') Leibniz took the opportunity to criticise the rules which Malebranche had substituted for Descartes's. They were really no better, he thought, and violated the principle of continuity (as at the end of the first section of this chapter) no less than those they replaced. Leibniz also urged Malebranche to acknowledge that Cartesian motion is *not* conserved, and that, as in the 'Brief demonstration', force is to be measured, not in proportion to speed, as by Descartes, but in proportion to the square of speed.

Yet another point which Leibniz urges on Malebranche in this reply to Catalan is that though Cartesian motion is not conserved, what he calls 'directed motion' is. Cartesian motion, as discussed at some length in the first section of this chapter, is a function of scalar speed. 'Directed motion', as its name implies, is a function of vector velocity. Now one thing which the notion of 'directed

motion' makes manifest is Leibniz's thought that not only is Cartesian motion unsatisfactory as measure of force, but also (conserved or not) it is not an interesting or important quantity, because of its marginalisation of direction as a feature of a body's motion. In his 'Critical thoughts on the general part of the Principles of Descartes' he argues that the proposition that 'motion perseveres as a simple state until it is destroyed by an external cause' (L 397) holds not only for scalar speed but for 'determination' or vector direction too. Ceasing to treat changes of direction in the Cartesian manner as, in Westfall's words, 'changes that are not changes, changes that involve no act' (67) would involve their being covered (as in Newton's corollary to his third law) by a conservation principle; and that there is indeed such a principle is what Leibniz urges on Malebranche.

The conservation in collisions of what Leibniz called 'directive force' (L 639) or 'quantity of progress' (La 658) and what we now call 'momentum' is something which Huygens had revealed in the late 1660s (see the beginning of the third section of this chapter), and which is implicit in Newton's early thought.[84] It seems to have entered Leibniz's thought in the 1680s (as in the 1687 correspondence with Arnauld[85] and the reply to Catalan). Perhaps referring to its importance, rather than to its existence as such, he sometimes says that he discovered it.[86]

Malebranche's reply, two months later, to Leibniz's response to Catalan acknowledged neither the importance of the law of continuity on which Leibniz laid so much stress nor the inadequacies of Cartesian motion as a measure of force, or as a conserved quantity. 'I believe it true that God conserves the same amount of motion in the world.'[87] But five years later, in a short book called *Laws concerning the Communication of Motion* (1692), he confessed that in the *Search after Truth* he had not realised that this Cartesian principle was either false or ambiguous. It is false if it is taken as Descartes meant it, as having to do with 'absolute motion', i.e. the product of size and scalar speed, but it is true if taken as having to do with 'relative motion', i.e. the product of size and a vectorially directed velocity.[88]

But this confession does not constitute a radical abandonment of Cartesianism. Malebranche simply ignores the Leibnizian quantity which is proportional to the square of speed; and he certainly does not enter into any discussion about it as a measure of force. Indeed he quite casually refers to both 'absolute motion'

(Cartesian motion) and 'relative motion' (directed motion, momentum) as 'force'.

Referring to these changes of mind, Leibniz says that when Malebranche did eventually come to reject the principle of conservation of Cartesian or 'absolute' motion, he went too far and did not recognise the conservation of anything absolute.

> The opinion that the same quantity of motion is preserved and abides in the concourse of bodies has reigned for a long time, and passed as an incontestable axiom among modern philosophers…. We begin now to be disabused of this opinion, especially since it has been abandoned by some of its most ancient, most skilful and most eminent defenders and above all by the author himself of the 'Search after Truth'. But in this case an inconvenience has arisen, namely that we have been thrown too far into the other extreme, and do not recognize the conservation of anything absolute which might hold the place of the quantity of motion. But our mind looks for this, and it is for this reason that I remark that philosophers who do not enter into the profound discussions of mathematicians have difficulty in abandoning an axiom such as this of the quantity of conserved motion without giving themselves another to which they may hold. (La 657–8)[89]

This criticism of Malebranche is worth considering.

By the latter half of the 1680s Leibniz's mechanical world picture had firmly at its centre what he describes to Arnauld as 'the two great laws of nature, the law of force and the law of direction' (*LA* 118). These, we may remind ourselves, are Leibniz's replacement for Descartes's mistaken ideas about conservation of 'quantity of motion'. Though Malebranche never came to recognise the first of them, he does acknowledge the second. Moreover, though the first is, as we have seen, deeply rooted in his metaphysics of corporeal substance, Leibniz describes the second as being 'as good and as general as the other, [and] deserved as little to be broken' (Lt 328–9). At first sight, then, it might seem that there is some unfairness in Leibniz's suggestion that Malebranche 'did not recognize the conservation of anything absolute which might hold the place of the quantity of motion'—for in accepting the 'law of direction' he is recognising the conservation of

momentum. The basis of Leibniz's criticism, however, is that his 'active force', his *vis viva,* is an *absolute* quantity (as befits its deep roots in his metaphysics), whereas directed motion or momentum (or, as in the next quotation, 'progress') is, as Malebranche's reference to it as 'relative force' itself indicates, merely a *relative* quantity. It is not simply that Malebranche fails to recognise any conserved force-like thing; it is that he fails to recognise any *absolute* conserved force-like thing.

This elevation of one of the 'two great laws of nature' over the other as being concerned with an absolute comes out clearly in Leibniz's explanation of his criticism of Malebranche.

> I call *progress* the quantity of motion with which a body proceeds in a certain direction, so that if the body went in a contrary direction, this progress would be a negative quantity. Now if two…bodies are concurrent…we must take the sum of the progress of each for the total progress…. But if one of the bodies proceeded from a contrary direction, its progress in the direction in question would be negative and consequently must be subtracted…in order to have the total progress…. Now it will be found that the total progress is conserved, or that there is as much progress in the same direction before or after the impact. But it is also plain that this conservation does not correspond to that which is demanded of something absolute. For it may happen that the velocity, quantity of motion, and force of bodies being very considerable, their progress is null. This occurs when the two opposed bodies have their quantities of motion equal. In such a case, according to the sense we have just given, there is no total progress at all.
>
> (La 658)

As it is important to be clear about this, it is perhaps worth spelling out why and in what way, despite its being conserved in a system of bodies, 'directed motion', momentum, or 'progress' is not 'absolute'. It is because change in a system's 'total progress' is not necessarily produced by a change in the size or speed of the bodies in it. What is required is a change in their size or speed *relative to each other*. Thus, as in Leibniz's example, the total progress in a system of two bodies of equal size and equal and opposite speed is unchanged from zero by a change in the bodies'

size and speed when they are changed equally. Similarly, a *decrease* in size or speed of *one* of the bodies would produce an *increase,* from zero, in the total momentum in the system.

In this sense in which momentum is a relative quantity, Cartesian motion is an absolute. For the total amount of it in a system of two bodies of equal size and equal and opposite speed is not zero, and it would be doubled by a doubling in size or speed in each body. Similarly, a decrease in size or speed in *one* of the equal bodies would produce a decrease in the total quantity of Cartesian motion.

As for *vis viva,* it is an absolute quantity in the sense that Cartesian motion is, not a relative one in the sense that momentum is. The total *vis viva* in a system of bodies is increased or decreased by *any* increase or decrease in the speeds or sizes of the bodies in the system. It depends on their sizes and speeds as such, and not on their relative sizes and speeds. The total amount of *vis viva* in a system of two bodies of equal size and equal and opposite speed is not zero and would be doubled by a doubling in size of each body (quadrupled by a doubling in speed of each). Similarly, a decrease in size or speed of one of the equal bodies would produce a decrease in the total amount of *vis viva.*

Cartesian motion and *vis viva* are, then, both 'absolute' quantities; momentum is merely 'relative'. On the other hand, *vis viva* and momentum are conserved in collisions and their sum total in a closed system of bodies is a constant; Cartesian motion is not. It is for this reason that of 'the two great laws of nature' with which Leibniz replaces what he calls Descartes's 'great principle, that the same quantity of motion is conserved' (quoted Dugas 1958:647) the law of conservation of *vis viva* has precedence over the law of conservation of directed motion. Even if it is not conserved in collisions, the Cartesian force of motion was at least an 'absolute'. In 'correcting and rectifying', as he puts it, the Cartesian 'doctrine of the conservation of the Quantity of Motion', Leibniz took care to put in its place 'the conservation of some other absolute thing' (La 658).[90]

NOTES

1 CSM 1.92–8, PP 2.36–42.
2 For Descartes's influence on Newton see Gabbey 1971: sects 2–4, Harman: 11–17.
3 See *PP* 2.37, Westfall: 4.

4 AT 5.504/Westfall: 69.
5 For the proof of the rectilinearity of motion from God's immutability compare *World,* chap. 7 (CSM 1.96–7) with *PP* 2.39; see also Spinoza's account of the proof (C 277–8) and the discussion by Machamer 1976:189–90.
6 Barbour: 429–30 has an interesting discussion of these differences.
7 Newton: 1.
8 And, as a direct consequence, he never has the classical Newtonian conception of momentum. Though see Westfall's discussion (91 nn. 23–4) of Sabra's interpretation (Sabra: 116–21), according to which Descartes's 'determination' is not simply the direction of movement (or, similarly, the direction in which the force of a 'quantity of motion' happens to be acting), but is rather the directed force or directed quantity of motion itself, i.e. momentum.
9 Feather: 90–2.
10 Barbour: 505f., Gabbey 1971:33ff., Harman: 13–14.
11 See also *Phys* 243a12–17.
12 See Barbour: 197–8, 366, 393, Clagett: 505ff.
13 *Phys215a14.*
14 Clagett: 508.
15 For a discussion of the impetus theory see Clagett: 521ff.
16 Buridan also said that the amount of impetus was equal to the speed times the size of the moved body.
17 Barbour: 432, Lecrivain: 40; though cf. Westfall: 63. As Westfall: 529–34 shows, the word 'force' is used by Descartes in a variety of ways.
18 When Barbour speaks of Descartes's 'striking modernity', he has in mind a passage in *The World* where the first law of motion is said to free us from 'the difficulty in which the Schoolmen find themselves when they wish to explain why a stone continues to move for some time after leaving the hand of the one who threw it. For we should ask, instead, why does the stone not continue to move forever' (CSM 1.95). He takes this last sentence to be a ringing announcement of the 'modern' idea that force is something which *changes,* rather than *sustains* motion, and which therefore pertains to accelerated, rather than uniform, motion. But it is clear from the context that the 'schoolmen' are those who, rather than supposing that air slows projectiles down, suppose that it moves them on. In this passage Descartes is rejecting not the impetus theory but the theory of antiperistasis.
19 See also Spinoza on Descartes (C 282, 286). As against all of this it might be pointed out that at *PP* 2.25, 27 he talks *of force* as being in the mover and not the moved and also as what *produces* or *stops* motion.
20 Newton: 1. For the emergence and the development of the concept of mass see Jammer 1961, Westfall: 181–4, 255, 346, 448ff.
21 For a discussion see Dugas 1958:341, Westfall: 448–9.
22 See Clarke 1982:213f., and MM 152 nn. 120, 121.
23 See Gabbey 1971:52f., which also explains that Newton too would not have described his equivalent first law as being a principle of 'inertia'.
24 See Barbour: 328.

25 Writing to Mersenne Descartes rejects 'any inertia or natural laziness in bodies' (trans. Gabbey 1971:53).
26 In later editions of the *Principia* Newton comes to think of 'mass' purely in terms of 'inertia', and not at all in those of 'quantity of matter' (see Koslow: 243, Westfall: 448f.).
27 *PP* 2.40.
28 See also 53, and discussion in Clarke 1982:216–17.
29 *PP* 2.43–4.
30 As with moving force, this again is true only in idealised conditions. In the actual world it too depends partly on surface area (see letter to Debeaune, AT 2.543–4/Dugas 1958:155–6). Also it depends on a body's hardness or softness (*PP* 2.40, CSM 1.95).
31 CSM 1.95.
32 Clarke 1982:218–19, Gabbey 1971:25. Anderson:217 takes Descartes's 'force of rest' to be directly proportional to the speed with which a stationary body is hit. This accords with Descartes's statement that 'a body which is at rest puts up more resistance to high speed than to low speed; and this resistance increases in proportion to the difference in the speeds' (*PP* 2.49/MM 66), and with his statement to Clerselier in 1645 that, considerations of size aside, a body 'which is at rest has as many degrees of resistance as…[an]other one, which moves it, has degrees of speed' (AT 4.183/Clarke 1982:224).
33 AT 2.627/Clarke 1982:222–3.
34 1982:24–5.
35 But some words at the end of the second-edition version *of PP* 2.49 support a different amendment, this time to the effect that the force of motion which needs, for any transfer to take place, to be larger than the force of rest is not so much the force that a moving body has as it approaches a stationary body, but rather the force *it would have left* after overcoming the force of rest of the stationary body. Descartes explains that a stationary body C would not begin to move when hit by a body B half its size, because 'each half of C has as much force to remain at rest as B has to drive it' (*PP* 2.49/MM 66); and this is true if B's force is the one it *would* have left if it did carry C along with it. For this reading see Gabbey 1971:26–7, 30. It involves going back to the beginning and calculating the 'strength' of a moving body in terms not of pre-collision but of post-collision speeds.
36 A way of avoiding this difference would be for the 'resistance' of a moving body to be set equal to the difference between its pre- and post-collision forces of motion.
37 See Westfall: 82.
38 La 685.
39 See Westfall: 83.
40 See chapter 5 above for the difference between 'hardness' and 'impenetrability' or 'solidity'.
41 An associated fact is that what Descartes says of soft bodies always fits the special case where they are perfectly inelastic.
42 Another reason is that since (as below) elastic bodies decelerate in and then accelerate out during a collision, there is in fact a moment when

they are stationary, and the law of conservation of motion would be contravened. Leibniz relocates this 'lost' motion in the parts of the elastic bodies, which he insists all bodies are (L 349–50, La 669; for discussion see Westfall: 295).

43 See Westfall: 92 n. 30. For some post-Cartesian attempts to take elasticity into account see Dugas 1955:173.

44 L 351–2, 397, 446, La 668–9.

45 L 112, 397, 447, 454, 699. This inevitably means that Leibniz rejects the perfectly hard indivisible particles of classical atomism. In chapter 3 we saw metaphysical reasons for this. One support from the point of view of physics is the idea that a material body needs rearrangeable parts to be flexible; another is that infinite divisibility is required by his law of continuity.

46 See also L 446.

47 L 397–403; see also Westfall: 290–1.

48 *Ep* 59, 60.

49 See Lachterman and Lecrivain for a fuller discussion.

50 As Pollock: 110 suggests.

51 Hampshire: 71, Pollock: 113; see also Wolf 1972:22–3.

52 See his note to *PP* 2.22 (C 282). Though he does talk of a 'force of determination' (C 286, 292) this is not momentum, but simply takes into account what Descartes said needs to be taken account of in non-co-linear collision. (Though see Lachterman: 110 n. 86 on Spinoza's *Descartes' Principles* 2.27, 36 and n. 9 above (on Sabra).)

53 C 131, 280.

54 *Ep* 32, El 1.57.

55 *E* 2P13L3C.

56 C 278.

57 C 282, 314.

58 The sixth rule concerns collisions between two equal bodies, one of which is stationary. According to Descartes, the moving body will impart a quarter of its original speed to the other, and itself spring back with three-quarters. In fact, and according to Huygens (see below), the moving body will halt, giving the whole of its speed to the other, which it projects forwards. Why Spinoza thinks this is wrong is not clear.

Spinoza's disagreement with the sixth rule did not come out in his exposition of Descartes. The differences in Spinoza's account of these rules are discussed by Lecrivain: 52–5. After seeing him in Holland in 1676 Leibniz wrote, 'Spinoza was not clear about the defects of Descartes' laws of motion. He was surprised when I began to show him they were inconsistent with the equality of cause and effect' (quoted Foucher de Careil: Ixiv).

59 For accounts of Huygens see Dugas 1958:280ff., Westfall: 147ff.

60 For example, and despite Descartes's fourth rule (*PP* 2.49), a body of one-unit size moving with velocity 3 which hits a stationary body twice its size will rebound from it with velocity 1 and move it with velocity 2. It therefore loses two units of Cartesian motion while the other has gained four.

61 The speed of the centre of gravity of a pair of bodies can be found by

dividing the sum (or difference if the bodies are moving in different directions) of the product of the speed and size of each body by the sum of their sizes. The direction is that of the body with the larger speed/size product.

62 The outcome of this collision is also determined by what Huygens also showed, that, after a hard collision, the speed of separation of two bodies is the same as that of their initial approach—six units in the above example. (See La 658.)

63 See Westfall: 156.

64 L 395, La 702.

65 L 395, 503.

66 L 395–6. As seen earlier in this chapter, Descartes does in fact offer proof. For Leibniz's own proof see La 689.

67 L 397.

68 See Westfall: 317.

69 See also L 111, 503, 517, La 678, *NE* 344.

70 Loemker's translation ('not indifferent to rest and motion…but strives towards motion with an active force proportional to its magnitude', L 503) misleadingly diverges from Russell's and from Westfall's ('not…indifferent to motion or rest, but requires more force to be moved in proportion to its quantity', Westfall: 318) which are to be preferred, ('ita ut non sit indifferens ad motum et quietem…sed ad motum pro magnitudine sua vi tanto majore activa indigeat' (G 4.510).)

71 L 503, 516.

72 See also L 503, T30, 380. For Kepler's 'inertia' see Barbour: 328. One view (as in Cohen) might be that Leibniz fails to see that Descartes's 'inertia' is any different from Kepler's (and that his own is simply Kepler's). Another (as in Bernstein) is that Leibniz is clear about the difference.

73 Not only does Leibniz use different terms for the same concepts in his dynamics, but he also he uses similar terms for different, though related, concepts. Thus active force must be distinguished from 'moving action' *(actio matrix,* La 667) or 'action' *(actio.* La 702), which is a function of active force and time (see Westfall:293ff.).

74 See also La 659, 702, *DM* 17.

75 L 393–4.

76 With variations, the 'demonstration' gets repeated over the years—*Discourse on Metaphysics* (1686), sect. 17, 'Essay on dynamics' (1691), La 660, 'Critical thoughts on the Principles of Descartes' (1692), L 394–5, 'Specimen Dynamicum' (1695), L 442.

In later presentations of the argument Leibniz adds that the mistaken identification of 'force' with the Cartesian 'quantity of motion' involves the absurd possibility of a perpetual motion machine, or of 'an effect greater than its cause' (L 395, 443, La 661).

Though unwavering that 'force' is not to be measured by 'quantity of motion', Leibniz also later points out that in statics the two sometimes have the same numerical value. He suggests that these cases were instrumental in bringing about Descartes's error (La 659; for discussion see Papineau:146–7).

77 La 666–87, L 395.

78 Iltis: 25 says that the term 'living force' *(force vive)* was first used in 'Essay on dynamics' of about 1691 (La 660) and first published *(ins viva)* in 'Specimen Dynamicum' of 1695 (L 438).
79 See Papineau: passim (and 141 n. 10) for references to further discussions.
80 For the controversy with Catalan see Aiton: 129–31, Costabel: 41–7, Papineau: 145–8.
81 Huygens 1686:163; see also Westfall: 287.
82 See also L 279 of 1682–4.
83 G 3.42–9; see Aiton: 130.
84 Barbour: 505.
85 *LA* 117.
86 Lt 327, GM 3.243.
87 Malebranche 1958–72:17(1).45–6.
88 Malebranche 1958–72:17(1).55, 73. The rules of motion of the first four editions of *Search* are omitted from the fifth (the first to bear Malebranche's name), which includes the material of the *Laws concerning the Communication of Motion*.
89 See also AG 255.
90 *Vis viva* is in fact conserved only in perfectly elastic collisions. (Two equal but opposite non-elastic bodies will bring each other to a standstill.) For Leibniz this loss was merely apparent, and he explained it in terms of its absorption by the moving particles of the colliding bodies (La 668–70, L 713). (Later explanations would be in terms of the transformation of kinetic into heat and sound energy.) Newton, on the other hand, was prepared to accept a 'decay' of motion which required a constant Divine topping-up (Jammer 1957:168, Koyré 1957:215f., Westfall 390). Leibniz refers to Newton's 'very odd opinion' that God needs 'to wind up his watch from time to time' (L 675).

7

Causation, Occasionalism and Force

For the 'mechanical philosophy' the basic model of efficient causation was impact between moving bodies. Chapters 5 and 6 have discussed various accounts of the metaphysics and physics of impact. A recurring theme has been the distinction between motion considered kinematically, purely in terms of bodily transfer, and motion considered dynamically, that is, in pre-Newtonian terms, in terms of an underlying force which sustains motion. The distinction raises the question of the metaphysical status of this force and of its 'transfer' in collisions from one body to another; and this is the concern of the present chapter.

Descartes (as seen in chapter 5) speaks of the 'transfer of motion' (*PP* 2.42) from one body in a collision to another. Henry More asked how this could be. According to Descartes, motion is a 'mode'—indeed a paradigm example of one[1]—and More, quite rightly, 'cannot conceive how something that cannot be outside the subject, as all modes are, passes nevertheless into another subject' (AT 5.382/Anderson: 218).

Descartes's reply in effect rests on the distinction, which he makes at *Principles* 2.25, between motion as kinematical bodily transfer, and motion as a dynamical force which brings about that transfer. As mere kinematical transference, motion is indeed a mode, and cannot 'pass' or 'transmigrate' from one body to another. But in talking about motion passing or transferring from body to body he means, Descartes explains, 'the force which impels its [matter's] parts' (K 258).

It is possible, however, to suppose that More was actually clear about all of *that,* clear that motion as bodily transfer is a mode which cannot be passed on. Perhaps his puzzle concerned what

Descartes takes for granted in his reply: that motion *as a* '*force*' *can* be passed on. The difference between the question which Descartes answers and the further one which may have been More's real worry was brought out very clearly by John Toland some fifty years later. If the distinction between motion as transfer and motion as force which underlies and sustains that transfer is not clearly made then, Toland says, problems might arise about what kind of thing motion is and how it can be communicated from one body to another. But even those who are clear about that

> are yet extremely puzzl'd about the *moving Force* it self, what sort of Being it is; where it resides, in Matter or without it; by what means it can move Matter; how it passes from one body to another; or is divided between many Bodys while others are at rest, and a thousand more such Riddles.

As a result of these further difficulties, Toland says, people have been

> forc'd at last to have recourse to God, and to maintain that as he communicated Motion to Matter at the beginning, so he still begets and continues it whenever, and as long as there's occasion for it, and that he actually concurs to every Motion in the Universe.
>
> (Toland: 156–7)

On the whole, Descartes himself does not seem puzzled about these things—about 'the moving force itself, about 'where it resides, in matter or outside of it', about 'how it passes from one body to another'. He seems (see chapter 5) content to think that it 'resides in matter', and he is able quite unselfconsciously to speak of it as being 'mutually transferred when collisions occur' (*PP* 2.42). But his writings can suggest a less than full commitment to the idea that the movement of bodies is due to their possession of a sustaining 'moving force'.

It is quite beyond doubt that, for Descartes, any moving body will have a 'quantity of motion': any moving body has size and speed, and a numerical quantity can be got by multiplying them together. But there has been doubt whether for Descartes this is a measure *of a force possessed by a body in its motion*. Leibniz (as we saw in chapter 6) implied that Descartes failed to recognise any dynamical force underlying the kinematics of motion; Huygens, in

a comment on Leibniz's 'Brief demonstration', doubted that Descartes identified 'quantity of motion' with 'moving force';[2] and Malebranche said that 'this great man' held that 'the natural motor force of all bodies is none other than the general will of the Author of nature, and that…the communication of the motion of bodies at their collision can come only from this same will' (1674–5:524). More recently, Koyré has said that 'Descartes did not believe in endowing bodies with powers' (1965:70), and Jammer has said that in Descartes there is 'the rejection of the existence of force altogether'. Descartes, Jammer says, 'eventually conceived "force" as merely a fictitious appearance' (1957:103); and, taking Descartes's talk of 'forces' as a *mere façon de parler,* he understands his 'force of motion', not as something which 'sustains' a body in its motion, but simply as a name for the numerical product of size and speed. On this view of it, Cartesian mechanics would be a pure kinematics, an account of the visible phenomena of collisions, not underpinned by any dynamical entity, such as 'force', which explains and brings the phenomena about.[3]

An explanation Descartes gives of the 'power' that moving bodies have to act on each other does lend itself to being read in these terms. 'Power' consists, he says, 'simply in the fact' (*PP* 2.43) that bodies obey the law of nature about their remaining in motion or at rest. This gives the impression that bodies possess no force which causes them to act according to certain laws. A letter to Mersenne gives this impression too. Here there is no suggestion that a body's motion continues because of some sustaining force or power it possesses; it continues simply because it is absurd that anything which has an 'entirely perfect and unchangeable… God for its author, should have in itself the principle of its destruction' (K 136).

It is certainly true that Descartes's metaphysics of corporeal substance does not firmly commit him to the idea that moving bodies are themselves possessed of any motive force. Force does not for him have the central place it does for Leibniz. But it goes too far to say that Descartes sometimes conceives of force 'as merely a fictional appearance' and that he 'abolished the notion of force altogether' (Jammer 1957:103). Having clearly distinguished between motion as the 'transfer' or spatial redistribution of bodies, and motion as a 'force or action which brings about the transfer', he never denies the actuality of motion in the second sense.[4] If he ever does think that moving bodies have no such force themselves, it is not because he is denying force altogether but because he is locating it in God.[5]

The clearest case of this is in his reply to More's question about the transfer of motion. Of 'the force which impels' (K 258), the 'power causing motion' (K 257), Descartes says that it

> may be the power of God Himself conserving the same amount of translation in matter as He put in it in the first moment of creation; or it may be the power of a created substance, like our soul, or of any other thing to which He gave the power to move a body.
>
> (K 257)

It has been supposed that the 'other things' which have the power to move bodies are simply other bodies; and it has been supposed they are disembodied minds such as angels.[6] But, in either case, Descartes is raising the possibility that (our voluntary movements aside) the force involved in the movement of bodies is located in God. Descartes explains to More that he has not discussed this possibility in his writings lest he seem 'inclined to favour the view of those who consider God as a world-soul united to matter' (K 257).

The idea that Descartes locates the force or power of motion in God, and not in moving bodies themselves, can also be obtained from his view that God not only 'in the beginning…created matter, along with its motion and rest' but also 'now, merely by his regular concurrence…preserves the same amount of motion and rest in the material universe as he put there in the beginning' (*PP* 2.36). Descartes is hardly explicit about the method by which God sees to this preservation of the same amount of motion, but what he says elsewhere, about there being a merely conceptual distinction between preservation and creation, suggests one. He says that 'the same power and action are needed to preserve anything at each individual moment of its duration as would be required to create that thing anew if it were not yet in existence' (CSM 2.33).[7] So a persisting body is a continuously created one, and, if it is moving, God will have to recreate it in different places. Perhaps, then, motion just *is* the recreation of bodies at different times in different places, and the force or power of motion is the power of God to recreate them in those places. On this view, which later quite clearly was Malebranche's, 'the moving force of a body [would be]…simply the efficacy of the volition of God who conserves it differently in different places' (Malebranche 1688:159).[8]

Hume's reading of Descartes is most judicious: 'Descartes insinuated that doctrine of the universal and sole efficacy of the Deity, without insisting on it' (sect. 57).[9] Moreover, not long after Descartes, some people, as we can see from Toland's report, did 'have recourse to God, and…maintain[ed] that…he actually concurs to every Motion' (156). There were, as Hume says, people who 'made…[this] the foundation of all their philosophy' (sect. 57).

Hume is referring to 'Malebranche and other Cartesians', who developed the doctrine of occasionalism.[10] According to this (see chapter 4) there is no real, 'natural', or 'primary' causation in the created world. God is the only real and efficacious cause. What are commonly picked out as causes in the world are only 'secondary'; they are merely the 'occasions' for *God* to produce what are only loosely speaking *their* effects. Occasionalism was applied comprehensively: its application to the relation between minds and bodies, or to states of the same mind, will be discussed in chapter 9. The focus here is its application to the causation involved in the motion of bodies.

The contexts of these three applications all have to do with the question of the force or power involved in activity and change. Discussion of any one, such as, as in this chapter, the question of the force or power which produces or sustains the motion of bodies, took place against the background of a commonly received idea that immaterial minds are active, while material bodies are passive. Minds have a power of self-movement and are able to initiate change and motion, both in themselves and in bodies: bodies lack self-movement and can merely receive motion (either from a mind or another body) which they then retain, or communicate to another body. The contrast can be brought out from Descartes. There are passages where he says he conceives of minds as 'powers or forces' (K 239), and where he speaks of the soul's 'power to move the body' (K 138);[11] and there are passages where he says that part of his pre-theoretical idea of body is of something which, though it lacks 'the power of self-movement', can nevertheless 'be moved in various ways, not by itself but by whatever else comes into contact with it' (CSM 2.17). The contrast is explicit in Henry More, who says in the same passage both that minds have the 'powers' of 'self-motion' and of 'moving… matter', while matter is not 'self-moveable';[12] and it is clear in an early letter of Leibniz: 'mind supplies motion to matter…. Matter in itself is devoid of motion…as Aristotle rightly saw' (L 199). It could not be

sharper than when Locke contrasts the 'active' power of minds voluntarily to initiate motion in bodies with the 'passive' power of bodies to be moved or, if already moving, to pass motion on: 'as Body cannot but communicate its Motion by impulse, to another Body, which it meets with at rest; so the Mind can put Bodies into Motion…as it pleases' (1690:II.xxi.2, xxiii.18).[13]

As Leibniz says, this distinction between active, animated (literally, 'having a mind') things which, through will and desire, can initiate motion in themselves and in bodies and passive things which can only be moved goes back to Aristotle.[14] Its conventional acceptance in the seventeenth century makes it fertile ground for the development of occasionalism. If bodies are already understood as lacking a power of initiating movement, which minds possess, it is a relatively short step to the conclusion that *all* power and activity is located in a single mind, the infinite mind of God.

An early expression of this occasionalist conclusion is in Louis de La Forge's *Traité de l'esprit de l'homme…suivant les principes de René Descartes* (1666).[15] La Forge's primary concern was the question (to be discussed in chapter 9) how the human mind and body are united. He took this union to 'consist in the correspondence and reciprocal dependence of movements of the body and thoughts of mind' (244), and so he was concerned more with how mind and body can act on each other than with how bodies can. But he comes to discuss that second matter because of the 'unhappy prejudice' (236) of some people that the soul could have the force to move the body only by being corporeal and able to touch it. Against this he held that it is in fact no more difficult to understand how the mind moves the body than to understand how one body moves another. Motion, he eventually concludes, is never actually communicated even by contact, and in both cases (of bodies moving bodies, and of souls moving bodies) we have to have recourse to the same universal cause, God.

La Forge's route to this conclusion begins with Descartes's distinction between motion as bodily transfer and motion as motive force. He argues that since bodies cannot move themselves, they cannot move each other. Hence 'it is necessary that every moving body should be pushed by some thing entirely distinct from it, which would not be corporeal' (238). For bodies to have their own motive force 'the notion of that force would have to include the idea of extension, as do the other modes of bodies'

(238). But this is not so, and 'thus we have reason to believe that the force which moves is no less really distinct from matter than thought is, and that, just as much as it, it belongs to an incorporeal substance' (238). 'No body', he says, 'has the power of motion, and the force which moves it must belong to some other substance' (241).

La Forge's primary concern, the union of the human mind and body, was Gerauld de Cordemoy's too. So was his main conclusion: it is mind, and the infinite mind of God at that, which is the active cause of all events in the created world. Cordemoy's argument, in his *Traité sur le discernement du corps et de l'âme* (1666), is laid out rather more formally than La Forge's, but it takes a similar route. The first stage of this establishes that bodies can neither initiate their motion (or that of other bodies) nor sustain it. They cannot initiate motion because they can be at rest without ceasing to be bodies and so they do not have motion 'of themselves' (136). But why could we not suppose that some mind first put parts of matter into motion, parts which then sustained it themselves or passed it on to others? This is formally ruled out by one of Cordemoy's axioms, that 'an action can be continued only by the agent which began it' (136).[16] But he also has against it the fact that although bodies may seem to move each other, all we 'actually see' (137) is that they begin to move after being met with by others. It is 'presumption' (137) that they are moved *by* them.[17]

Though therefore not the first, Malebranche is the most famous of the seventeenth-century occasionalists. Leibniz says that it was particularly he 'who, with his characteristic acumen, embellished it in luminous phrases' (L 502). Along with La Forge and Cordemoy, he holds that all causal activity resides in the infinite mind of God; and, as with them, his discussion of causation between bodies is merely a stage on the way to this conclusion. In his *Search after Truth* he too begins with the now familiar Cartesian distinction between motion as 'a certain force imagined to be in the body moved and that is the cause of its motion' and motion as 'the continual transport of a body approaching or receding from another object taken to be at rest' (1674–5:37). Concerning the former there seem, he says, 'to abound very great and even dangerous errors'. The errors are in supposing that bodies contain this force; the dangers are that this supposition is impious and pagan.

Since it is clear that no material thing has the power to move itself, it follows, he argues, that such things must be moved by mind. But while we can see no connection between the will of finite minds and the movement of bodies, we can see one between the will of God and that movement. So, he concludes,

> [t]he motor force of bodies is therefore not in the bodies that are moved, for this motor force is nothing other than the will of God. Thus, bodies have no action; and when a ball that is moved collides with and moves another, it communicates to it nothing of its own, for it does not itself have the force it communicates to it. Nevertheless, a ball is the natural cause of the motion it communicates. A natural cause is therefore not a real and true but only an occasional cause, which determines the Author of nature to act in such and such a manner in such and such a situation.
>
> (1674–5:448)

Malebranche's argument in his *Dialogues on Metaphysics* again begins with the thought that though 'bodies can be moved… they cannot move themselves' (1688:151). But rather than concluding directly that they must therefore be moved by mind, Malebranche investigates the idea that they move each other. However, since bodies depend on God not only for their initial creation but also for their continued existence, they must be moved not by each other but by God. 'One body could not move another without communicating to it some of its moving force. Now, the moving force of a body in motion is simply the volition of the Creator who conserves it successively in different places' (1688:159).[18]

In a letter written when he was only 23, at about the time of Cordemoy's and La Forge's books, Leibniz can be found agreeing with most of these occasionalist ideas. He says that 'Matter in itself is devoid of motion' (L 99); that 'motion itself (L 102) cannot be derived from the nature of bodies as extended and impenetrable; and that '[m]ind is the principle of all motion' (L 99). It does not follow from all of this that an *already* moving body cannot move another, and at first Leibniz seems to allow that it can. But he goes on to say what Malebranche himself was later to say: 'there is no motion, strictly speaking, as a real entity in bodies…. [W]hatever moves is continuously recreated' (L 102). We have seen in earlier chapters, however, that Leibniz was eventually in far less

agreement with occasionalism than this and held very firmly that moving bodies do have an internal force. The process of this change of view was as follows.

In *The Search after Truth,* in the mid–1670s, Malebranche argued, first, that bodies are not causally active and can move neither themselves nor each other; then, that there is no causal interaction between finite minds and bodies; and, finally, that God alone has force and is active. About five years later, Leibniz wrote to him, agreeing with the second of these stages: 'I am entirely of your opinion concerning the impossibility of conceiving that a substance which has nothing but extension, without thought, can act upon a substance which has nothing but thought, without extension' (L 209); and then, a few months later: 'I approve most heartily…[that] which you advance…that strictly speaking, bodies do not act upon us' (L 210). But along with this agreement that, as a separate finite substance, mind cannot act on or be acted on by body, there is a disagreement about Malebranche's final conclusion that God alone possesses activity and force. Malebranche has not traced things back to first principles, says Leibniz. He has not appreciated that the impossibility of causal interaction between body and mind follows from 'certain axioms', axioms which Leibniz 'do[es] not as yet see used anywhere' (L 210). Malebranche's denial of that causal interaction has 'gone only halfway' (L 209).

What Malebranche has failed to see is that one of the 'important reasons' (L 210) there are for denying that body can act on mind (namely that there is no activity or force in something understood as merely extended) also shows that 'matter is something different from mere extension' (L 209). Given that bodies are merely extended, they do indeed have no activity and force, and the occasionalist conclusion about God lies in sight down the road. To Leibniz's mind, however, the argument really runs the other way. What needs to be realised, he thinks, is that (see chapters 4, 5 and 6) material substance must be something importantly more than extension, something which does provide them with activity and force.

This line of thought, which is merely hinted at in Leibniz's 1679 letters to Malebranche, is progressively developed over the following years, and a very clear account of it is given in the 'Specimen Dynamicum' of 1695. This account shows, what was seen at the end of chapter 4, the considerable extent to which

Leibniz's account of substance was developed as a response to occasionalism:

> The fact that the nature of body, and indeed of substance in general, is not well enough understood has resulted…in outstanding philosophers of our time locating the notion of body in extension alone and being driven therefore to take refuge in God to explain the union between soul and body and even the communication between bodies themselves. For it must be admitted that it is impossible for mere extension, which involves only geometric concepts, to be capable of action and passion…. But such views…should have shown their authors that they…had not set up a correct concept of substance, since such consequences followed from it. We show, therefore, that there is in every substance a force of action.
>
> (L 444–5)

To Malebranche it was an impious error to suppose that bodies and, in general, anything other than God are possessed of any force or activity. 'Our idea of cause or of power to act… represents something divine' (1674–5:446), and so we fail to acknowledge God's supreme divinity when we think that anything else could be a real cause with power to act. Leibniz's belief was quite to the contrary. According to him, God would *lack* all dignity were he the sole cause of events in the created world, and had always to act in 'extraordinary concourse' with it. It is far more worthy of God to have created things which (as in Leibniz's view) themselves are active, and productive of their changes. In discussion with Leibniz in the late 1690s Pierre Bayle agreed that this view of created substances and of God's relation to them squared far better than did the occasionalists' view with our ideas of God's power, wisdom, and intelligence. But Bayle could not agree with the way Leibniz often put this point, in terms of a claim that occasionalism involves miracles. Malebranche is quite correct, Leibniz says, that 'there is no real influence of one created substance upon another and that all things, with all their reality, are continually produced by the power of God'. But his appeal to God as 'a general cause…without offering any other explanation drawn from the order of secondary causes is, properly speaking, to have recourse to miracle' (L 457).

Leibniz makes this objection to occasionalism in *the Discourse on Metaphysics* and in his subsequent letters to Arnauld; and also in the 'New system of the nature of substances' of 1696, which he discussed with Bayle. In answer to it Bayle and Arnauld each insisted that since it is a part of occasionalism that God acts 'only according to general laws' (Bayle:238), there is no question of his acting by miracles. Occasionalists do not hold that God is forever making up his mind, deciding anew on each occasion how bodies should move after a collision; they hold that God makes up his mind once and for all that bodies hit thus will move off so. This means that miracles are *not* involved. A miracle, says Bayle, is something produced by God 'as an exception to the general laws; and everything of which he is the author, in accordance with these laws, is distinct from a miracle, properly so called' (Bayle:245–6).

But Leibniz's view was that even if God acted in the world in accordance with quite general decisions, the results of his action would still be miracles. 'I shall be told', he wrote to Arnauld,

> that God acts…only according to a general rule and consequently without miracles, but I do not concede this inference…. [F]or example, if God had decided…to carry out another action of…[one] kind every time that a certain circumstance occurred, this action would nevertheless be a miracle, albeit an ordinary one.
>
> (*LA* 116)

So long as what happens in the world is a direct result of God's power and activity, and not of any power or force on the part of created things themselves, then, for Leibniz, those happenings, no matter how regular they may be, are miracles. 'The distinguishing mark of miracles…is that they cannot be accounted for by the natures of created things' (*T* 257), and unless a general law 'serve[s] to explain…[events] through the nature of things, it can only be put into execution by a miracle' (*T* 338).

As Leibniz explained it to Arnauld (see the end of chapter 4), his view is that the substantial form of a created corporeal substance gives it an activity or force which brings about all that God, in his wisdom, wanted for it. Everything that becomes true of a created substance, he said, 'comes from its own depths' (*LA* 170); nothing that becomes true of it becomes true through God's 'extraordinary concourse' or through interaction with other created substances. At

first Arnauld could see no difference between this and occasionalism. Using an example of a kind which will be of special concern in chapter 9, Arnauld said that Leibniz's idea, that 'God first created the soul in such a way that…what happens to the soul is born to it in its own depths, without its having to adapt itself subsequently to the body, any more than the body to the soul' (*LA* 65), seemed to be 'saying the same thing in other words as those who claim that my will is the occasional cause of the movement of my arm and that God is the real cause of it' (*LA* 105). The occasionalists, he said, 'do not claim that God causes my arm to move through a new act of will which he exercises each time I wish to raise my arm' (*LA* 105–6).

In answer, Leibniz accepted that, for the occasionalist, God is not continually making fresh decisions about what to do. But he reiterated his claim about miracles. The occasionalists 'introduce a miracle which is no less one for being continual…. [A] miracle differs intrinsically and through the substance of the act from a common action, and not by an external accident of frequent repetition' (*LA* 116). So long as God is acting directly on the world, then, no matter how regular, the resulting events are miraculous.

These points were made most clearly in the *Theodicy,* towards the end of Leibniz's life. If the ordinary regular course of things is not to be miraculous, it is not sufficient simply that it be the ordinary course of things. How it comes about is relevant too. It must come about not because of God's action on created things, but because those things are active substances whose nature it is to do as they do.'The distinguishing mark of miracles…is that they cannot be accounted for by the natures of created things' (*T* 257).

There is an unclarity at one point in Bayle's discussion of these matters which is worth looking at in order to bring out the contrast between the occasionalist view that worldly events are grounded in God's direct activity and Leibniz's view that they are the expression of the natures of active created substances. When Bayle said (as above) that since God's involvement in the world is 'only according to general laws' and that consequently there is no question 'of his acting extraordinarily', one thing he meant was that it is not part of occasionalism that God is forever making up his mind. Occasionalism does not say that God decides anew on each fresh occasion of a certain kind what next to make happen; it says that God decides once and for all that, on the occasion of *this* kind of happening, he will do *that.* But even if Bayle is right that it holds that God acts according to antecedently-made general decisions, how does

occasionalism stand on the question whether God needs to *act* on each new occasion? Even though God has *decided once for all*, and as a perfectly general matter, to do *this* kind of thing on the occasion of *that,* might he not, on each particular occasion, still need to *do* something? Nothing Bayle said provides a very clear answer to this, but Arnauld was clearer. He evidently saw occasionalism as holding that, in order for *this* kind of thing to happen on the occasion *of that*, God need *do* (or, rather, need *have done*) *nothing*—nothing other than already have made a general decision about occasions of that sort. The occasionalists, Arnauld said, 'claim that God [makes things happen]…by that single act of the eternal will, whereby he has wished to do everything which he has foreseen that it would be necessary to do, in order that the universe might be what he deemed it was to be' (*LA* 105–6).[19]

Now Leibniz's attitude to the idea that worldly events result from God's direct activity (whether in accordance with antecedently-made general decisions or not) is that while it describes a perfectly *possible* kind of relation between God and creation, it describes one which is inconsistent with God's wisdom and dignity. But, as comes out most clearly in his replies to Bayle, he finds the idea described by Arnauld to be unintelligible. It is hardly sufficient, he argues, simply that God make general decisions: *the mere making of a decision does not of itself ensure its being carried out*; there must be some means by which it is carried out. Either God must be 'the executor of his own laws' (L 580) and must act in a certain way when there is the occasion for it; or angels must be 'charged expressly with this responsibility' (L 494); or created substances must themselves have 'instruments for such execution' (L 580) and there must be set up 'natural means of carrying it out' (L 494). This last case means that created things have their own force and power and that 'all that happens…[is to be] explained through the nature which God gives to things' (L 494).

This line of thought, that even divine decisions are not self-fulfilling, but need to be put into effect, is similarly clear in Leibniz's reaction to the ocasionalism of Christian Sturm. As Leibniz describes it, Sturm held that 'motions now taking place result by virtue of an *eternal law* once established by God, which law he [Sturm] then calls a volition and *command';* and, further, that 'no new command or new volition of God is then necessary' for the command to be later followed by the events which satisfy it—no 'new conatus or some laborious effort' (L 500) is needed.

According to Sturm, God does not 'move things as a wood chopper moves his ax' (L 500); events happening *now* are happening simply because of this *prior* decision. Leibniz found this completely unintelligible. A 'command in the past no longer exists at present', so unless it left 'some subsistent effect behind which has lasted and operated until now', it 'can accomplish nothing' (L 500). If it is to be satisfied, it is necessary that 'this divine…law conferred upon [things] some created impression which endures within them…an *internal* law from which their actions and passions follow' (L 500). It is necessary that 'the law set up by God does in fact leave some vestige of him expressed in things…. [It must be that] things have been so formed by the command that they are made capable of fulfilling the will of him who commanded them…. [T]here must be residing in things, a form or force…from which the series of phenomenona follow according to the prescription of the first command' (L 501).

In a note which he appended to a piece he wrote about 1686, Leibniz gives a pleasing summary of his position with regard to occasionalism. 'The system of occasional causes', he says, 'must be partly admitted and partly rejected' (PM 80). It is partly to be rejected because it wrongly holds that all activity and power is located in God. There is power and activity in the created world. 'Each substance is the true and real cause of its *immanent* actions and has the power of acting' (PM 80). It is partly to be admitted too, however, because it rightly holds that created substances have no power or force to act on each other. '[E]ach substance (with the sole exception of God) is only the occasional cause of those of its actions which are *transient* with regard to another substance' (PM 80–1). The occasionalists are right to reject causality between created substances, but it would be 'foreign to reason' to extend this to 'the *immanent actions* of substances' (L 502).

From a distance it is clear enough where Leibniz's views are located in relation to the occasionalist account of causality. But, we should note in conclusion, a closer look reveals some complication. As typically presented by its proponents, occasionalism gives an account of the causal relationship between colliding material bodies or, in either direction, between the mind and the body. In the terms of the Cartesianism from which it historically developed it is, therefore, an account of the causal relationship between extended material *substances* (or arrangements of extended material substance) and between immaterial mental *substances* and material extended *substances* (or

arrangements of it). Leibniz typically accepts these terms in many of his references to occasionalism, but he must in the end be understood in terms of his own non-Cartesian theory according to which a material body (be it a billiard ball or a human body) is *not* a material substance (or an arrangement of it).

What Leibniz says in response to occasionalism about the relationship between the mind and the body (which we will come to in chapter 9) can to a large extent be taken as it stands, of course. For even on his own account the mind really is a substance, and a genuine case of something immanently active and unable to act on or be acted on by other things. Leibniz sometimes speaks as though the same self-activity and lack of interaction applies to bodies too. In collision and impact, he says, bodies do not 'give new force' to other bodies, but rather 'give determinate direction to the force already existing in them, so that one body is repelled away from another by its own force rather than being propelled by the other' (L 530).[20] A 'foreign impulse', he says, 'furnishes only an occasion of acting' (La 703).[21] But despite this his views about the relation between substances cannot, in all strictness, be simply and directly taken to apply to that between bodies.[22]

NOTES

1 *PP* 1.61, K 135.
2 Huygens 1686:163. Of course, Leibniz bases this article on the idea that Descartes's quantity of motion *is* a force.
3 As against this view of Descartes see Gabbey 1971:9, Kemp Smith: 212f., Prendergast, Westfall: 60–4.
4 Anderson: *passim* and Clatterbaugh: 399 argue that Descartes is not always careful about this distinction.
5 As in the interpretation of Hatfield, Garber 1983b: 2–7, Machamer 1976:178–9.
6 Respectively, Hoenen: 359, Prendergast: 460, and Garber 1983b:32 n. 27, Hatfield: 130 n. 73.
7 See also *PP* 1.21, CSM 2.116.
8 See also 1674–5:515.
9 A reading echoed recently: 'The conclusion toward which Descartes was drawn was that…the moving force of bodies was not in bodies themselves but in God. However, he did not draw this conclusion' (Doney 1967:41).
10 The development of occasionalism in the seventeenth century is in fact the re-emergence in a new context of a certain picture of the relationship of God to the world (see Clarke 1989:105, Wilson 1987: *passim*).

11 See also K 139, 235f.
12 More 1662a: 12, see also 1662b: 66.
13 See also II.xxi.4–5, and Westfall: 340, 419, 421 for the same contrast in Newton.
14 See *Phys* 252b 17–23; and, for some discussion, Sorabji: 60–2.
15 For other discussion of La Forge see Clarke l989:106f.,Church: 76f., Lennon: 811f.
16 Lennon: 814 relates this to the Cartesian view that the distinction between creation and conservation is merely one of reason.
17 For other discussion of Cordemoy see Balz 1951:18–21, Church: 82ff., Clarke 1989:110–11, Dugas 1958:248, Lennon: 811f.
18 See also 1674–5:660.
19 See Malebranche 1674–5:450.
20 See also L 448, 506, PM 79.
21 There is an interesting anticipation of this in 1649 when More explains to Descartes that, rather than supposing that bodies can act on each other, 'I feel more disposed to believe that motion is not communicated, but that from the impulse of one body another body is so to speak roused into motion, like the mind to a thought on this or that occasion, and that the body does not take as much motion as it needs for movement, being reminded of the matter by the other body…. [M]otion bears the same relation to a body as a thought does to the mind: neither is received into the subject, in fact, but both arise from the subject in which they are found. And everything that is called body I hold to be alive' (AT 5.383/Gabbey 1982:211).
22 For a discussion of the question of interaction between non-substantial Leibnizian bodies see Brown 1992, Garber 1986:89, Miller.

8

Descartes, Spinoza, and Leibniz, and Thinking Substance

Against the background of Descartes's dualism of kinds of substance (see chapter 2), chapters 5–7 have considered what he, and Spinoza, and Leibniz, said about extended material substance. This chapter turns to thinking, immaterial substance. We can begin from the fact that, according to Descartes, the attribute of thought is instantiated in an infinite immaterial God, and a large number of finite human minds, which are separate substances, 'really distinct' from each other: 'each of us…is capable, in thought, of excluding from himself every other substance, whether thinking or extended, [and so] it is certain that each of us is really distinct' (*PP* 1.60).[1] Chapter 2 raised the question of the possible relations between, on the one hand, the 'form' and 'matter' of the earlier Aristotelian tradition, and Cartesian 'mind' and 'matter' on the other. The following detail about how a Cartesian mind relates to those special forms of earlier thought which were called 'souls' supplements the general answer given there.

In the Aristotelian tradition (as we saw in chapters 1 and 4), a human being is one individual corporeal substance which is a composite of form and matter. It has a 'rational soul' which forms or organises the matter of flesh, blood, and bones into a living creature, a creature which characteristically engages in various activities from synthesising food, through to sensing, willing, and rational thought. Other animals, which lack reason, are informed by a 'sensitive soul'; and all other living things, distinguished from the non-living by the power of self-nutrition, have as their organising principle a 'vegetative soul'.[2]

In rejecting these ideas Descartes construes all living things, other than humans, purely as extended substance. All the

functions which were referred to sensitive or vegetative souls are now to be understood mechanically. Everything from the digestion of food, through to the reception of stimuli by sense-organs, and the movements of limbs in appropriate reaction is nothing more than movements of matter. Speaking of a living animal as a machine, Descartes says

> 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 arrangments of its counter-weights and wheels. In order to explain these functions it is not necessary to conceive of this machine as having any vegetative or sensitive soul or other principle of movement and life.
>
> (CSM 1.108)[3]

In respect of all these functions humans are no different from other animals, and Descartes understood most of their activities purely mechanically too. But humans had been supposed to have 'intellectual souls' also, and to be capable of rational thought. Descartes did not seek to absorb the functions of this so-called 'form' into the mechanical workings of material substance, as did materialists such as Hobbes. Rejecting the form/matter account of substance, he assigned the functions of this 'form' to an immaterial substance instead, the mind or soul of his scheme. Understanding, reason, or thought, which is often expressed bodily in the use of language, or in the ability to act and perform successfully in a wide range of practical situations, is the exclusive possession *of human* animals. It requires the attribution to them of a soul or mind.[4]

But 'thought', the essential property of the substantial Cartesian mind, is not straightforwardly just a matter of rational 'understanding'. As Descartes had to remind Mersenne, it is not true that 'if the nature of man is simply to think, then he has no will'. For 'willing, understanding, imagining, sensing and so on are just different ways of thinking, and all belong to the soul' (K 32).[5] This means that so far as *humans* are concerned, not only are the functions of the traditional 'rational soul' assigned to the Cartesian 'mind', but some features of sense and appetite (as Descartes construes them) are assigned there too.

The Scholastics, with their form/matter account, could think of desire, whether in humans or not, as something embodied in,

or giving a structured form to, certain movements of living creatures. Now while Descartes thinks of desire in animals in purely mechanical terms, he thinks of it in humans as, primarily, a certain kind of mental mode, and one which might cause various effects in the bodily machine. Similarly, perception is not for him as it is for the Scholastics, simply an awareness, common to us and other animals, of a physical environment. It is a 'movement in the brain, which is common to us and the brutes' (CSM 2.295), together with, in humans, an immaterial mind having 'sensation[s] or thought[s]' (*PP* 1.9) or being 'affected by… sensation[s]' (CSM 2.295) (and, sometimes, also making judgements on those sensations).[6] 'Sensations of hunger, thirst, and pain' are not the prerogative of all living animals. They are specifically human, and are 'modes of thinking' which depend on humans' having a mind as well as a body (CSM 2.56).[7] But it is not simply because he identifies a specifically 'immaterial mental' aspect in them that Descartes classifies human willing and sensing as 'thought' in some new, extended sense. It is rather that he takes them to involve thought in some properly narrow sense. There is, he says, 'an intellectual act involved in their essential definition' (CSM 2.54).[8]

Now Descartes defines thought as 'everything which we are aware of as happening within us, in so far as we have awareness of it' (PP 1.9). Thoughts 'happen within us', in our minds, and we are aware of their doing so; but it is *in so far as we are aware of them* that they are thoughts. Thought is not merely mental activity, but self-aware mental activity. Yet it is surely possible for 'there…[to] be many things *in* our mind *of which* the mind is not aware' (CSM 2.150, my italics). One kind of possibility envisaged by Arnauld was illuminatingly described by Thomas Sergeant, who commented on Locke's endorsement of the Cartesian idea that nothing thinks '*without being conscious of it*, or perceiving, that it does so' (Locke 1690:II.i.19):[9]

> when a Man is quite absorpt in a serious Thought, or (as we say) in a *Brown Study,* his Mind is so *totally* taken up with the *Object* of his *present* Contemplation…that he can have no Thought, at that very Instant, of his own *Internal* operation, or that he is *thinking,* or any thing like it.
>
> (121–2)

Of course it is true that we *are* often aware of our awareness; we may, for example, be listening to music with half a mind and aware of ourselves as doing so with the other half. It is also true that even though we can be 'quite absorpt' by something, we always emerge from our 'brown study' and 'come to ourselves'. But it does seem that Descartes runs together two different things in saying that thought is not possible without simultaneous awareness of it.[10]

This doctrine that there is no thought of which we are not aware blocks a move Descartes might have made to defend his claim that the mind's essence is to think. As he makes plain, what he means by this is that the mind *always actually is* engaged in thought. He would, he says, find it easier 'to believe that the soul ceased to exist at the times when it is supposed to cease to think than to conceive that it could exist without thought' (K 125).[11]

Locke argued against this that the essence of mind is the *capacity* for thought.[12] Actual thought, which results from the exercise of that capacity, stands to the mind, not as extension to the body, but as motion. To suppose that we are always actually thinking is to suppose, as Gassendi had already pointed out to Descartes, that our minds are 'in perpetual motion' (CSM 2.184). Are we really to accept, Gassendi asked him, that there is thinking going on 'during deep sleep and or indeed in the womb' (CSM 2.184)?

Though he is speaking loosely and suppressing his own distinctions between 'thought', 'sensation', and 'perception' (see later in this chapter), Leibniz agrees with Descartes against Locke that the mind always thinks. But, he argues against him, we are not always aware of our 'thoughts', particularly during sleep or in a swoon.[13] Descartes, however, has no alternative but to insist that we *are* always thinking, and always aware of doing so.[14] It is simply that we do not remember, or are not aware of this *afterwards*, 'because the impressions of these thoughts do not remain in the memory' (CSM 2.172).[15] Moreover, this does not mean that 'the mind of an infant meditates on metaphysics in its mother's womb' (K 111); all it need mean is that it has sensations of pain, pleasure, and warmth.

It is possible to see the same running together, of thought as awareness with the reflexive awareness of thought, at work in Descartes's startling view that dogs and cats are as insensate, unfeeling, and lacking in appetites as clocks. It is not merely that

non-human animals do not engage in rational thought: it is also that they do not perceive, desire, or sense. Unlike clocks they are natural, not artificial, machines, but there the difference ends.[16] The kind of non-reflexive awareness which Sergeant suggests we are capable of is just the kind of awareness it would be plausible to see animals as always having, of their bodily pains, and, via their sense-organs, of their environment. There is a letter in which Descartes at first seems to agree with just this point: 'my view', he says, 'is that animals do not see as we do when we are aware that we see, but only as we do when our mind is elsewhere' (K 36). In fact, though, he is ruling the point out. For him, it turns out, that kind of seeing involves *no* awareness at all of anything, at least if that is supposed to involve anything other than bodily mechanism. 'In such a case', he continues, 'the images of external objects are depicted on our retinas, and perhaps the impressions they leave in the optic nerves cause our limbs to make various movements…. In such a case we too move just like automata.'

'Our mind is elsewhere', and other than on our seeing a tree in front of us, when we are engaged in conversation. Presumably this is the kind of case Descartes intends. But what about when our absorption in the tree that we see, rather than in our conversation, leaves no room in our minds for an awareness of our seeing? This is a case too; and recognition of it would open up the possibility of attributing souls, of an other than reflexively aware kind, to non-human animals, as an alternative to seeing them simply as machines.

In the early *Metaphysical Thoughts* Spinoza seems to go even further than Descartes in the direction of materialism. *All* the 'souls' of the Aristotelians, the vegetative, the sensitive, *and* the rational, 'are only fictions': 'there is nothing in matter but mechanical constructions and operations' (C 325). But if this is to be taken as his later view too, it must be seen, not as a *denial* of mind but, as we shall see in chapter 9, one aspect of his account of the relationship between mind and body. Moreover, besides quite clearly recognising thought as a substantial attribute, Spinoza also maintains (see chapter 9) that there is a finite mode of that attribute for every finite mode of extension.[17] This means that not only human beings but all individual things, 'though in different degrees, are nevertheless animate' (*E* 2P13S).[18] The degree to which a thing is animated depends on its complexity (e.g. on its possession of sense-organs): 'in proportion as a Body is more

capable than others of doing many things at once, or being acted on in many ways at once, so its Mind is more capable than others of perceiving many things at once' (2P13S). This view that all material things are 'animated' does not bulk large in the *Ethics*; Spinoza merely remarks that it follows from his theory of attributes. However, like much else that Spinoza (see chapter 9) says about the mind and the body, it has remarkable echoes in Leibniz.

Before coming to this, however, we should note a huge difference between Spinoza and Leibniz vis-à-vis the separate individual substantiality of human minds which Descartes's metaphysics accords to them. Leibniz wholeheartedly endorses and dwells on the substantiality of our immaterial minds. It is only because of it that there are individual *material* substances also, and only because of it that we have an awareness of substantiality at all. 'That we are not substance is contrary to experience, since indeed we have no knowledge of substance except from the intimate experience of ourselves when we perceive the I' (trans. Jolley 1984:123/Gr 2.558). But it is completely rejected by Spinoza. Just as he and Descartes reject the individual substantiality of material things, so he does the same with minds. For him human minds are not individual substances; rather they are (as was noted in chapter 3) finite modes under the attribute of thought. As such 'the human Mind is a part of the infinite intellect of God' (2 P11D); and it follows from this, Spinoza says, that 'when we say that the human Mind perceives this or that, we are saying nothing but that God, not insofar as he is infinite, but insofar as he…constitutes the essence of the human Mind, has this or that idea' (2P11D).

Bayle took this to mean that 'one would speak falsely when one said, "Peter denies this, he wants that, he affirms such and such a thing"; for actually, according to this theory, it is God who denies, wants, affirms' (Bayle:309–10). Leibniz agreed that this was indeed Spinoza's ridiculous position. He suggested that it is simply 'refuted by our experience, which teaches…that we are in ourselves something particular which thinks, which perceives, and which wills, and that we are distinguished from another being who thinks and wills something else' (L 559). Locating him by reference to the medieval philosopher Averroës, and by reference to the seventeenth-century Quietists who saw individual minds as drops in the ocean of a universal spirit, Leibniz says that Spinoza is 'not far from the doctrine of a single universal spirit' (L 554).[19]

There is, however, another way in which Spinoza has been understood when he says that the human mind is part of the infinite intellect of God (and also when he says that any mode of extension, and not merely the human body, has a 'mind' which is part of that infinite intellect).

Consistently with a human mind's not being a substance which might be modified by the ideas it has, Spinoza also says that it is an idea, an idea whose object is the complex mode of extension which is the human body.[20] One approach to this has been to 'logicise' the attribute of thought and to interpret its finite modes, 'ideas' or 'minds', not as psychological, but as logical entities.[21] On an approach of this kind the doctrine that for every mode of extension there is a corresponding mode of thought does not 'attribute consciousness to all things' (Curley 1969:126), and would mean something to the effect that every extended mode has corresponding true propositions about it. Specifically, my 'mind' would be the set of true propositions describing my body; and God's intellect, of which a human mind is 'a part', would be the set of true propositions describing the whole extended world.[22] In so far as it 'de-psychologises' God's intellect, the immediate infinite mode of thinking substance, this interpretation points in the same general direction as the 'de-materialising' account of Spinoza's extended substance given in chapter 3 above according to which extended substance is to be thought of not as the material world itself but rather as its real possibility. So far as finite modes of thinking substance are concerned, however, Bennett is surely right just not to believe that 'Spinoza would be willing to use "mind" in that eccentric fashion' (129).

Might it be possible to 'de-psychologise' thinking substance (and its immediate infinite mode), but yet to do so in a way such that the minds which are its finite modes are what we might ordinarily recognise as minds? Anything more than the merest sketch of how this might be done would require a lengthy excursion into Spinoza's theory of knowledge (as at *E* 2P38–48), and his account of reason and adequate ideas.[23] What follows, then, *is* the merest sketch. As in chapter 4, to say that extended substance exists is to say that there is (i.e. in the 'essential' rather than the 'existential' sense) such a thing as extension. Understood thus, the existence of extended substance is a guarantee that the material world really is intelligible in terms of extension. Similarly, to say that thinking substance exists is to say that there is (i.e.

'essentially') such a thing as adequate, clear, and rational thought. This does not mean, of course, that any individual's actual thinking, or attempt at it, will be coherent or valid, for (according to Spinoza's theory of knowledge) the ideas which constitute any person's mind may not be adequate. What it does mean is that there are (i.e. 'essentially') standards to which actual thought may approximate, and criteria it needs to fulfil to be coherent and correct. It also means that in so far as people are reasoning correctly and their ideas are adequate, their thinking is, in a sense, not their own. Their mistakes, fallacies, and confusions are their own, for (despite the fact that logic books sometimes describe invalid, as well as valid, forms of thought) mistakes of reasoning and thought have no standards and criteria—there are no correct ways to reason badly. Confusion and error is simply an individual's failure to meet the standards of validity. When people do think adequately and clearly their thought is not, particularly or idiosyncratically, theirs. Going some way with Bayle and Leibniz, we might say that in these cases they are merely the vehicle for God's thought.

Since this approach to Spinoza 'de-psychologises' only thinking substance itself and not also, as with Curley, the minds which are its finite modes, it allows us to find Leibniz's attribution (touched on in chapter 4) of souls to all corporeal substances, and not only to humans, genuinely reminiscent of Spinoza's view that all material things are 'animated'. In Leibniz's case, of course, the doctrine is related to his restoration of substantial forms. Indeed, with some variation, he continues to recognise the traditional distinctions between rational, sensitive, and vegetative souls. All corporeal substances, from humans and animals through to the organic substances out of which matter such as dead bodies and blocks of marble are aggregated, have souls or minds, or something 'analogous' (*LA* 154) to them. Humans are distingished from other animals by their possession of a rational soul, the kind of soul which can properly be called a *mind* or *spirit*.[24] Only human animals have *thought* and *understanding,* which Leibniz connects with the ability to derive eternal truths such as those of geometry.[25] As for animals, human or not, they have something akin to the 'sensitive souls' of traditional thought, for what characterises their souls, Leibniz says, is the activity of *sensation*. This means that animal bodies have sense-organs which focus, make distinct, and heighten the impressions made on them by sound waves, light-rays, and so on.[26] Leibniz sometimes says

that the distinction between understanding and sensibility is only one of degree, and that sensations are 'confused', 'indistinct' thoughts.[27] Whereas Aristotle distinguishes living things, of whatever kind, from non-living matter, by reference to the vegetative soul of self-nutrition, Leibniz counts *perception* as the principle of life, and what the soul and body of *any* corporeal substance equips it to do. Perception is defined as the expression or representation of the many in the one, or of the composite in the simple.[28] The difference between it and animal sensation is that the latter is 'heightened perception', the kind of focused perception made possible by the possession of sense-organs. In a neat summary of this Leibniz says 'mind is rational soul…soul is sentient life, and life is perceptive principle' (Wi 505).

Just as animal sensation is explained in terms of the perception which is common to all substances, so human understanding is explained in its terms too. While sensation is heightened or focused perception, thought and understanding is 'apperception' or 'consciousness' or 'reflective knowledge' of perception.[29] Leibniz says it is 'for lack of this distinction' between perception and apperception that 'the Cartesians have made the mistake of disregarding perceptions which are not themselves perceived… and think…that there is no soul in beasts' (L 637).[30]

Descartes's treatment of non-human animals as insensate machines is coloured by theological concerns. If an immaterial soul is required for sensation and feeling, and also for immortality, then, if the brutes are *not* just insensate machines, they may have a place in heaven too.[31] Leibniz reports that Descartes's followers saw this as a problem:

> according to the Cartesians, it is only man who truly has a soul and, indeed, who has perception and appetite—an opinion which will never receive general approval and into which they rushed only because it seemed necessary either to ascribe immortal souls to beasts or to admit that the soul of man could be mortal.
>
> (L 588)

Such thoughts had not been absent from Descartes's mind either. He was clearly conscious of the dilemma that if there is no difference between us and other animals—if they are like us or, conversely, we are like them—then either, improbably, as he thought, 'worms and flies and caterpillars…all have immortal souls'

(K 244) or 'after this present life we have nothing to fear or to hope for, any more than flies or ants' (CSM 1.141).[32]

The kind of immortality Descartes is thinking of is the survival of the immaterial soul after death.[33] On the hylomorphic analysis of substance any such idea would be hard to sustain. For on that analysis, death is the disorganising of a corporeal whole, and forms are not themselves substances or capable of existing apart from matter—a fact with which Aquinas had to contend.[34] For Descartes, however, the death of a non-human animal can only be like the running down or the breaking of a machine, and this is so for a human death too. Cartesian death is certainly not, as in the Aristotelian tradition, the disintegration of a single substance; but nor is it the separation of the immaterial substantial soul from its union with the material substantial body:

> death never occurs through the absence of the soul, but only because one of the principal parts of the body decays…. [T]he 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 machine or other automaton (that is, a self-moving machine) when it is wound-up…and, on the other hand, the same watch or machine when it is broken.
>
> (CSM 1.329)

The separation of the Cartesian soul from the body is not the *cause* of bodily death but its *result*.

For Descartes an advantage in, if not a reason for, denying an immaterial mind to non-human animals was that they would then not be immortal. But he took the immateriality of the soul and its 'real distinction' from the body to be only a necessary condition of immortality. Though the 'Dedicatory letter' of the *Meditations* seems to promise more, it is, he insists, all that reason can establish.[35] God could choose to annihilate the soul after bodily death, but it will survive unless he does so, and he has in fact 'revealed to us that this will not occur' (CSM 2.10).

Notwithstanding their place in a restored hylomorphism, human souls or minds quite clearly are for Leibniz, as they are for Descartes, complete immaterial substances; and again as for Descartes, though God could destroy them, in themselves they are 'naturally immortal' (*NE* 68).[36] Humans, however, are not alone of God's creatures in having immortal souls; other animals have them too:[37]

> I include the beasts and believe that they too have sense, and souls which are properly described as immaterial and are …imperishable…. [W]hereas the Cartesians have been needlessly perplexed over the souls of beasts. Not knowing what to do about them if they are preserved (since they have failed to hit on the idea of the preservation of the animal in miniature), they have been driven to deny—contrary to all appearances and to the general opinion of mankind—that beasts even have sense.
>
> (*NE* 67)

The last sentence of this passage in effect recalls a moment in Leibniz's correspondence with Arnauld (see chapter 4). Arnauld was puzzled about the post-mortem fate of the souls which Leibniz attributed to animals: '[i]f one of those houses where some hundred thousand silkworms are being nurtured were to catch fire, what would become of those one hundred thousand indestructible souls? Would they continue to exist separated from all matter, like our souls?' (*LA* 109).

Leibniz explained in reply that at the so-called death of an animal its soul does not leave its body, which then moulders away. There is 'rigorously speaking, no total destruction or death' (L 650), in the sense of 'the separation of the soul' (L 650). Rather there is, as he says above, 'the preservation of the animal in miniature'. Corruption and death are simply a matter of bodily 'transformation', a 'diminution and envelopment of an animal which nevertheless goes on surviving and remaining alive and organic' (*LA* 157).[38] Arnauld was therefore wrong to think that after an animal's death its soul would have to 'continue to exist separated from all matter'. He was also wrong, however, to suppose that Leibniz would agree that human souls ever exist in this way themselves. Unlike Descartes, Leibniz holds, quite firmly, that 'every Spirit, every soul…is always united with a body, and that no soul is ever entirely without one' (*NE* 58).[39]

Just as animal souls are never destroyed so new ones are not being created. '[A]ll the births of animals lacking reason and not meriting a new creation are merely transformations of another animal who is already alive but sometimes imperceptible…. Thus crude souls…have been created since the beginning of the world' (*LA* 93).[40] But since humans do not lack reason, they *do* merit a new creation: 'the rational soul is created only at the time of the

formation of its body' (*LA* 93). How exactly this 'new creation' should be understood is, Leibniz says to Arnauld, 'a detail' (LA 89), and one beyond his limited knowledge. It may be that the animal soul which animated 'the seed' before its development into a human body is transformed by God into a human soul; it may be that that the animal soul is displaced by a newly created human soul. Later, in the *Theodicy,* he holds with the first—though, again, he is unsure how such a 'transcreation' (*T* 91) might work.

What happens to human souls at death is not clear. Leibniz says to Arnauld that God 'detaches them from the body (at least from the coarse body) by death' (*LA* 125). The reason for this detachment is that they must retain their distinctly human properties, which they could not do were they to remain with a radically changing and corrupting body. On the other hand Leibniz does speak elsewhere as though they *do* go through some of these bodily transformations and diminutions, and, awaiting Judgement Day, are for a time as in a 'swoon' or 'sleep'. His reference to detachment from the coarse body seems to be the idea that after 'death' human souls inform some rarefied material body. 'For why cannot the soul always retain a subtle body organized after its own manner, which could even some day reassume the form of its visible body in the resurrection, since a glorified body is ascribed to the blessed, and since the ancient Fathers have ascribed a subtle body to the angels?' (L 556–7).[41]

On the face of it Spinoza is in some broad agreement with Descartes about immortality. 'The human Mind cannot be absolutely destroyed with the Body, but something of it remains which is eternal' (5P23) and 'without relation to the Body's existence' (5P40S). He refers to 'the Mind's duration without relation to the body' (5P20S). Yet given that the finite mode of thought which is the human mind is a corresponding idea of the finite mode of extension which is the body, it is certainly not at all immediately clear how anything of the mind could exist without the body. Indeed it seems to be precisely because (see chapter 9) Leibniz holds something akin to Spinoza's view that for every finite mode of thought there is a finite mode of extension that he also holds that there is no immortality of the kind which involves a 'separation of the soul' (L 650).[42] Something of this relationship between the body and mind is acknowledged in the fact that the immortality Spinoza proposes is not personal in any way that involves memory.[43] Perhaps what was said above about the

possibility for humans of adequate, rational, and objective thought would be a way in to interpreting what Spinoza means when he speaks of a part of the mind being eternal. 'Man is eternal in so far as he understands.'[44] But, as Spinoza's most recent editor comments, these parts of the *Ethics* (5P23–40) are 'generally regarded as more than usually obscure' (C 607).[45]

NOTES

1 There is debate whether this is good enough to establish separate individual thinking substances (Cottingham 1976:84–5, 1988:85–6, Kenny 1968:58–60, Russell 1961:440.) For example, Hyperaspistes suggested to Descartes that 'you do not know whether it is you yourself who thinks or whether the world-soul in you does the thinking, as the Platonists believe' (K 113–14).
2 See *De an* bk 2, chaps 1–3.
3 See also K 102.
4 CSM 1.139–40, K 207, 244–5; Wilson 1978:182ff.
5 See also *PP* 1.53.
6 CSM 2.295.
7 For some discussion see Delahunty: 205f., Kenny 1973:113–14.
8 For some discussion see Kenny 1968:7If., McRae 1972:64–6.
9 See also II.i.10.
10 For some discussion see Williams: 226, 286.
11 See also K 111.
12 1690: II.i.10.
13 *NE* 112–14, 118.
14 CSM 2.246–7.
15 See also CSM 2.247.
16 For discussion of this view's contemporary reception see Balz 1951:106–7, Rosenfield.
17 2P7S, P13S.
18 See also 3P57S.
19 See also *NE* 59, *T* 77–80, and Pollock: 289f. For discussion of this doctrine see editorial notes on 'Averroists' and 'Quietists' in RB, and nn. 118–20 at Lt 383–5. The interpretation of Spinoza which I propose below perhaps puts him close to Averroës.
20 2P11–13.
21 For a discussion of this approach in Balz 1967:1–49 and Curley 1969:119–28 see Bennett: 53f., 128f.
22 Curley 1969:124, 127.
23 For some discussion see Parkinson 1954: chap. 8.
24 L 638, *NE* 210.
25 *NE* 173. He also connects it with self-consciousness and memory, things which allow of the moral and personal identity necessary for Divine reward and punishment (*DM* 34, *LA* 89, 93, *NE* 58, 236).

26 See, for example, L 557, 637, 644.
27 L 580; for a discussion see Brandom, Kulstad, McRae 1976: chap. 5, Parkinson 1982.
28 L 496, *LA* 144, 155, Wi 505.
29 L 637, *LA* 90, 144, *NE* 139.
30 See also L 644; but see McRae (1976:30ff.), who says that Leibniz also, and inconsistently, says that apperception is necessary for sensation, not just for thought.
31 It was common, though not universal (cf. Locke—see Woolhouse 1983:181–2) to connect immateriality and immortality.
32 See also K 36.
33 See, for example, K 19.
34 See Copleston: 161–73, Cottingham forthcoming.
35 CSM 2.4, 108–9, K 87; for discussion see Mijuskovic: 27–32.
36 See also *NE* 59, 67.
37 Strictly speaking, only human souls are immortal (and their personal identity is preserved); animal souls are incessable (their physical identity, which is all they have, is preserved) (*NE* 236)—see n. 25 above.
38 See also LA 158–9.
39 See also L 556, 580, 644, 650, *LA* 159.
40 See also *LA* 150, *T* 172–3.
41 See also *NE* 58.
42 See L 556, 580.
43 5P21.
44 The quotation is from Parkinson's more extensive presentation of a not unrelated interpretation (1954:176; also 166–80).
45 For discussions of Spinoza on immortality see Donagan 1973a, Harris 1975, Joachim: 292–306, Wolfson: 2.289–325.

9

Extended Substance and Thinking Substance related: 'the nature of the union between body and mind'

Against the background of Descartes's dualism of kinds of substance (see chapter 2), chapters 5–7 have considered what he, Spinoza, and Leibniz said about extended substance (and the created material world), and chapter 8 has considered their views on thinking substance (and individual minds). They had things to say about the *relation* between 'thought' and 'extension' too, things which begin from the fact of human life that there is a 'union', as it was usually put, between body and mind. We will look at these here.

Quite evidently there is some relation between individual human minds and the arrangements of matter which are human bodies. Our sensations and perceptions sometimes follow on from, and represent, events in the corporeal world; and those events sometimes follow on from our desires and decisions. As Descartes puts it,

> people who never philosophize and use only their senses have no doubt that the soul moves the body and that the body acts on the soul…. Everyone feels that he is a single person with both body and thought so related by nature that the thought can move the body and feel the things which happen to it.
>
> (K 141–2)

But what is the nature of this 'union', this relationship between minds and bodies? The hylomorphic conception of a human being as a composite of an organising 'form' or 'rational soul' and of 'matter', the flesh and blood of the body, provided the basis for an answer; but Descartes's rejection of this traditional account of

substance, and his dualism of thinking and corporeal substance, necessitated some other answer.

As has recently been suggested, what Descartes says 'is afflicted with a fundamental ambivalence between two incompatible conceptions' (Wilson 1978:205).[1] On the one hand he often speaks as though the union between mind and body is a matter of there being causal interaction between individual human minds and the parts of corporeal substance which are human bodies. He developed a detailed physiological theory about the workings of the human body, both as a whole and in its parts, and traced the interaction between body and mind to a single point in the brain, the *conarion* or pineal gland:

> the mind is not immediately affected by all parts of the body, but only by…one small part of the brain…. Every time this part of the brain is in a given state, it presents the same signals to the mind, even though the other parts of the body may be in a different condition at the time.
>
> (CSM 2.59–60)

The soul has 'its principal seat in the brain; it is here alone that the soul not only understands and imagines but also has sensory awareness' (*PP 4*.189).[2]

In such passages our relation to our body is made to seem rather loose, and it is hardly surprising that Arnauld should want to attribute to Descartes the Platonic view that 'man is merely a rational soul and the body merely a vehicle for the soul…which makes use of [it]' (CSM 2.143)—as though '[p]ains are not in the body at all, but in the mind. And the mind is not in the foot or hand, but in the brain' (Wilson 1978:209).

On the other hand Descartes also (and sometimes in adjacent passages—e.g. *Passions* 1.30 and 31) seems to have a quite different view of the 'union' between mind and body, a view according to which it does not consist merely in causal interaction. He says that 'the soul is really joined to the whole body, and that we cannot properly say that it exists in any one part of the body to the exclusion of the others' (PS 1.30), and that the mind is 'so closely joined' to the body that they 'make up a kind of unit' (*Med* 6 Synop.).[3]

It has been suggested that none of this involves anything different from the first idea that the union consists in mind and body being directly causally connected at the pineal gland. 'The

mind is "united" to the entire body (including the pineal gland) because it is either a proximate or a nonproximate cause of physical states and events throughout the body' (Loeb:129). This certainly makes good sense of the soul's 'radiating' (PS 1.34) through the whole body, and of its being 'united to the whole body' yet not 'extended throughout' it (CSM 2.266). But it is implausible that Descartes's talk of there being a 'substantial union' (CSM 2.160) between mind and body involves no more than this. For Descartes seems to do more here than merely use the terminology of the hylomorphic theory, in the way he does elsewhere with 'inform' (*PP* 4.189). In *The Passions of the Soul* he certainly appears to endorse something like that theory's idea that the soul is what 'formally' organises a living human being and its functions: in explaining how 'the soul is really joined to the whole body', he says that

> the body is a unity which is in a sense indivisible because of the arrangement of its organs, these being so related that the removal of any one of them renders the whole body defective. And the soul is of such a nature that it has no relation to extension…[but] solely to the whole assemblage of the body's organs.
>
> (*PP* 1.30)

It is the first of these views with which Descartes became identified, and it is one which has often been thought to be problematic:

> it is difficult to see how an unextended thinking substance can cause motion in an extended unthinking substance and how the extended unthinking substance can cause sensations in the unextended thinking substance. The properties of the two kinds of substance seem to place them in such diverse categories that it is impossible for them to interact.
>
> (Kenny 1968:222–3)

It needs to be stressed, however, that, rightly or wrongly, this did not trouble Descartes much. In his correspondence he is calmly confident that incorporeal mind can move corporeal matter.[4] When Gassendi put the problem, he replied that the question how a non-material soul can move the body and have perceptions of corporeal

things arises 'from a supposition that is false…namely that, if the soul and the body are two substances whose nature is different, this prevents them from being able to act on each other' (CSM 2.275). Descartes says that this supposition 'cannot in any way be proved'; but it could be supported by the principle that there must be an essential likeness between any cause and its effect. Moreover, Descartes himself has been supposed to hold this principle.[5]

Now the 'union' is two-way, and it links two different things—there is the mind's action on the body (as in voluntary action), and there is the body's action on the mind (as in sensation and perception). These involve different considerations. Descartes's adoption of the Augustinian idea that a cause must be at least as 'perfect' as its effect, together with the idea that the mind is more perfect than the body, has been thought to produce a problem for the body's action on the mind.[6] A further problem, in the philosophy of mind specifically, arises from the fact that at least some of the effects of body on mind have, as Descartes puts it, an 'objective' as well as a 'formal' reality.[7] This raises questions about mental representation, questions again raised by Gassendi, as to 'how… an unextended subject…could receive the semblance or idea of a body that is extended' (CSM 2.234).[8]

There are characteristic difficulties in the other direction too. Some account is needed of the voluntary action which is involved in the supposedly causal action of the mind on the body;[9] moreover, some assurance is called for that the changes of motion in the corporeal world which are effected by that action are not inconsistent with natural laws. In the main this chapter will focus on these last two points.

The question of the relation between mind and body in voluntary action is to the fore in an important correspondence which Descartes had in 1643 with Princess Elizabeth of Bohemia. She had been reading the *Meditations,* and asked him how a person's soul, 'being only a thinking substance', can 'determine his bodily spirits to perform voluntary actions' (K 136). She does not say what the problem is exactly; but a reasonable supposition, one perfectly consistent with all that is said in the correspondence, is that she is subject to what La Forge (see chapter 8) was to call the 'unhappy prejudice' of believing that the soul could move the body only in the way bodies move each other—by being corporeal and able to make physical contact.

The 'prejudice' was certainly common enough. Boyle, Gassendi, Glanvill, Locke, and More all raised the question how the immaterial mind was to get a 'handle' (Reid:1.187a) on the body.[10]

'How', asked Gassendi, 'can there be any influence exerted upon a thing and any motion in it without mutual contact between the mover and the moved?' (Gassendi 1644:273).[11] '[C]onstant Experience' shows that our 'voluntary Motions…are produced in us only by the free Action or Thought of our own Minds'; nevertheless, says Locke, '[w]e cannot conceive how any thing but impulse of Body can move Body' (1690:IV.x.19).[12]

Descartes accepted Elizabeth's question as 'the one which may most properly be put to me in view of my published writings' (K 137). Doubtless he had in mind that though these contain a deal of physiological theory about the human body, and much about the mind in elaboration of its essential property of thought, they yet contain, as he confesses, 'hardly anything' about how he 'conceive[s] the union of the soul and the body and how the soul has the power to move the body' (K 137–8).

'Hardly anything' rather than 'nothing', for what Descartes proceeds to say to Elizabeth echoes things already said in *Replies* to *Objections* to the *Meditations*.[13] In effect addressing himself to the 'unhappy prejudice', he says that it is completely wrong to 'conceive the way in which the soul moves the body after the manner in which one body is moved by another' (K 138). We have a basic notion of extension which grounds the sciences of shape and motion, and we have one of thought, in terms of which we understand the mind. But the two must be kept apart; they must not be applied where they do not belong. Nothing but confusion can come from using 'the notion of extension which entails the notions of shape and motion…to explain matters [to do with the mind] to which it does not belong' (K 138). Descartes now adds that over and above these two basic and explanatory notions, notions which pertain to the two kinds of substance, we have a *third,* which applies to their 'union'. It is this, he says, which forms the basis for an understanding of the ability of the one to move the other.[14]

This third notion, or something modelled on it, is at work, Descartes suggests, in the Scholastic theory of gravity. Since Newton, 'gravity' has been understood as a mutual attraction between masses, such as between the earth and bodies on it. According to an earlier, Scholastic theory, however, *gravitas* or heaviness was conceived as a real quality, a quasi-substance which pervades a material body and weighs it down. Though not seeing things in later, Newtonian terms, Descartes here rejects this

conception, which he had once held, and refers Elizabeth to his projected *Physics* for his own mechanistic account, an account according to which heaviness consists 'solely in the motion of bodies, or its absence, and the configurations and situation of their parts' (CSM 2.297).

His objection to the Scholastic theory is not that it is wrong in detail; it is that it is misconceived in principle. His own account explains certain behaviour of bodies in the relevant terms of the basic notion of extension and the associated ideas of shape and motion; whereas, he argues, the Scholastic theory in effect explains it in the completely inappropriate terms of the notion of mind/body union. According to Descartes there are various aspects of this which are taken over by the Scholastic theory of gravity. For example, trading on our idea of mind/body union, it feels it need not suppose (as does Descartes's own theory of gravity) that the downward motion of a heavy body 'takes place by a real contact between two surfaces' (K 139). The Scholastic theory of gravity is effectively a converse of the 'unhappy prejudice'. The latter pictures the action of minds on bodies in terms of the mutual action of bodies; the former pictures the actions of bodies in terms of the action of minds on bodies.

Elizabeth was puzzled how an appeal to a false theory could possibly help with her problem about the action of mind on body. But she misunderstood Descartes's point. He was not, as she thought, trying to explain the obscure by the misconceived. It was not his intention to illustrate and throw light on the mind/body relation by appeal to a mistaken theory.[15] His point was that that theory misappropriates a notion *we already have,* and his intent is to recover and to make a relevant use of it. As Descartes sees it, any appeal the Scholastic theory may have (and it once had some for him) derives from its patterning itself on an already understood notion. It applies to heaviness a notion which 'was given us for the purpose of conceiving the manner in which the soul moves the body' (K 139). The Scholastic idea of gravity 'was taken largely from the idea of…mind' (CSM 2.298). We are, his message is to Elizabeth, clearer than we think about the action of the mind on the body.

As Descartes admitted, these ideas are hardly prominent in his published writings. If they had been, fewer might have shared Gassendi's basic worry: 'how can the incorporeal grasp the corporeal?' (CSM 2.239). But, even if they are accepted, problems

remain. Though most of the detail was wrong, there was nothing wrong in principle in Descartes's attempt to work out rules for colliding bodies. The sizes, speeds, and directions of two moving bodies are of the same kind and directly comparable. By contrast, what goes on in the mind is incommensurable with what goes on with bodies. It is hard to see how there could be an intelligible systematic relation when there is, in Spinoza's phrase, 'no common measure' (5Pref) between them. The point is very forcibly made in the radical criticisms he makes of Descartes.

People who say that 'this or that action of the Body arises from the Mind' simply 'do not know what they are saying'. '[N]o one knows how, or by what means, the Mind moves the body, nor how many degrees of motion it can give the body, nor with what speed it can move it' (3P2S).[16] The idea is unintelligible. Mind and body are incommensurable: 'there is no common measure between the will and motion…no comparison between the powers, or forces, of the Mind and those of the Body' (5Pref). These criticisms are made in the course of what, for Spinoza, are unusually lengthy and relatively informal remarks. They were not, however, meant as an alternative to formal demonstrations. Before making them he says that though the things he has so far proved are perfectly clear to reason, yet 'I hardly believe that men can be induced to consider them fairly unless I confirm them by experience' (3P2S). So the comment that there is no comparison between the forces of the mind and those of the body is not simply a negative criticism of Descartes's belief that some actions of the body are causal effects of the mind. It has behind it a formally proved and positive claim that nothing in the body ever is a causal product of the mind.

In 2P6 he maintains that '[t]he modes of each attribute have God for their cause only insofar as he is considered under the attributes of which they are modes, and not insofar as he is considered under any other attribute'. This means that the cause of any event in the extended world is *always* itself in that world; it is never some event under the attribute of thought. The claim, more specifically put, appears later: 'The Body cannot determine the Mind to thinking, and the Mind cannot determine the Body to motion, [or] to rest' (3P2).

On the face of it, these are bold claims. While the causes of an earthquake surely lie entirely in the material world, those of a temple seem not to. The temple is a voluntary product of mind as

well as body. Spinoza expects this reaction. It will be objected, he says,

> that it cannot happen that the causes of buildings, of paintings, and of things of this kind, which are made only by human skill, should be able to be deduced from the laws of nature alone, insofar as it is considered to be only corporeal; nor would the human Body be able to build a temple, if it were not guided and determined by the Mind.
>
> (3P2S)

His response is that this does not prove the case against him. Our knowledge is just too limited to say what is not possible in the material world on the basis of its laws alone:

> [M]any things are observed in the lower Animals that far surpass human ingenuity, and…sleepwalkers do a great many things in their sleep that they would not dare to awake. This shows well enough that the Body itself, simply from the laws of its own nature, can do many things which its Mind wonders at.
>
> (3P2S)

On Descartes's account of it, the union between body and mind is a matter of events in the material world sometimes having their efficient cause (via the pineal gland) in a mind, and of events in minds sometimes having their cause (again via the pineal gland), in the material world. But this causal 'union' is not so close for Descartes that *all* events in the material world have mental causes, or that *all* mental events have material causes. Many events have causes of their own kind. In *The Passions of the Soul* Descartes discusses those parts of the material world which are human bodies, and shows many of their functions to have purely mechanical explanations.[17] Then, when he turns to the 'thoughts' of the mind, he explains how, in a similar fashion, many of them 'have the soul as their cause' (*PS* 1.19) and 'proceed directly from the soul and…depend on it alone' (1.17). Now of these, *some* go on to 'terminate in the soul itself…as when we will…to apply our mind to some object which is not material' (1.18). In these cases there is *no* connection between the mind and the body; so much do our thoughts which are not about material things terminate in the soul that they leave no bodily trace as in our brains.[18]

On the other hand, some bodily events do have mental causes. Sometimes thoughts 'proceeding directly from our soul' (1.17) do not terminate there, but rather 'consist of actions which terminate in our body, as when our merely willing to walk has the consequence that our legs move and we walk' (1.18). Similarly, some mental events have causes in the body or the wider world. Some 'thoughts' proceed neither directly nor indirectly from the soul as their cause, but from the material world. In such cases 'it is not our soul which makes them such as they are, and the soul always receives them from the things that are represented by them' (1.17)—be it our body, as with pain, or 'objects outside us', as with the light of a torch.[19]

Spinoza's position on the idea that some events in the mind have causes in the body or in the wider material world, and that some events in the body have causes in the mind, is clear. Quite simply: there is *no* causal connection between the attributes of thought and of extension; events in the corporeal world *always* have their causes in that world, and events in the mind *never* have theirs there. They always have theirs in the mind. But it is one of the thrusts of his informal remarks about this that Descartes is wrong, not only about the causal nature of the 'union', but *also* about its being less than complete.

Spinoza's reply to the pro-Cartesian claim that we know by experience 'that unless the human Mind were capable of thinking, the Body would be inactive' is that when 'the Body is inactive, the Mind is at the same time incapable of thinking' (3P2S). This is not as 'entirely wrongheaded' (Loeb:158) as has been suggested. Of course, Spinoza can hardly hope to show that the mind does *not* act on the body by showing, what Descartes anyway does not deny, that the body *can* act on the mind. His remarks are meant to indicate, however, not only that the mind and the body cannot act on each other (as at 3P2), but also that every mode of extension has a corresponding mode of thought, and vice versa (as at 2P7). Part of their intent is to show 'that both the decision of the Mind and the appetite and the determination of the Body by nature exist together' (3P2S). This deeply non-Cartesian view, that there is a complete (though non-causal) correspondence between mental and bodily events, is offered more support when Spinoza replies to the suggestion that there surely is such a thing as voluntary action, in which what happens in the body is entirely up to our mental decisions. We are not,

he says, as free as we think: '[M]en believe themselves free because they are conscious of their own actions, and ignorant of the causes by which they are determined …the decisions of the Mind are nothing but the appetites [of the Body]' (3P2S). So while the 'union' of the mind and body consists for Descartes of intermittent (causal) links between the two, it consists for Spinoza of a complete (non-causal) correspondence. 'The order and connection of ideas is the same as the order and connection of things' (2P7). Added to the fact that corporeal events always have corporeal causes, and mental events mental causes, is the fact that there is a thoroughgoing correspondence between the two causal series.

Spinoza speaks of this correspondence as being a matter of identity. He says that 'the Mind and the Body are one and the same thing' (3P2S). He says not simply that 'the decision of the Mind and the…determination of the Body by nature exist together', but rather that it is

> one and the same thing, which we call a decision when it is considered under, and explained though, the attribute of Thought, and which we call a determination when it is considered under the attribute of Extension and deduced from the laws of motion and rest.
>
> (3P2S)

But the mind and the body cannot be identical just like that; their 'union' cannot be straightforward identity. Two modes under different attributes cannot be simply identical any more than the two attributes can. The relation is described elsewhere less straightforwardly as one in which the body is the 'object' of the mind, the mind the 'idea' of the body (2P12). To understand this, Spinoza says, is to understand 'not only that the human Mind is united to the Body, but also what should be understood by the union of Mind and Body' (2P13S).

It will turn out that Leibniz's account of the mind/body 'union' is un-Cartesian in just the ways Spinoza's is: an intermittent causal interaction is replaced by a complete, and completely non-causal, correspondence. Bodily events always have bodily causes and mental events always have mental causes; and between these two series there is a correspondence in which the mental events

'represent' the bodily ones. In his case this was worked out not just in reaction to Descartes, but in response to the occasionalists too.

As we saw in chapter 7, the occasionalist conclusion that the causal activity in the material world is merely 'secondary' was part of a larger argument: bodies cannot cause motion either in themselves or each other, so minds must be the cause; finite human minds cannot cause motion in bodies; therefore God must be the cause of motion in bodies.[20] There is, we have seen, disagreement about the extent to which the first premise of this argument is non-Cartesian. There is disagreement whether Descartes thought that the motive force of inanimate bodies in motion resided in them, or whether he thought it resided in God's will. But it is quite clear that the second premise, that finite minds cannot cause bodily motion, *is* non-Cartesian. Descartes clearly thought that a human mind could have a real effect on that part of the material world which was its own body.[21]

Malebranche's support for this second premise, that 'there is absolutely no mind created that can move a body as a true or principal cause, just as it has been said that no body could move itself, is that 'when we examine our idea of all finite minds, we do not see any necessary connection between their will and the motion of any body whatsoever' (1674–5:448). By contrast, he says that when we think of God, 'infinitely perfect and consequently all-powerful', we know that 'there is such a connection between His will and the motion of all bodies, that it is impossible to conceive that He wills a body to be moved and that this body not be moved'. But even granted that an all-perfect, all-powerful will cannot fail to be efficacious, why should it follow that a finite one cannot ever succeed?

Perhaps in explanation of this, perhaps as a further argument, Malebranche says elsewhere that 'I see clearly that there can be no relation between the volition I have to move my arm and the agitation of the animal spirits' (1677–8:669). The point, which is repeated more than once and at some length, is that since we do not know all the anatomical facts relevant to our arms' movements, we are hardly in a position to move them.[22]

Speaking in the *Discourse on Metaphysics* of the 'great mystery of the union of body and soul' Leibniz agrees with Malebranche's anti-Cartesian conclusion that 'there is no way we can conceive of an influence of the one on the other' (DM 33). This denial of causal connection is repeated in his correspondence with Arnauld

in a way which very noticeably echoes Spinoza's earlier point 'that there is no common measure between the will and motion…no comparison between the power, or forces, of the Mind and those of the Body' (5Pref). Mind and body, Leibniz says, 'are incommensurable and nothing can determine what degree of speed a mind will impart to the body' (*LA* 117). Underlying this apparent anti-Cartesian agreement there is in fact a difference which puts Spinoza and Leibniz on one side against Malebranche on the other, and which puts Malebranche closer to Descartes than at first appears. It has to do with the 'incommensurability' of mind and body.

Spinoza's and Leibniz's point about this is clear. There is nothing wrong with the idea that, in terms of speed and direction, bodies are affected in their collisions with each other. But the idea that the mind could affect the speed and direction of bodies is wrong in principle. How could one begin to work out how the speed and direction of things in the material world will be changed by a mental volition? 'I should like very much to know', says Spinoza, 'how many degrees of motion the Mind can give to that pineal gland' (5Pref). Spinoza left the matter there, but Leibniz developed it into something more precise: the mind's giving of any degree of motion to some part of the material world is inconsistent with Descartes's physics, specifically with his law of nature according to which there is a constant amount of motion in the world. In accordance with that law, when something collides with my stationary arm and causes it to move, the motion my arm acquires is counterbalanced by loss of motion in the colliding object. But if my mental desire were to cause my arm to move there would need to be an increase of the arm's motion which could not be counterbalanced by a loss in my mind, for my mind has no extended size or speed, and so no quantity of Cartesian motion. The supposed action of the mind on the body therefore involves an increase in the total quantity of motion in the extended world, contrary to Descartes's law.

This point, which had earlier been raised by Cordemoy,[23] did not stand out as starkly in the correspondence with Arnauld as it did ten years later. In a published explanation of his then-recent 'New system' Leibniz not only raises the problem, but also says that Descartes was conscious of it. 'Descartes believed in the conservation of the same quantity of motion in bodies…[and] he

was perplexed by the changes which take place in the body in consequence of modifications of the soul, because they seemed to break this law' (Lt 327).

There is actually no reason—at least not on the basis of any evidence available now—to suppose that Descartes ever was 'perplexed' by this.[24] It has indeed been suggested that Descartes's doctrine about overall conservation of motion, *as he understands it,* perhaps is not actually inconsistent with the possibility that the mind could add to the motion of the body or its parts. Quite simply, Descartes's position may have been that while causal interaction *between bodies* cannot increase motion, causal interaction *between mind and body* can.[25] There is support for this interpretation in the fact that, when discussing the law that collisions between bodies redistribute a constant quantity of motion, Descartes first says that '[*a*]*ll* the particular…changes which bodies undergo are covered by this law'; and then he adds: 'or at least the law covers *all changes which are* themselves *corporeal* (*PP* 2.40, my italics). 'I am not here inquiring', he says, 'into the existence or nature of any power to move bodies which may be possessed by human minds.'

This is some indication that an absence of 'perplexity' on Descartes's part need not be due to his failure to notice an inconsistency in his view so much as to there being no inconsistency to notice. It should be remarked, however, that even if the addition of motion to the material world by the action of the mind is not inconsistent with the law of conservation of motion *as Descartes understands it*, it is possibly inconsistent with the stability of the Cartesian world. As Cordemoy suggested, if a certain quantity of motion is required for the world to be as it is, that amount will need to be constant if the world is not to be radically unstable.

> Now Leibniz goes on to say that Descartes thought he had found a way out of [his supposed perplexity] (which is certainly ingenious) in saying that we must distinguish between motion and direction; and that the soul cannot increase or decrease the moving force, but that it changes the direction or determination of the course of the animal spirits, and that it is in this way that voluntary motion takes place. (Lt 327)[26]

And within the terms of Descartes's own metaphysics this certainly is a 'way out' of the problem. From the very outset, Descartes's discussion of the laws of motion laid down a distinction between the speed of a body's movement and its direction. Moreover (see chapter 6), it is clear that what God conserves is 'quantity of motion' which is a function of a body's scalar speed, and to which direction is quite irrelevant. Since changes of direction have 'the anomalous status of changes that are not changes' (Westfall:67) in Descartes's physics, they are ideally suited as the means by which the soul can make itself felt in the world. Yet just as there is no evidence that Descartes was ever 'perplexed', so there is none that he took this 'way out'. We have nothing to justify Leibniz's remark to Arnauld that 'apparently M.Descartes intends, that the soul…changes only the direction or determination of the movement and not the force which is in the bodies'(LA 117).[27]

But even if Leibniz is wrong about Descartes, his imagination is not running completely free, for the story is true of Descartes's followers. Just sixteen years after Descartes's death La Forge says that

> the soul has no power to increase or decrease the motion of the spirits which leave the gland, but only to determine them, that is to say, to turn them in the direction where they need to go to execute its will. That is clear from what has already been said about God conserving the same quantity of motion that he has put in nature, neither increasing nor decreasing it.
>
> (245–6)[28]

It is ironic that Descartes or anyone else should try in this way to make the voluntary action of the mind on the body consistent with Descartes's law of conservation of motion. For, as Leibniz well knew by the time he wrote to Arnauld, that law is false. It is doubly ironic that though Cartesian motion is *not* conserved (see chapter 6), 'directed motion' is. If a moving object causes my stationary arm to move, the change of directed motion, or momentum, of my arm must be counterbalanced by a corresponding change of momentum in the object. So even if a desire caused a change merely in the direction of motion of the arm or parts of it, this would involve a change of momentum which was not counter-balanced by a corresponding change

elsewhere. As Leibniz points out to Arnauld, the attempt to preserve consistency with the Cartesian law is of no avail, for 'there is still in nature another general law which M.Descartes did not perceive…namely that the same total direction or determination must always continue to exist' (*LA* 117). In a needless attempt to save a false 'law' the 'ingenious way out' falls foul of a true one!

Leibniz liked this argument against Cartesian interactionism, and he repeated it over the years.[29] He naturally claimed that his own account of the relation between body and mind (what came to be called the system of pre-established harmony, and which we have yet to consider) was not open to it. But in his later years he also makes the rather stronger claim that if Descartes had known of the law of conservation of directed motion, he would have been led directly to Leibniz's own view of mind/body 'union'. If the law of conservation of direction

> had been known in Descartes's day…he would undoubtedly have been led to my system of pre-established harmony, for he would have recognized that it is just as reasonable to say that the soul does not change the quantity of the direction of the body as it is to deny to the soul the power of changing the quantity of its force, both being equally contrary to the order of things and the laws of nature, since both are equally inexplicable.
>
> (L 587)

Bertrand Russell found this claim too bold: why could Descartes not as easily have been led to occasionalism, or to Spinoza's view of the union between mind and body?[30] Yet Leibniz had already answered at least the first part of this question. Quite simply, the argument against Descartes's interactionism *applies equally against occasionalism*. The point is explained in detail in the *Theodicy*. If, Leibniz says, Descartes had been aware that 'direction [momentum] is…conserved', he would have 'recognized that without a complete derangement of the laws of Nature the soul could not act physically upon the body'. And, if he had recognised that, he would have been 'led direct to the Hypothesis of Preestablished Harmony'. Then, as if in direct answer to Russell, he says, 'I did not believe that one could here listen to philosophers …who produce a God…to bring about the final solution of the piece,

maintaining that God exerts himself deliberately to move bodies as the soul pleases, and to give perceptions to the soul as the body requires.' And why not? Because 'this system…of *occasional causes*…besides introducing perpetual miracles to establish communication between these two substances, does not obviate the derangement of…natural laws' (*T* 156).

Leibniz's objection about miracles has already been discussed, in chapter 7. His further objection here to occasionalism is that it would involve an inconsistency with natural law *even for God,* and even with perfectly uniform regularity, to move a body *on the* '*occasion*' of some event in a mind. If the cause of a change in the motion of a body were ever a change in mind, and not some change in the motion of another body, then, whether it be a 'real' or an 'occasional' cause, the law of conservation of directed motion would be broken. So far as these considerations are concerned, occasionalism constitutes no improvement over interactionism. Its substitution of 'occasional' for 'real' causation does not escape the point that an account of the union of mind and body must not involve the interruption of the laws of physics by mental events.

Leibniz makes this quite clear to Arnauld. '[O]ne must not be worried', he says, 'as to how the soul can impart some movement or new determination to animal spirits, since in fact it never does.' The occasionalists are right about that. But in fact there is still 'the same problem…to be found with the hypothesis of occasional causes as with the hypothesis of a real influence of the soul upon the body'. So long as the question is one of 'obeying a fixed law' such as that of conservation of directed motion, 'nothing can determine what degree of speed a mind will impart to a body, not even what degree of speed God would wish to impart to the body on the occasion of the mind' (*LA* 117). Though his occasionalist followers disagree with Descartes about the metaphysics of causation, they effectively agree that, be it 'real', or be it 'secondary' and 'occasional', there is causation between mind and body. They both allow that the material world is not closed to mental causation, and that, from time to time, bodily movements are not subject to otherwise true conservation laws.

About 1680 (as we saw in chapter 7), Leibniz agreed with Malebranche that there is no interaction between finite minds and bodies; but he thought Malebranche had 'gone only halfway'. Going the whole way—as Leibniz did in the *Discourse on*

Metaphysics and the ensuing correspondence with Arnauld—involved realising that matter must therefore be something more than extension; and that though created things are not interactive (as indeed Malebranche says), they are nevertheless *active* (something which Malebranche denies). This resulting conception of a created substance is one according to which 'all its actions come from its own depths, except for dependence on God' *(LA* 170). Now by this account of substance, Leibniz says in the *Discourse,* '[w]e are …unexpectedly brought to a clear insight into the great mystery of the union of body and soul' *(DM* 33).[31] '[T]he true principle' of the union is this:

> We have said that everything which happens to the soul and to each substance follows from its concept; hence the idea itself, or the essence of the soul, carries with it that all its appearances and perceptions must arise spontaneously out of its own nature and in just such a way that they correspond, by themselves…to what happens in the body which is assigned to it.
>
> (*DM* 33)

Leibniz's 'hypothesis of concomitance' between body and mind, which with increased confidence he came to call 'the system of pre-established harmony', is shaped by two things: first, he explicitly says, by his account of substances, an account which also offers an alternative to the miracles of occasionalism; second, by the need to avoid the difficulty, which we have just been reviewing, about not only 'real' but even 'occasional' action of mind on body.

Despite the fact that Leibniz's hypothesis of concomitance was born of his objections to occasionalism it was not always clear to some of his contemporaries how it differed from it. It seemed to Arnauld in 1687 that Leibniz was 'saying the same thing in other words' (*LA* 105) as the occasionalists; it seemed to Foucher in 1695 that Leibniz's system was 'scarcely more advantageous than that of the Cartesians' (trans. R.N.D.Martin in Brown 1983:48). Leibniz's own way of talking perhaps encouraged such judgements. He wrote towards the end of his life that his views were not very far removed from Malebranche's. 'The transition from occasional causes to pre-established Harmony', he said, 'doesn't seem very difficult' (E 704). Typically positive, he explained his view, not as a denial of Malebranche's, but as an advance from or development of it.

For Leibniz, one requirement of any satisfactory account of the union of body and mind is that there is real causation in the created world, and that there is no need always to have recourse to God's 'extraordinary' action. Another is consistency with the law of conservation of directed motion, or momentum. Both these requirements are met by the central feature of his 'hypothesis', which (as in Spinoza's view too) is that every bodily event has a bodily cause and every mental event a mental cause. '[Everything occurs in the soul as if there were no body, just as everything occurs in the body as if there were no soul' (L 578). So far as the mind is concerned this is clear. As we saw in chapter 4, a human mind is an immaterial substance, and, being such, 'all its appearances or perceptions must arise…out of its own nature' (DM 33). The matter is less straightforward for the body (as discussed at the end of chapter 7), for, taken by itself and apart from the soul, it is not a substance. It is, however, a mass of secondary matter and possesses active moving force. It is clear that everything that happens, either between its parts, or between it and other bodies, happens mechanically and in accordance with the laws of motion.

Now from Descartes's and Malebranche's points of view the 'union' between mind and body consists in causal connections ('real' or 'occasional') between them. From there it would seem that, in denying all causal connection between them, Leibniz is effectively disuniting the mind and the body. But Leibniz's hypothesis is that the two are united by a non-causal 'concomitance' or 'correspondence':

> God…first created the machine of the world in such a way that, without constantly violating…laws of nature…it happens precisely that the springs of bodies are ready to work by themselves, as necessary, at the moment when the soul conceives a suitable act of will or thought that it too has conceived only in accordance with the preceding states of the bodies, and that thus the union of the soul with the machine of the body…consists only of that concomitance which betokens the admirable wisdom of the creator much better than any other hypothesis.
>
> (*LA* 118)

Moreover, besides its non-causal basis, the 'union' of Leibniz's 'concomitance' differs from a causal union in being complete. It is

not part of Leibniz's view, as it is of Descartes's and Malebranche's, that the 'union' is a matter of *some* bodily (or mental) events being related to mental (or bodily) events. 'Concomitance' means that they *all* are. Everything in the mind has a correspondence with something in the body, and vice versa. This is clear from Leibniz's reply to Bayle's comments on his 'New system', at a time when 'concomitance' had become 'pre-established harmony':

> [C]ertain movements, rightly called involuntary, have been ascribed to the body in such a way that nothing is believed to correspond to them in the soul; and reciprocally, it is believed that certain abstract thoughts are not represented at all in the body. But there is an error in both of these views. (L 580)[32]

Leibniz similarly claimed that 'to all the movements of our body there correspond certain more or less confused perceptions or thoughts of our soul' (L 339) and that '[t]he body is made in such a way that the soul never makes any resolutions to which the movements of the body do not correspond' (L 577). 'Everything which ambition or any other passion makes the soul of Caesar do is represented in his body as well, and the movements of these passions…all come from impressions of objects' (L 577).

As Leibniz describes it, the 'correspondence' between the mind and the body is a matter of the former 'representing' or 'expressing' the latter. It is, he says, the very 'nature of the soul to represent the body' (L 517).[33] Descartes's distinction between events in the mind in respect of which it is active and those in respect of which it is passive and 'have the body as their cause' is captured and reinterpreted in terms of a distinction between the distinct representation which is thought, and the confused representation which is sense-perception.[34] '[T]hat whose expression is the more distinct is judged to act, and that whose expression is the more confused is judged to be passive' (PM 79).

For Leibniz, of course, many of these confused sensations 'represent' events in the body which Descartes did not consider had effects in the mind. Leibniz's claim 'that there is always a perfect correspondence between the body and the soul' is to be taken at its face value. 'I even maintain that something happens in the soul corresponding to the circulation of the blood and to every internal movement of the viscera' (*NE* 116).[35] Spinoza's claim that

there is a one-to-one correspondence between modes of thought and modes of extension leads him to say that, since the object of the idea which is the human mind is the body, 'nothing can happen in that body which is not perceived by the Mind' (2P12).[36] There may be ways of not doing so, but there seems no good reason for not taking this literally.[37]

Besides saying that everything that happens *in the body* is represented, albeit confusedly, in the mind, Leibniz goes significantly further and says that everything that happens *in the rest of the material world* is, via our bodies, represented there too. This is clearly so of some events in the wider world—as, for example, with the sound produced by a distant bell. But Leibniz's view is that it is so of all. '[O]ur body must be affected in some way by the changes of all the rest', and since 'to all the motions of our body there correspond certain perceptions or thoughts of our soul, more or less confused…the soul will also have some thought of all the motions of the universe' (L 339).[38] Because of his belief in a material plenum Descartes, says Leibniz, 'would himself have agreed…that the slightest movement exerts its effect upon near-by bodies, and so from body to body to infinity, but in diminishing proportion' (L 339).[39] Descartes would not have agreed, however, that our minds have, as Leibniz puts it, 'thoughts of all the motions of the universe'; for he thinks that some of the movements in the body have no eventual effect on our minds.

Spinoza does not explicitly commit himself to the claim that everything in the material world has its effect on the body, but he does devote some time to the point that the complex mode of extension which is our body and which relates to the mode of thought which is our mind is at least often affected by other extended modes. At least sometimes 'the human Mind perceives the nature of a great many bodies together with the nature of its ownbody'(2Pl6Cl).[40]

Leibniz tends to put the claim that our minds, more generously than we usually think, represent the whole world, in terms of the idea that, more meanly than we usually think, they directly represent only our own bodies—as though we do not see the distant hills but rather our retinas or brains. Spinoza speaks in this way too. '[T]he ideas we have of external bodies indicate the condition of our own body more than the nature of the external bodies' (2P16C2).

Leibniz's claim, that via our bodies all that happens in the material world is represented in our minds, connects with a claim

he often makes—as, for example, in his *Discourse on Metaphysics*—about the nature of an individual substance. Leibniz holds, as we saw in chapter 4, that it is the nature of an individual substance to have a 'complete concept' sufficient for the understanding and deduction of all its predicates. But (what chapter 4 did not bring out) this means ('when we well consider the connection of things') that in an individual's substantial soul 'there are at all times… traces of all that has happened to him and marks of all that will happen to him and even traces of all that happens in the universe' (*DM* 8). Thus 'each singular substance expresses the whole universe in its own way, and…in its concept are included all of the experiences belonging to it together with all of their circumstances and the entire sequence of exterior events' (DM 9). So the whole world 'is in a certain sense multiplied as many times as there are substances, and the glory of *God* is likewise redoubled by as many wholly different representations of his work' (DM 9).[41]

In effect Leibniz himself replied to the first half of Russell's objection that had Descartes been aware of the law of conservation of directed motion, he could just as easily have been led to the occasionalist's, or to Spinoza's view of the union of mind and body, as to the pre-established harmony. As for the second half, it is now apparent that in at least three important respects Spinoza's and Leibniz's views are essentially the same. They both maintain that there is no causal interaction beween body and mind, and that bodily (or mental) events always have bodily (or mental) causes. They both maintain that for every bodily (or mental) event there is a corresponding mental (or bodily) event. Finally, they both maintain that this non-causal correlation between body and mind is one of 'representation'.[42]

This does not mean that their accounts are identical, and Leibniz was not silent about why his is to be preferred. Given the anti-occasionalist connections he makes between substantiality and force or activity, he naturally takes occasionalism to be concurrent with Spinoza's denial of substantiality to created things, the mind in particular:

> [T]he doctrine of occasional causes…is fraught with dangerous consequences…. So far is this doctrine from increasing the glory of God by removing the idol of nature that it seems rather, like Spinoza, to make out of God the

> nature of the world itself, by causing created things to disappear into mere modifications of the one divine substance, since that which…lacks active force…can in no way be a substance.
>
> (L 506–7)

It is worth dwelling in conclusion on how Leibniz's hypothesis of concomitance applies to corporeal substances, such as human beings and other animals, as Leibniz explained them to Arnauld. As seen in chapter 4, corporeal substances consist of an immaterial 'form' or 'soul', and a material body—the first of these being a substance itself, the second being an aggregate of other and smaller corporeal substances. As an account of the union of body and mind, the hypothesis of concomitance is, therefore, an account of the relation between these two elements. It holds that every event or change that takes place in a corporeal substance's 'form' is a consequence of previous states of that same 'form'. Since the material body is not itself a substance, its events or changes need not be consequences exclusively of its earlier states or changes; they could be consequential on changes in the wider material world. In any case, no event in it will be a consequence of anything in the 'form' which it embodies. Making this clear to Arnauld, Leibniz says that '[a]ll bodily phenomena can be explained mechanically…without troubling whether souls exist or not' (*LA* 96).[43]

In his discussion with Bayle on the pre-established harmony, Leibniz (in a manner reminiscent of Spinoza)[44] makes much of the unlimited possibilities of mechanism. 'There is no doubt whatever that a man could make a machine capable of walking about for some time through a city and of turning exactly at the corners of certain streets' (L 575). Someone cleverer than a man but still of finite intelligence 'could construct a ship capable of sailing by itself to a designated port, by giving it the needed route, direction, and force at the start, but could also form a body capable of counterfeiting a man' (L 575). There is, then, nothing impossible in principle about all bodies of the material world, created by the infinite wisdom and power of God, being 'infallible machines of nature' (L 576).

In its application to non-human animals, the half of this hypothesis which concerns changes in the body is in entire agreement with, and indeed reinforces, all that Descartes wanted to say. According to him (see chapter 8), non-human animals are simply machines; as

with clocks, all that they do can be explained in terms of the motions of matter. But (see chapters 8 and 9) Descartes does not hold the same of human animals. They are not just machines for him, and (see chapter 8) some of what happens to their bodies is caused by their minds. From the point of view of a complete materialist, such as Hobbes or Epicurus, Descartes is wrong about that. In no case for them are there immaterial minds to affect the body, and human beings are purely mechanical too. According to one half of Leibniz's hypothesis of concomitance, therefore, Cartesianism is only partially right, and materialism is wholly so.

These dialectical relationships are explicit in the exchanges Leibniz had with Bayle.[45] Summing the matter up he says

> everything takes place in the body as if the evil doctrine of those who believe, with Epicurus and Hobbes, that the soul is material, or as if man himself were only a body or an automaton. These materialists have thus extended to man as well what the Cartesians have held regarding all other animals…. Those who point out to Cartesians that their way of proving that beasts are only automatons tends at length to support the view that it is possible, metaphysically speaking, for all other men except themselves also to be simple automatons, have said exactly and precisely what I need in order to prove the half of my hypothesis which concerns the body.
>
> (L 577)

According to the other half of Leibniz's hypothesis, that the mind is a 'spiritual automaton' (as he says), and that all changes in it result from it, Descartes again is partially right. He is right that *we* have immaterial substantial minds, and that our thoughts often reflect what is going on in our body. In this respect the materialists are completely wrong:

> internal experience refutes the Epicurean doctrine. This experience is the consciousness within us of this Ego which perceives the things occurring in the body. And since this perception cannot be explained by figures and movements, it establishes the other half of my hypothesis and makes us recognize an indivisible substance in ourselves which must itself be the source of its phenomena.
>
> (L 578)

But, at the same time, Descartes is partly wrong too. He is wrong to hold that animals do not have minds too, and wrong to hold that our mind is *not always* 'the source of its phenomena', and that sometimes the body is.

NOTES

1 For discussion see Wilson 1978:207–18; see also Mattern: 217–19, Williams: 289–90.
2 See also *PP* 1.46, 47, 4.196. For Descartes's general physiology see *Treatise on Man* (CSM 1.99–108), *Description of the Human Body* (CSM 1.314–24); for the gland/mind connection in particular, see PS 1.31, CSM 1.100.
3 See also 1.141, 2.56, K 119–20.
4 K112, 139, 235–6, 239.
5 Foucher has been suggested as one of the first to make this difficulty explicit for Descartes; see O'Neill: 227–8, Watson 1966:36, Watson 1969:xviii. There is disagreement whether Descartes does hold this principle and how it relates to other 'causal likeness' principles which he does hold, such as that 'whatever reality or perfection there is in a thing is present either formally or eminently in its first and adequate cause' (CSM 2.116; see also 28, 96–7, K 91, *B* 24). For discussion see Clatterbaugh, Jolley 1987, Loeb: 134ff., O'Neill 1987, Radner 1985:40–4.
6 CSM 2.97; for discussion see Jolley 1987:45f., Machamer 1986:136f.
7 CSM 2.27–9, 74–5. A tree has 'formal' reality, as part of the corporeal world; similarly my idea of it has the 'formal' reality of real existence as a mode of my mind. But the idea has an 'objective' reality too inasmuch as it represents the formally real tree. For a discussion of the problems see Watson 1966:50ff.
8 Malebranche was similarly concerned (Smith: 92f.).
9 Loeb 143ff., Machamer 1986:136, 140ff.
10 Boyle 1681:224, Glanvill:21f., More 1662b:81.
11 See also CSM 2.238–9.
12 Locke later *could* conceive how, and he accepted 'action at a distance' (1823:4.464–5, 467–8).
13 CSM 2.296–9; see also, later, K 236.
14 As an explicit and considered doctrine the idea of a primitive and basic notion of thought/extension union, over and above the familiar two of thought and extension, is quite new; and it is somewhat disturbing if it means that there are *three* principal differentiating attributes and hence *three* different kinds of substances. For discussion see Ariew, Broughton and Mattern, Garber 1983b, Mattern, Radner 197la, Richardson.
15 As Mattern: 215 suggests.
16 See also 2P35S.
17 See also CSM 1.314–24.

18 K 112.

19 1.23, 24.

20 For the argument in La Forge, Cordemoy and Malebranche respectively, see Clarke 1989:107; Clarke 1989:110–11, Lennon: 812; and Malebranche 1674–5:448.

21 While bodies, for Descartes, are always passive, unable to initiate but able only to receive motion from the mind or to communicate it to each other, minds, for him, are sometimes, but not always, active. One division he makes amongst the 'thoughts' of the mind is between 'volitions', or 'actions of the soul', and 'perceptions', or 'its passions' (1.17). Just as volitions may have their effect in a mental 'perception' or a bodily movement, so some perceptions 'have the soul as their cause…[such as] are the perceptions of our volitions and of all the imaginings or other thoughts which depend on them' (1.19), and others have the material world as their cause (1.23, 24). Elsewhere Descartes explains the activity and passivity of the mind in terms of 'will' on the one side, and 'perception, or the operation of the intellect' on the other (K 102, *PP* 1.32). It is this distinction which Malebranche takes up when he comes to discuss the matter.

Now Leibniz agrees with the occasionalist that it would be wrong to suppose that our 'volitions' can be 'real' causes of any bodily movement, but he holds that it would be simply 'foreign to reason' to extend this to 'the *immanent* [internal] *actions* of substances' (L 502). For 'who will doubt that the mind thinks and wills, that many thoughts and volitions are produced in us and by us and that there is something spontaneous about us?' (L 502–3). He says also that, similarly, Malebranche 'seems to admit at least the internal action of particular spirits' (L 555). But it is hardly straightforwardly clear that this is so (see also McCracken 106–10). Malebranche certainly denies (what Descartes asserted (PS 1.18–20)) that our thinking of a certain thing is caused by our wanting or deciding to think of it. 'I deny that my will is the true cause…of my mind's ideas' (1677–8:669; cf.671). As for the volitions or 'inclinations' or 'willings' (1674–5:2) themselves, God is the cause of these too (4). It is true, however, that as produced by God these are merely 'vaguely and indeterminately directed' (5) to the good in general, and our will does have a real ability to 'direct' its inclinations in particular determinate ways; so our will 'in a sense can be said to be active' (4). (Interestingly, Malebranche draws a direct comparison between this and the redirection of natural rectlinear motion (4; cf. Descartes, CSM 1.97).)

22 1674–5:449–50, 670–1, 1688:163. Smith: 88 and Doney 1967:41–2 report that this principle was held earlier by the Dutch occasionalist Geulincx. Cf. Descartes at CSM 2.298.

23 140–1.

24 See Garber 1983a: sect. 2 (and nn. 21 and 35 in particular), Remnant. Perhaps Descartes was, or would have been, perplexed in the never-written, or now lost, third part of the *Treatise on Man,* which deals with 'how these two natures ["a soul and a body"] would have to be joined and united in order to constitute men who resemble us' (CSM 1.99).

25 Garber 1983a:115; for a different suggestion about how Descartes might be rendered consistent see Remnant (and Garber 1983a:
26 see also LA 117, T 60.
27 Erdmann: 2.27 suggests there is evidence for it in the fourth set of Descartes's *Replies to Objections,* and Williams:281 reports a suggestion that it is 'implicit' in the *Treatise on Man.*
28 In *TGM (C* 131–2) Spinoza perhaps says that the mind can affect direction of motion of the animal spirits; see Lachterman: 108 n. 70, Wolf 1910:227–8 for some discussion of Spinoza's early views on body/mind.

The 'ingenious way out' is later discussed, mentioned, or taken by Bayley: 2.11–12, Boyle 1681:224, Clarke 1704:2.558–9, Clerselier (see Garber 1983a:130 n. 35), Locke 1690:IV.x.19.

29 L587–8, 655, Lt 263–4.
30 1937:81.
31 See also L 445, *LA* 84, PM 80.
32 See also *NE* 116. Clearly Descartes (as seen earlier in this chapter) is someone who believed these things.
33 See also L 339, 340, 493, 496, 649, 710, *LA* 65, 1 13.
34 L 517, 580–1, *DM* 15, *LA* 64–5.
35 See also L 339, 496.
36 See also 2P15Dem.
37 For some discussion and reaction see Odegard: 71, Parkinson 1954:110–11, Wilson 1980:108.
38 See also L 340, 493, 496, 649.
39 See also L 340.
40 See also 2P14–18, 29.
41 See also *DM* 14, L 269, 649, *LA* 63–4.
42 For further discussion of the similarities between Leibniz and Spinoza see Wilson 1980:105–8. Wilson 1980:110–13 also provides a useful discussion of Spinoza's notion of 'representation'; see also Bennett:153ff, Radner 1971b. For Leibniz's notion of it see 'representation' in the index to McRae 1976.
43 See also *DM* 12.
44 *E* 3P2S, 5Pref.
45 These exchanges were stimulated by Leibniz's account of mind/body union in his 'New system' (1695), which Bayle discussed in a note to his *Dictionary* (1697) article, 'Rorarius'. Contributing to the debate provoked by the Cartesian view of animals as insensate machines, Rorarius had tried to show that animals use reason even better than we do. Bayle feels that the attribution of reason to animals would blur the distinction between them and us and make it hard to show that our souls are immortal. Yet, successful as Descartes is in maintaining the distinction, he cannot, Bayle thinks, make sense of the evidence Rorarius presents.

10

Uncreated and Created Substance: God and the World

A feature of seventeenth-century metaphysics is a contrast between uncreated and created substances, or between God and the world. It is not a completely stable contrast: the ideas of being created and dependent, and yet substantial, did not go easily together. Thus Descartes is led to say that the definition of substance as 'a thing which exists in such a way as to depend on no other thing for its existence' applies properly only to God; all other substances 'can exist only with the help of God's concurrence' (*PP* 1.51). With Spinoza the contrast collapses completely: for him nothing created is a substance, and God's creation consists wholly of modes. Similarly, Leibniz argues that occasionalism too amounts to a denial that God's creation is substantial. A good part of Leibniz's effort is, in effect, devoted to showing how substantiality is compatible with dependence on a creator. His success depends on the cogency of the distinction, on which he places much weight, between God's 'ordinary' and his 'extraordinary' concourse.

None of these three philosophers takes the existence of God for granted. They each provide proofs,[1] though this was not always sufficient to protect them from accusations of atheism.[2] The God of Descartes and Leibniz is an infinite immaterial thinking substance. Descartes speaks of 'a substance that is infinite, eternal, immutable, independent, supremely intelligent, supremely powerful, and which created both myself and everything else' (CSM 2.31);[3] and God for Leibniz is an immaterial 'spirit', a 'supreme substance', 'absolutely perfect', the 'source of everything', 'absolutely infinite', with wisdom and goodness.[4] Spinoza's 'absolutely infinite' (1D6) God, on the other hand, is extended as well as thinking substance; and as thinking substance he has neither intellect nor will.[5] The

kind of existence which pertains to Spinoza's God is (see chapter 4) of a radically different sort from that of Descartes's or Leibniz's, which exists as the instantiation or exemplification of an essence.[6] Leibniz probably has Spinoza in mind when he says 'God is not something metaphysical, imaginary, incapable of thought, will or action, as some make him…. God is a particular substance, a person, a mind' (trans. Macdonald Ross: 136).[7] It was, however, not so much the abstract nature of his God which led to Spinoza's common vilification as an atheist as the misinterpretation of him as a materialist who called the corporeal world by the name 'God'.[8]

A traditional problem and one of concern in the seventeenth century was how an immaterial God could create a material world—a problem sometimes partly solved by supposing that God merely imposed form on already existing matter. In puzzling about this both Locke and Newton made an interesting connection between the action of the human mind on the body and God's creation of matter: 'God…created the world solely by the act of will just as we move our bodies by an act of will alone' (Newton, quoted Westfall:340). Explain the latter, said Locke, 'and then the next step will be to understand Creation' (1690:IV.x.19). But Descartes was untroubled how God's will brings about a material world. Hobbes' attempt to press him about what meaning can be given to 'creation' was simply sidestepped.[9]

Faced with Locke's suggestion, Leibniz undercut it by saying that our bodies move not by, but only in pre-established harmony with, our will. This left him having to say that though all substances were created by and depend on God, 'yet we cannot understand in detail *how* this was done' (*NE* 443).[10] Sometimes he uses the language of a traditional doctrine of so-called emanation:[11] 'created substances depend on God, who…produces them…by a kind of emanation, as we produce our thoughts' (L 311).[12] This happens, Leibniz says, once God has decided what will best 'manifest his glory', at which point he 'sees fit to render his thought effective and to produce' (L 312). There are times, though, when Leibniz seems to hold that creation does not depend on God's decision and will. In an essay which he begins by saying that God 'fabricates or makes' (L 486) the world, Leibniz goes on to speak as though the essences of possible substances in God's mind realise themselves, *independently* of his will or decision: 'there is a certain urgency towards existence in possible things…. [A]ll possible things…tend towards existence with equal right in

proportion to the…degree of perfection which they involve' (L 487). There is disagreement whether this is really only a metaphorical account of God's coming to a decision about what is most perfect and so best to create, or whether Leibniz does sometimes think that the best of all possible worlds is self-creating.[13] God would not, of course, be otiose on this second account, for the possibles and their realisation would still depend on his understanding and his power, even if not on his will.

Spinoza devoted a whole chapter of his early *Metaphysical Thoughts*[14] to the topic of creation, and propositions 2–6 of book 1 of the *Ethics* are relevant to it.[15] Wolfson understands Spinoza to solve the problem of the creation of a material world by an immaterial God, by 'abolish[ing] the immateriality of God' (1.80).[16] Something like this claim was made by Malebranche: Spinoza, he says, was 'not…able to understand…how God by his will alone could create the universe', and so he 'took the universe for his God' (1958–72:17(1).622). These claims are too extreme; though Spinoza's God is extended substance, it is thinking substance too. But Spinoza certainly does lay weight on the fact that God has any attribute under which any created thing is conceived. Commenting on an early version of *E* IP3, which says that 'if things have nothing in common with one another, one of them cannot be the cause of the other', Oldenburg says that '[s]urely God has nothing formally in common with created things, yet nearly all of us regard him as their cause' (*Ep* 3/C 169). Spinoza replied that he had 'maintained the complete opposite'—since 'God is a Being consisting of infinite attributes' (*Ep* 4/C 172).[17] Spinoza's account of God's causality, and of the relationship between substantial and creative *natura naturans* and modal and created *natura naturata,* as in 1P15–36, is, to say the least, not easy to come to grips with.[18] What follows is comment merely on two associated features of it, features which have a bearing on Descartes and Leibniz: its denial of final causes, and its necessitarianism. These are implicit when, in the appendix to book 1, Spinoza says that he has shown that God 'acts from the necessity alone of his nature…[and that] things have been predetermined by God, not from freedom of the will *or* absolute good pleasure, but from God's absolute nature' (1App). This stands in direct opposition to Aquinas' conclusion, some centuries earlier, that since God 'works for an end…He works not by a necessity of His nature, but by His intellect and will' (quoted Kemp Smith:174).

The doctrine that 'God works for an end' is Aquinas' Christian version of Aristotelian final or ideological causality, one of the four kinds of causality mentioned in chapter 1. Aristotle thought not merely of human artifacts, but also of 'works of nature', as having an 'end', something for which they were suited. He saw this as their mature and flourishing state, the full expression of their 'nature'. In his turn, Aquinas, thinking of the world as a Divine artifact, understood final causation primarily in terms of the purposes of the Divine will. In his view, all the workings of the natural world express God's intentions and purposes—purposes which, he further believed, always relate to the good of mankind.[19]

Descartes concurred with Aquinas that creation is a matter of God's will, and he believed there are reasons why God brought things about as he did. For example, the 'proper purpose' (CSM 2.57) of our bodily sensations is to tell us what is beneficial or harmful to our bodies, and 'there is absolutely nothing to be found in them that does not bear witness to the power and goodness of God' (CSM 2.60).[20] It would, on the other hand, 'be the height of presumption if we were to imagine that all things were created by God for our benefit alone' (*PP* 3.2)[21] It would be presumptuous too, given the mediocrity of our mental capacities, to suppose that we can 'grasp the ends which he set before himself in creating the universe' (*PP* 3.2). It is for this reason that Descartes rejects any thought that scientific endeavour might be aided by our trying to work out in particular cases what aims God might have had. 'I consider the customary search for final causes to be totally useless in physics' (CSM 2.39).[22] Descartes's answer to Gassendi's criticism, that by his 'rejection of the employment of final causes in physics' (CSM 2.215) he risks abandoning the main argument by which we can come to know of the existence of a good and powerful God, is that he does not deny that we might not 'recognize and glorify the craftsman through examining his works' (CSM 2.258). He just denies, he says, that we could arrive at God's purposes through such examination.[23]

In his passionate appendix to book 1 Spinoza goes far beyond Descartes's limitation of Aquinas' doctrine that God *always* acts for our good. Having denied that God has will and intellect, he is adamant that 'Nature has no end set before it, and that all final causes are nothing but human fictions' (C 442).[24] As his notes on it record, Leibniz saw this attack on the supposedly anthropomorphic prejudices of the belief in final causes as 'a

mixture of truth and falsehood'. While it is true that not everything happens for the sake of man,[25] it does not follow that 'God acts without will or knowledge of the good' (L 205). Moreover, rather like Gassendi, he thought that Descartes's rejection of any appeal to final causes in physics was 'strongly suspect' (L 272) as an encouragement to atheism. In any case, the idea that God acts with 'knowledge of the good' is, Leibniz thinks, of great relevance for physics.

Not supposing that we can discern God's plans, Descartes had said that in our physical investigations we should think solely in terms of efficient causation. Yet, by considering God as 'the efficient cause of all things' (*PP* 1.28) and on the basis of what we know of his attributes, we can, he thought, reach some conclusions about the workings of the material world. The attributes in question are perfection and the immutability which that implies. 'God's perfection involves not only his being immutable in himself, but also his operating in a manner that is always utterly constant and immutable' (*PP* 2.36).[26] Moreover, though Descartes makes little or nothing of it, he at one point adds God's 'simplicity of operation' (*PP* 2.39) to his immutability and constancy. Finally, what we can infer from this is, Descartes says (as noted in chapter 5), that the world is governed by the law of conservation of motion, and by the three subsidiary laws which he specifies about the motion of bodies by themselves and in collisions.[27] Now specifically having in mind the first of these four laws, Leibniz agreed that 'the constancy of God may be supreme, and he may change nothing except in accordance with the laws…already laid down' (L 394); but, he points out, this leaves things underdetermined: 'we must still ask what it is, after all, that he has decreed should be conserved' (L 394). His own view, of course, is that the decreed conservation is of a force of motion which is proportional, not (as with Descartes) to a body's speed, but to the square of its speed.

Malebranche made the same point about underdetermination in his *Laws concerning Motion*. God's actions do reflect his immutability, but we cannot tell from that whether Cartesian motion is, or is not, conserved.[28] Only the 'revelation' of experiment can show us what regularities God has arbitrarily adopted; and what it does show (he now thinks) is that absolute Cartesian motion is not conserved, but that relative or directed motion is. Though, experience apart, we cannot know God's

decisions, or exactly what follows from his attributes, Malebranche nevertheless says that conservation of directed, relative motion is *more* in accord with divine immutability than is that of absolute motion. Since one of its consequences is that collisions have no effect on the motion of the centre of gravity of the colliding bodies taken together, it means that, despite all particular changes of motions, 'everything rests…in a perfect and unchanging equilibrium' (75).

But Leibniz thought that we can go further than supposing merely that 'no matter how God might have created the world, it would always have been regular and in a certain general order' (DM 6). He suggests, indeed, that this is not saying much at all; for it is possible to find order in *any* sequence of events. However, since we know also that God is wise and good, we know his actions are not arbitrary and that he 'always aims at the best and most perfect' (DM 19). As Leibniz understands it, the most perfect world is the one which is, simultaneously, 'the simplest in its hypotheses and the richest in phenomena' (DM 6).

Simplicity of operation, the production of effects in 'the easiest and most determined ways' (DM 21), is a feature of God's activity which Descartes and Malebranche[29] merely mention, but, unlike them, Leibniz makes something of it. He contrasts the successful appeal to it made by Snell and Fermat in the discovery of the law of refraction with the 'not nearly so good' (DM 22) Cartesian demonstration of the same law, a demonstration which relied purely on reasoning about efficient causes.[30]

The harmonious combination of simplicity and richness spoken of in the *Discourse on Metaphysics* was made more precise in some of the discussion which followed Leibniz's 'Brief demonstration'. As already noted in chapter 6, he argued that Descartes's laws of motion involve irregularities which a good and wise God would never have chosen to produce. They violate 'a principle of general order' which is 'effective in physics…because the Sovereign wisdom, the source of all things, acts…observing a harmony' (L 351). According to this 'law of continuity', changes in nature never take place 'by a leap' (La 669), and it is 'a touchstone' (L 397) by which suggested laws of nature can be examined.[31]

The denial of will and intellect to God feeds into Spinoza's rejection of final causes. This denial that God acts out of choice from a range of possibilities relates also to the necessitarian view that '[i]n nature there is nothing contingent, but all things have

been determined from the necessity of the divine nature to exist' (1P29). Leibniz found this view that there are no unrealised possibilities in a somewhat off-hand and not very well-supported remark in the *Principles* when Descartes is explaining how change in the world takes place according to his laws of motion: 'matter must successively assume all the forms of which it is capable' (*PP* 3.47). Since this means, Leibniz says, that 'nothing can be imagined…that…would not have happened and will not some day happen', he sees the remark as 'the basis of atheistic philosophy' (L 273), and even more dangerous than Descartes's rejection of final causes.[32] It leaves no room for the wise and good exercise of Divine choice. Leibniz accuses Descartes of being 'careful not to speak so plainly' (L 273) as this; but in Spinoza, on the other hand, he finds precisely these opinions 'expounded more clearly' (L 273). Towards the end of his life, in the *Theodicy,* Leibniz judged Spinoza's view that 'all things exist through the necessity of the divine nature' (*T* 234), that 'no choice is left to God, and man's choice does not exempt him from necessity' (*T* 349), to be an 'opinion so bad, and indeed so inexplicable' (T 234) as not to be worth refuting; and he gives as his own the view that there are many possibilities which imply no contradiction and from which God chose the best.[33] Leibniz's judgement of Spinoza here is remarkably sanguine. More than thirty years earlier he had, by his own report at the time, been 'very close' to holding everything to be absolutely necessary; and he came to consider 'those possible things which neither are nor will be nor have been' only just in time to pull him 'back from this precipice' (L 263). Moreover, the problem of how to explain contingency, and Divine and human choice, within the parameters of his views as a whole continued to occupy him.[34]

NOTES

1 For some account see Cottingham 1986:47–64, Kemp Smith: chap. 11, Williams: chap. 5 (for Descartes); Doney 1980, Joachim: 45–58 (for Spinoza); Broad 1975:151–9, Russell 1937: chap. 15 (for Leibniz).

2 See Bennett: 32–5, Colie, Cottingham 1988:175–7, Delahunty: 125–31, Koyré 1965:94.

3 See also 2.114. 'Everything else' includes not merely created substances but also the essences and the truths concerning them, which were discussed in chapter 3. 'The mathematical truths which you call

eternal…depend on [God] entirely no less than the rest of his creation' (K 11; see also CSM 2.293–4). Leibniz similarly says that 'the source not only of existences but also of essences is in God' (L 647). A difference between them, however, is that for Descartes essences and eternal truths concerning them depend on God's will: 'Just as He was free not to create the world, so He was no less free to make it untrue that all the lines drawn from the centre of a circle to its circumference are equal' (K 15; see also CSM 2.291–2); whereas for Leibniz they are unlike created substances in that they depend only on God's understanding, and not also on his will: '[we] must not imagine…that since the eternal truths are dependent on God, they are arbitrary and dependent on his will, as Descartes…held…[They] depend solely on his understanding and are its internal object' (L 647; see also PM 77).

The distinction between essences which exist independendy of our ideas of them and independently of any instantiation they may have in the corporeal world, but not independendy of God, is, as we saw in chapter 3, there in Spinoza too. Yet Spinoza's God is not only thinking substance, but also extended substance, and it is on the latter that the essences of geometrical figures depend. (For further discussion see Woolhouse 1990:39, 42f.)

4 See, for example, L 646–8.
5 1P17S P32C2
6 See, for example, *Med* 5, CSM 2.117; and La 714–15.
7 See also L 204.
8 See Colie.
9 CSM 2.131–2.
10 Leibniz may be talking here just about the creation of immaterial substances, something which Locke finds just as puzzling as the creation of matter (1690:IV.x.18).
11 For some account see Mackinnon: 314–15, Wolfson: 1.218f.
12 See also L 312, 324.
13 See Blumenfeld 1981 for the former view, and Wilson 1989 for a recent defence of the latter. What Leibniz means by the degree of perfection of a world is discussed below.
14 2.10.
15 Wolfson: 1.80–111 stresses this.
16 See also 1.224.
17 See also *E* 1P15S.
18 For some discussion see Curley 1969: chap. 2, Donagan 1988: chap. 6, Joachim: chap. 4.
19 For a brief but useful account see Machamer 1976:180–1.
20 See also *PP* 2.3.
21 See also K 117–18.
22 See also *B* 27.
23 Machamer 1976:181ff. argues that Descartes nevertheless makes much implicit use of final causation.
24 For more discussion see Bennett: chap. 9, Delahunty: 165ff.
25 L 205, *T* 188.
26 See also 1.28, 2.37, 39, 42, CSM 1.95–7.

27 *PP* 2.36, 37, 39, 41, 42.
28 1958–72:55, 71–3.
29 Descartes, *PP* 2.36, Malebranche 1958–72:5.148, 17(1)46.
30 See also Leibniz's '*Tentamen Anagogicum,* an essay on final causes' (L 477–84). For Descartes's derivation of the law see CSM 1.156–64.
31 See references in nn. 44 and 46 in chapter 6, and for some discussion of its application to Descartes see Westfall: 290–1, 94.
32 See also L 263.
33 *T* 228, 234.
34 For example, the correspondence with Arnauld was provoked by the fact that the doctrine that individual substances have complete concepts seemed to him to mean that 'everything that…will ever happen to the human race was and is obliged to happen through a more than fatal necessity' (*LA* 9).

The literature on Leibniz's dealings with contingency is very large, but see, for example, Adams 1977; Brown 1984: chap. 9, and on Divine and human freedom, Blumenfeld 1975, Cottingham 1988:162–6, Parkinson 1970.

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