CLASSIC THINKERS

Leibniz

R.T.W. Arthur

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Note on the Text and Translations

Leibniz wrote mostly in Latin, somewhat less in French, and occasionally in German. All translations here are the author's own translations from standard editions of Leibniz's original Latin and French (except where explicitly noted otherwise). For the convenience of the reader wishing to see a given passage in fuller context, references are also given to available English-language translations where these exist, e.g. (A VI iii 518/DSR 75).

The titles of Leibniz's books and papers are all given in English; for ease of reference, the original-language titles are also given in the Chronological Sketch.

Abbreviations

A	Akademie der Wissenschaften der DDR, ed., G. W. Leibniz, *Sämtliche Schriften und Briefe* (Leibniz 1923–); cited by series, volume and page, e.g. A VI ii 229, etc.
AG	Ariew and Garber, eds, G. W. Leibniz, *Philosophical Essays* (Leibniz 1989).
AK	Akademie der Wissenschaften, ed., Immanuel Kant, *Gesammelte Schriften*, ed. (Kant 1910–); cited by volume and page, e.g. AK viii 138.
AT	Adam and Tannery, eds, *Oeuvres de Descartes* (Descartes 1964–76); cited by volume and page, e.g. AT viii A 71.
C	Couturat, ed., *Opuscules et fragments inédits de Leibniz* (Leibniz 1903).
CSM	Cottingham, Stoothof and Murdoch, eds, *Philosophical Writings of Descartes*, vols 1 and 2 (Descartes 1984–5).
CSMK	Cottingham, Stoothof, Murdoch and Kenny, eds, *Philosophical Writings of Descartes*, vol. 3 (Descartes 1991).
D	Dutens, ed., G. W. Leibniz, *Opera omnia* . . . (Leibniz 1768); cited by volume and page, e.g. D iv 279.
DSR	G. W. Leibniz, *De Summa Rerum*, trans. Parkinson (Leibniz 1992).
GM	Gerhardt, ed., *Leibnizens Mathematische Schriften* (Leibniz 1849–63); cited by volume and page, e.g. GM ii 157, etc.
GP	Gerhardt, ed., *Die Philosophische Schriften von Gottfried Wilhelm Leibniz* (Leibniz 1875–90); cited by volume and page, e.g. GP ii 268, etc.
Grua	Grua, ed., G. W. Leibniz, *Textes inédits* (Leibniz 1948).

L Loemker, ed., G. W. Leibniz, *Philosophical Papers and Letters* (Leibniz 1969).

LDB *The Leibniz–Des Bosses Correspondence*, trans. Look and Rutherford (Leibniz 2007).

LDV *The Leibniz–De Volder Correspondence*, trans. Lodge (Leibniz 2013).

LoC G. W. Leibniz, *The Labyrinth of the Continuum*, trans. Arthur (Leibniz 2001).

MP G. W. Leibniz, *Philosophical Writings*, trans. Morris and Parkinson (Leibniz 1995a).

NE G. W. Leibniz, *Nouveaux essais sur L'entendement humaine*, translation in Leibniz 1981, which has page numbers keyed to A VI vi.

PW G. W. Leibniz, *Political Writings*, trans. Riley (Leibniz 1988).

T G. W. Leibniz, *Théodicée (Essais de Théodicée sur la bonté de Dieu, la liberté de l'homme et l'origine du mal)*, page numbers keyed to the Huggard translation in Leibniz 1985.

WFT Woolhouse and Francks, eds, G. W. Leibniz, *Philosophical Texts* (Leibniz 1998).

Chronological Sketch

1646 1 July: Gottfried Wilhelm Leibniz born in Leipzig, Saxony.

1652 death of Leibniz's father, Friedrich Leibnutz; a year later Leibniz enters Latin school in Leipzig.

1661 April: begins studies at the University of Leipzig; awarded bachelor's degree in philosophy in December of the following year.

1663 June: discussion of bachelor's dissertation at Leipzig, *Disputatio metaphysica de principio individui* (*Metaphysical Disputation on the Principle of Individuation*); enrols in summer school at the University of Jena.

1664 February: Leibniz earns a master's degree in philosophy at Leipzig; nine days later his mother dies of a respiratory infection; December: discussion of master's dissertation, *Specimen quaestionum philosophicarum ex jure collectarum* (*An Essay of Collected Philosophical Problems of Right*).

1665 July, August: discussion of dissertation *De conditionibus* (*On Conditions*) for bachelor's degree in law at Leipzig, granted in September.

1666 March: discussion of the first part of dissertation *Dissertatio de arte combinatoria* (*Dissertation on the Combinatorial Art*) for habilitation in the faculty of philosophy; September: leaves Leipzig for Nuremberg, where he enrols in the law faculty at the University of Altdorf in October; November: discussion of the thesis *Disputatio inauguralis de casibus perplexis in jure* (*Inaugural Disputation on Ambiguous Legal Cases*) for a licence and doctorate in law at Altdorf.

1667 secretary of alchemical society in Nuremberg; meets Baron Johann Christian von Boineburg in Frankfurt and publishes *Nova methodus discendae docendae jurisprudentiae* (*New Method for Learning and Teaching Jurisprudence*).

1668 enters the employment of Johann Philipp von Schönborn, Elector and Prince-Archbishop of Mainz, to help reform the judicial body; begins collaboration with Boineburg, writing *Confessio naturae contra atheistas* (*Confession of Nature against Atheists*) and a conspectus of the *Demonstrationes Catholicae* (*Catholic Demonstrations*) for his employer.

1670 new edition published of the nominalist Mario Nizolio's *Antibarbarus: seu de veris principiis* (*Antibarbarus: or on the True Principles and True Reason for Philosophizing against the Pseudo-philosophers*), including an introduction by Leibniz and a revised copy of his 1669 letter to Jakob Thomasius stating his philosophical views.

1671 works on a proposed treatise, *Elementa mentis* (*Elements of Mind*); completes *Theoria motus abstracti* (*Theory of Abstract Motion*) and *Hypothesis physica nova* (*A New Physical Hypothesis*), which are sent to the Académie Royale des Sciences and the Royal Society.

1672 March: arrives in Paris on a diplomatic mission for Boineburg; will live there for four years, despite Boineburg's death in December, establishing contacts with Christiaan Huygens, Simon Foucher, Antoine Arnauld, Edme Mariotte, Claude Perrault and Nicolas Malebranche; writes *Confessio Philosophi* (*A Philosopher's Confession*) and *Propositiones quaedam physicae* (*Certain Physical Propositions*).

1673 January–February: first visit to London, where he meets Henry Oldenburg, secretary of the Royal Society; March: demonstrates his calculating machine to the Society; April: elected to the Royal Society. His employer Johann von Schönborn dies as he and Melchior Schönborn return to France.

1675 invents the differential and integral calculus, and composes a treatise, the *De quadratura arithmetica circuli . . .* (*On the Arithmetical Quadrature of the Circle . . .*), which he submits the following year in an effort to get elected to the Académie Royale des Sciences; begins exploration of Spinoza's philosophy with Walther von Tschirnhaus in Paris; writes notes on philosophy (the *De Summa Rerum*) between December and the following summer.

1676 summer: composes *De Arcanis Motus et Mechanica ad puram Geometriam reducenda* (*On the Secrets of Motion and Reducing Mechanics to Pure Geometry*) and *Principia mechanica* (*Mechanical Principles*); October: leaves Paris for London, where John Collins shows him some of Newton's manuscripts; November: writes the dialogue *Pacidius Philalethi* (*Pacidius to Philalethes*) while waiting in the Thames estuary for fair weather to sail for Holland; extended conversations with Spinoza in The Hague, and with Swammerdam and Leeuwenhoek in Amsterdam; December: finally arrives in Hanover to take up appointment as court counsellor and librarian to Duke Johann Friedrich.

1678 January: composes *De corporum concorsu* (*On the Collision of Bodies*), in which he outlines his new notion of force as proportional to mv^2; works on plans for a *scientia generalis*, including a demonstrative encyclopaedia, and proposes the creation of scientific societies and research groups to work on it; sketches a binary arithmetic and writes a paper laying the foundations for the theory of probability; Autumn: begins involvement with improving the mines in the Harz mountains, where he spends at least 165 weeks until the collapse of the project in 1685.

1679 April: composes a series of logical papers laying the foundation for a logical calculus; sketches plans for a *characteristic geometry* or *Analysis Situs*, which he sends to Huygens for his reaction; December: death of Johann Friedrich, who is succeeded as Duke of Hanover by his younger brother, Ernst August, who is married to Sophie von der Pfalz.

1684 January: invention of determinants and discovery of their properties; June: his biting attack on the Sun King, Louis XIV, *Mars Christianissimus seu Apologia armorum Regis Christianissimi contra Christianos* (*The Most Christian War-god, or an Apology for the Arms of the Most Christian King against the Christians*), appears in print anonymously; October: publication of his first paper on the differential calculus, the *Nova methodus pro maximis et minimis* (*New Method by Maxima and Minima*) in the *Acta Eruditorum*, as well as *Meditationes de cognition, veritate et ideis* (*Meditations on Knowledge, Truth and Ideas*) in November.

1686 July: his second paper on the calculus appears in the *Acta Eruditorum*, as does his attack on Cartesian physics, the *Brevis demonstration erroris memorabilis Cartesii et aliorum circa legem*

naturae (*Brief Demonstration of a Notable Error by Descartes and Others Concerning a Law of Nature*); he writes four other treatises, the *Discours de métaphysique* (*Discourse on Metaphysics*), the *Specimen inventorum de admirandis naturae generalis arcanis* (*Specimen of Discoveries of the Admirable Secrets of Nature in General*), the *Generales inquisitiones de analysi notionum et veritatum* (*General Investigations in the Analysis of Notions and Truths*) and the *Examen religionis Christianae* (*Examination of the Christian Religion*), and initiates his correspondence with Antoine Arnauld on the topics of the *Discourse*.

1687 Publishes a letter *Sur un principe général utile à l'explication des loix de la nature par la considération de la sagesse divine* (*On a General Principle Useful in Explaining the Laws of Nature through a Consideration of Divine Wisdom*) in the *Nouvelles de la république des lettres*, in which he states his Law of Continuity and shows how Malebranche's laws of motion are in violation of it.

1688 April: finds proof of the connection between the Este and Brunswick families in a codex in Augsburg, and continues touring Germany and Italy to do further archival research; May: arrives in Vienna, and after reading a review of Newton's *Principia Mathematica Naturalis Philosophiae* (*Mathematical Principles of Natural Philosophy*) (1687) in the *Acta Eruditorum*, gets hold of a copy, on which he makes notes and marginal comments, composing a number of draft manuscripts in quick succession in which he tries to derive Newton's results in conformity with the mechanical philosophy, using his invention of the differential equation.

1689 February: the *Tentamen de motuum caelestium causis* (*An Essay on the Causes of the Celestial Motions*) is published in the *Acta Eruditorum*; leaves Vienna for Italy to consult the Este archives in Modena, visiting Venice, Rome, Naples, Florence, Bologna and finally Modena in December; composes his major works on dynamics, the two dialogues *Phoranomus seu de potential et legibus naturae* (*Phoranomus, or on Power and the Laws of Nature*), and begins the treatise *Dynamica de potential et legibus naturae corporeae* (*Dynamics: On Power and the Laws of Corporeal Nature*).

1690 February: discovers the exact connection between the Este and Guelph houses, and writes drafts of *Brevis synopsis historiae Guelficae* (*Brief Synopsis of the History of the Guelphs*); May: *De causa gravitatis* (*On the Cause of Gravity*) is published

in the *Acta Eruditorum*; discussions with Michel Angelo Fardella in Venice; June: returns to Hanover.

1692 Leibniz's efforts to establish Duke Ernst August's electoral claim meet success when Emperor Leopold I grants the status of ninth electorate to the territories of Calenberg (Hanover) and Celle; declines an invitation to join the court of Louis XIV; composes the *Essai de dynamique* (*Essay on Dynamics*) for the Paris Academy.

1694 March: publication in the *Acta Eruditorum* of *De primae philosophiae emendatione et de notione substantiae* (*On the Emendation of First Philosophy and the Notion of Substance*); December: finishes, but does not publish, the *Protogaea*, his treatise on geology.

1695 publication of the first part of *Specimen Dynamicum* (*Specimen of Dynamics*) in the *Acta Eruditorum*, and the *Système nouveau de la nature et de la communication des substances* (*New System of the Nature and Communication of Substances*) in the *Journal des sçavans*, and comments on Foucher's objections.

1697 completes a treatise on the German language, *Unvorgreiffliche Gedanken betreffend die Ausübung und Verbesserung der Teutschen Sprache* (*Novel Thoughts on the Use and Improvement of the German Language*); writes *De rerum origine radicali* (*On the Ultimate Origin of Things*).

1698 death of Ernst August, Duke of Hanover, who is succeeded by his son, Georg Ludwig; Leibniz begins a correspondence with the Dutch thinker Burcher de Volder which will last until 1706; publication of *De natura ipsa* (*On Nature Itself*) in the *Acta Eruditorum*.

1700 February: elected to the Parisian Académie Royale des Sciences; March: founding of the Berlin Society of Sciences, with Leibniz appointed President in July; October: summoned to Vienna by Emperor Leopold for talks on reunification of the Catholic and Protestant churches.

1703 begins writing his *Nouveaux essais sur l'entendement humain* (*New Essays on Human Understanding*), intended to initiate a dialogue with John Locke, but decides not to publish after Locke dies in October 1704; writes the *Méditation sur la notion commune de justice* (*Meditation on the Common Notion of Justice*).

1705 February: death of Queen Sophie Charlotte of Prussia, one of Leibniz's closest confidantes; May: publishes *Considérations sur les principes de vie, et sur les natures plastiques* (*Considerations on Vital Principles and Plastic Natures*) in the *Histoire des*

ouvrages des savants; begins his *Discours sur la Theologie naturelle des Chinois* (*Discourse on the Natural Theology of the Chinese*), which he works on until 1716.

1706 January: begins a ten-year correspondence with the Jesuit Bartholomew Des Bosses, centred on the possibility of adapting his philosophy to the articles approved by that Order.

1707 brings out the *Novissima Sinica* (*Latest News from China*), an edition of writings by missionaries about China, for which he wrote a famous preface, extolling the virtues of that culture and of a multicultural approach to knowledge, and supporting Ricci's stand on the rites of ancestors.

1710 publication of *Essais de théodicée sur la bonté de Dieu, la liberté de l'homme et l'origine du mal* (the *Theodicy*), written in response to the good-natured criticisms of Pierre Bayle in his *Dictionnaire*.

1712 November: after audiences with Peter the Great during the previous year, nominated Russian privy counsellor of justice and adviser to the Tsar on mathematical and scientific matters; December: leaves for Vienna, where he will stay until September 1714; appointed Imperial Court councillor in Vienna. Returns to work on *Analysis Situs*, composing many new drafts in the next four years, as well as a treatise on etymology, *Epistolica de historia etymologica dissertatio* (*An Epistolic Dissertation on Etymological History*).

1713 January: publication in England of the *Commercium Epistolicum*, the supposedly neutral report by the Royal Society on the priority dispute over the calculus, in fact largely composed by Newton himself; on seeing it, Leibniz writes a quick anonymous response (the *Charta volans*), as well as his own account, *The History and Origins of the Differential Calculus*, which remained unpublished.

1714 composes the *Principes de la nature et de la grâce fondés en raison* (*Principles of Nature and Grace Founded in Reason*) for Prince Eugene of Saxony, and the essay that came to be called the *Monadology*; June: death of dowager Electress Sophie, Leibniz's friend and protector in Hanover; writes the *Initia rerum mathematicarum metaphysica* (*Metaphysical Foundations of Mathematics*), summarizing his mature views on space and time; 14 September: returns to Hanover from Prague, only to find that Georg Ludwig and his court have left for London without him three days before; Georg becomes George I, King of England.

1715 November–October 1716: correspondence with Samuel Clarke, mediated by Princess Caroline; Newton's 'anonymous' account of the *Commercium Epistolicum* appears in the *Philosophical Transactions*.

1716 Summer: meetings with Tsar Peter the Great in Lower Saxony; 14 November: Leibniz dies in Hanover of complications arising from self-administered treatment of gout; funeral one month later.

1

Introduction

Gottfried Wilhelm Leibniz was one of the most prolific thinkers of all time. 'Often in the morning when I am still in bed,' he wrote, 'so many thoughts occur to me in a single hour that sometimes it takes me a whole day or more to write them out' (quoted from Mates 1986: 34). These thoughts might have included designs for a new wind pump to drain the mines of the Harz mountains or for a calculating machine based on binary arithmetic, sketches for a treatise on geology or etymology, another draft of a logical calculus that was two hundred years ahead of its time, or a new derivation of Newton's law of gravitation on strictly mechanical principles. Even before getting up, Leibniz would usually have written lengthy letters on such subjects to one or two learned correspondents. He might also have penned a proposal to his employer the Duke of Hanover for a universally accessible state medical system, a legal brief in support of the Duke's electoral claim to certain territories, a deposition aimed at church reunification, or tried to mediate in the dispute among the Jesuits over the interpretation of Chinese religious rites. In short, Leibniz was an indefatigable one-man industry.

Yet all this worldly activity seems at odds with the usual understanding of Leibniz as a philosopher. He is perhaps best known for his *monads* or unities of substance. These he conceived as enduring entities constituting what is real in bodies and their motions. But although in those respects they are like material atoms, Leibniz characterized monads as 'possessing something analogous to perception and appetite' (NE 318), where perceptions (or states) of monads are representations of the whole of the rest of the universe,

and their appetites are tendencies toward future states, governed by a law specific to each individual. Consequently, Leibniz is usually understood as an idealist who wished to reduce the whole of reality to mind-like entities and their intentional states: each monad is a world apart, constituted only by its own perceptions, sequenced according to its own internal law. On the usual understanding, moreover, these monads do not even exist in space and time. For, as Leibniz famously argued against Isaac Newton (1642–1727) and Samuel Clarke (1675–1729), space and time are relations; but he also held that relations, far from being independently existing entities, are supplied by a perceiving mind. On this reading, then, Leibniz's philosophy appears as a thorough-going idealism.

This presents a perplexing contrast. Leibniz was a 'natural philosopher', making active contributions to geometry, mechanics, dynamics, optics, geology and the life sciences. But why would someone on the cutting edge of both theoretical and empirical developments in these fields have developed a philosophy apparently so hostile to the physical world? We know that Leibniz understood himself to be attempting a rapprochement between the new 'mechanical philosophy' of Descartes, Gassendi and Boyle, and the Aristotelian philosophy taught in the universities. But both parties understood the physical world to exist in an unambiguous way: for the mechanical philosophers, it was constituted by bodies in motion, bodies being understood as parts of matter extended in length, breadth and depth, whose motion could be treated geometrically; for the Aristotelians, bodies or 'corporeal substances' possessed 'substantial forms', which they used to explain all types of goal-directed behaviour: plants tending to face the light, heavy bodies tending to fall to Earth, and so forth. Now what kind of rapprochement would Leibniz have achieved if he was asking both parties to deny the existence of matter and motion, and of the corporeal substances that they took to be the very stuff of the physical world?

Interpreters have generally answered that question by an appeal to a distinction between Leibniz's public and private philosophies: the 'optimistic, orthodox, fantastic, and shallow' philosophy 'designed to win the approbation of princes and princesses', as Bertrand Russell puts it (Russell [1946] 1972: 604), and the 'profound, coherent, largely Spinozistic, and amazingly logical' philosophy he had developed in his unpublished manuscripts. On this view, Leibniz was happy to promote his philosophy in public as solving such problems as the interaction between body and mind by proposing that both bodies and minds unfold their states

independently and perfectly in step, like two clocks that keep perfect time; and generally to speak of bodies and corporeal substances in a realistic vein. But in his private philosophy bodies are no more than the coherent appearances of perceiving substances.

I see no such schism between private and public in Leibniz's philosophy, but only differences in presentation, resulting from his cooperative approach to building knowledge. Although Leibniz worked hard to produce general principles that he thought could promote science and its application, as well as heal religious rifts, he knew this could only be achieved through dialogue with others. And in order to promote dialogue, he would bend or colour his views to maximize the chances of productive exchange.

A big difficulty in trying to present Leibniz's philosophy, however, is the sheer profusion and ambitious scope of the projects in which he was engaged, either at the bidding of his employers in court or on his own account, which virtually guaranteed he would bring few of them to completion. As a result of this almost permanent distraction, Leibniz produced no definitive masterwork, such as Spinoza's *Ethics* or Kant's *Critique of Pure Reason*. He did publish a long book on the problem of evil in 1710, the *Theodicy*, but, like his posthumously published *New Essays*, the work is too discursive and polemical to serve as an introduction to the main themes of his thought. Consequently, his philosophy is usually introduced through the study of two summaries he gave of his metaphysics, the *Discourse on Metaphysics* of 1686 and the *Monadology* of 1714 (both these titles are the creations of later editors). The first presents his views in a context heavily conditioned by his desire to engage Antoine Arnauld in correspondence. Arnauld (1616–98) was a co-author of the famous Port Royal Logic, and a leading Catholic theologian and critic of Descartes, whose approval would aid Leibniz (a tolerant Lutheran) in his ambition to bring about a reconciliation of faiths. But for a modern reader unfamiliar with this context, it is hard to understand the *mélange* of issues from theology, logic, metaphysics and physics that Leibniz chooses to stress. The second work, the *Monadology*, although in many ways an admirably succinct summary of Leibniz's metaphysics, by and large fails to give much argument for his views, the contexts in which they were generated, or the problems they were designed to resolve. As a result, Leibniz's philosophy comes across, in Hegel's words, 'as a string of arbitrary assertions, following one upon another without any necessity in their connection, like a metaphysical romance' (Hegel 1836: 454).

The usual reception of Leibniz is also conditioned by the need to fit him into a simple narrative about the history of philosophy, where he is seen as one of the 'great rationalists' along with Descartes and Spinoza, whose dogmatism is opposed by the British empiricist philosophers beginning with Locke. But Leibniz was not an academic with an allegiance to any one school. He was a court diplomat, who thought that a political career would better enable him to achieve his goals of reforming scientific knowledge and helping to bring about the reunification of the Church. Seen in this light, his contributions to science, such as his correction of Descartes's law of the conservation of force, were not side-issues, but an integral part of his programme for the advancement of learning which he hoped would repair the theological rifts that were dividing seventeenth-century Europe. Leibniz was not trying to undermine the mechanical philosophy by reducing things to ideas and intentions, but rather trying to improve it by providing it with a proper foundation that could lead to new discoveries and advancements, as well as reconcile it with accepted articles of faith.

Accordingly, I shall approach Leibniz here in a way that I think is in keeping with his philosophy, although it will be an unusual methodology for a book of this kind. Instead of beginning with the themes and principles of his mature philosophy, and then structuring his philosophy around them, I take a genetic approach, trying to show how Leibniz's views arose by reference to the problems he was trying to solve, in their own historical context. In so doing, I will concentrate on his youthful writings, most of which are scattered Latin drafts that do not exist in any convenient compilation, and all of which I have translated. This genetic approach courts some obvious dangers: a reader encountering Leibniz for the first time might remember him more for views he gave up, or confuse his earlier attempts with his mature solutions to some of these problems, or simply rue the fact that not much space is left to discuss developments in his mature writings. And of course, it is more difficult to understand anyone in historical context: the various scientific, political and theological problems that occupied Leibniz, such as the correct measure of force or church reunification, will seem remote from today's philosophical concerns. But the reward is to see Leibniz at his best, as a profound and creative thinker always pushing the boundaries of knowledge, anticipating and engendering new approaches, many of them of surprising contemporary relevance.

Another advantage of this genetic approach is that it allows me to tackle some of the issues of interpretation obliquely, rather than

head on. Instead of assuming that Leibniz had a definite metaphysical system, consisting in certain dogmatically asserted premises that were more or less impervious to his scientific and political pursuits, I will try to show how his metaphysics developed through the attempt to solve various more specific problems in the life sciences, theology, physics and mathematics. From this perspective it will emerge that Leibniz never intended to deny that substances have real bodies, but he meant rather to convey a deeper appreciation of what it is to be a substance or to be a body. Nor did he intend to deny that things exist in spatial relations, or that states of substances really succeed one another in time; rather he wanted to show how a correct understanding of space as an order of situations and time as an order of successive things would rule out a metaphysics in which extension is taken to be a substance, or space and time are depicted as existing independently of the things in them.

This results in a picture of Leibniz's metaphysics very different from the idealistic interpretation described above, and it may be worth briefly stating it to orient readers familiar with the issues. On my reading, Leibniz's corporeal substances simply are his embodied monads, whose bodies are aggregates of subordinate substances.[1] A corporeal substance is a unity by virtue of what is substantial in it, namely the form which gives it a unity of function and purpose through time. The body it has at any instant derives its reality from the substances presupposed in all its parts, although it is not itself a substance, and has at any time only a perceived unity. Similarly, motions derive their reality from an underlying instantaneous force existing at any instant. Thus Leibniz's commitment to corporeal substances is quite genuine, although by that term he means something different from what either the Cartesians or the Aristotelians understood by it. 'It is really not surprising that the Cartesians have failed to understand the nature of corporeal substance,' he tells his correspondent Burchard de Volder in June 1704, 'since they consider extension as something absolute, ineffable, irresolvable, and primitive' (GP ii 269/LDV 305). Extension, Leibniz insists, must be the extension *of* something, and what that something is he explains in terms of his new concept of force: it is the diffusion of a *passive force* of resistance. This passive force is complemented by an *active force*, which is his reinterpretation of the 'substantial form' or 'first entelechy' that Aristotle claimed to be the active principle of perfection in a body. Together the active and passive forces constitute corporeal substance. But more on these matters below.

Now let us turn to the context in which Leibniz's views were formulated. How did he come by his ambitions, and how did he seek to achieve them?

Historical Context

The political world into which Leibniz was born in 1646 was one riven with conflict. The German nation at that time was the Holy Roman Empire, an entity created already several hundreds of years before as a result (on two separate occasions) of a German king coming to the aid of a Pope in need of protection. In the seventeenth century the Empire included most of central Europe, including Burgundy, Bohemia and northern Italy. It was comprised of hundreds of imperial states ruled over by various dukes, counts, margraves and princes subservient to the Emperor, and at the time of Leibniz's birth had been at war – the Thirty Years War (1618–48) – for almost three decades. Peace negotiations were under way, but war did not cease until the Peace of Westphalia two years later. Hostilities had begun with the Bohemian revolt of 1618, in which Protestant estates rose up to defend their religious liberties against an attempt to impose Catholicism on them by the Habsburgs. When the Calvinist Palatine Elector came to the throne in Bohemia, the war widened along confessional lines, with Leibniz's state of Saxony entering into the fray, later to be joined by the fellow Lutheran states of Denmark and Sweden. Although military hostilities ceased in 1648, the truce, in recognizing the rights of Lutherans to practise their religions in Lutheran territories, and Calvinists in Calvinist territories, only confirmed the division of the Empire into three unreconciled religious confessions.

The intellectual world, too, was in turmoil. Leibniz lived in the heyday of what we now call the 'Scientific Revolution', when the Aristotelian philosophy of the Schools (the European universities) was under sustained attack from modern thinkers. After the demolishing of the older Aristotelian cosmology by Galileo Galilei (1564–1642) and Johannes Kepler (1571–1630) in central Europe, the Copernican worldview was widely accepted, even if in the Catholic countries it was theologically dangerous to embrace it as literal truth. Still in a state of flux, however, was the natural philosophy that would support Copernicanism: by what means did the planets stay in orbit around the Sun? If heavy bodies do not fall to the ground because of their natural motion to the centre of the Earth,

as Aristotle and the Scholastics had taught, then what explains terrestrial gravity?

René Descartes (1596–1650) had famously exhorted his contemporaries to make a clean break with Aristotle's conception of the natural world. Where Aristotle had populated the world with individual substances modelled on living creatures, each with its own form or soul, acting in accordance with ends appropriate to its nature, Descartes introduced a radical dichotomy between the material and the mental. For him, created substances are of two kinds: corporeal substances or bodies; and mental substances or minds (a human being, of course, as a mind with an associated body, is a kind of composite of the two). Since matter is identical with extension, there can be no vacuum: the material world is full (a *plenum*). Bodies, or material substances, are simply divisible portions of this continuously extended plenum, distinguishable by their different motions. As such, they are entirely passive. They can react, as when one body is moved by the impact on it of another, but they cannot initiate any action. God has imbued all the matter in the world with a certain quantity of motion, and this gets redistributed among the bodies as they mutually collide, subject to the three laws of motion that Descartes expounds. Mental substances, on the other hand, are immaterial, and not divisible into parts. They are characterized by completely different qualities, such as willing, perceiving, believing and thinking. Mind, in fact, is essentially a thinking thing, a conclusion Descartes derives through his famous *cogito, ergo sum*, 'I think, therefore I am'.

Thus on Descartes's austere philosophy, it is simply anthropocentrism to think of the planets as having souls (as Kepler did); he was highly sceptical whether any organisms apart from humans were animate, or contained souls. Just as the appearance of a force for resisting motion could be explained in terms of a redistribution of quantity of motion of the bodies (without assuming that they had an inherent inertia or laziness, as Kepler had proposed), so the motion of the planets could be explained entirely mechanically in terms of the actions on them of the matter of the fluid heavens without assuming planetary intelligences. Descartes's definition of bodies as quantities of extension, on the other hand, possessing a certain quantity of motion at each instant, facilitated the replacement of the qualitative Aristotelian physics with one in which mathematics, the science of quantity, would have immediate purchase. All natural phenomena were to be explained in terms of the motion, shapes and sizes of particles subject to mathematical laws, in