Introduction

He came into the World a Philosopher, which sufficiently appeared by his writing the Nature of things upon their Names: he could view Essences in themselves, and read Forms with the comment of their respective Properties; he could see Consequents yet dormant in their principles, and effects yet unborn in the Womb of their Causes; his understanding could almost pierce into future contingents, his conjectures improving even to Prophesy, or the certainties of Prediction; till his fall it was ignorant of nothing but of Sin, or at least rested in the notion without the smart of Experiment . . . I confess 'tis difficult for us who date our ignorance from our first Being, & were still bred up with the same infirmities about us, with which we were born, to raise our thoughts, and imaginations to those intellectual perfections that attended our nature in its time of Innocence . . . [1]

These effusive estimates of Adam's abilities were delivered by Robert South in a sermon to worshippers at St Paul's Cathedral, London on a Sunday morning in November 1662. While this description of Adam's philosophical acumen was notable for its eloquence – South was widely acknowledged as the most gifted preacher of his generation – there was nothing unusual in its substance. From quite early in the Christian era, patristic writers had commented on the unique intellectual capacities of our first father, on the vast extent of his knowledge, and on the magnitude of his losses at the Fall. These ideas were further elaborated during the Middle Ages and were commonplace in the early modern period. For many champions of the new learning in the seventeenth century the encyclopaedic knowledge of Adam was the benchmark against which their own aspirations were gauged. Francis Bacon's project to reform philosophy was motivated by an attempt to determine whether the human mind 'might by any means be restored to its perfect and original condition, or if that may not be, yet reduced to a better condition than that in which it now is'.[2] In 1662, the year in

[1] Robert South, 'Man was made in God's Image', *Sermons Preached upon Several Occasions* (Oxford, 1679), pp. 127, 128.
[2] Francis Bacon, *The Great Instauration*, in *The Works of Francis Bacon*, ed. James Spedding, Robert Ellis, and Douglas Heath, 14 vols. (London, 1857–74), IV, 7.

which South delivered his sermon, Bacon's intellectual heirs formed the Royal Society, the goals of which were also expressed by the apologist for the Society, Thomas Sprat, in terms of a regaining of the knowledge that Adam had once possessed.[3]

Such sanguine expectations, it must be said, were not shared by all. Robert South himself, while clearly impressed by the scope of Adam's original knowledge, entertained serious doubts about the prospects for its contemporary recovery, and he could be scathing of those who cherished such proud ambitions. In his capacity as the Public Orator at Oxford, he had presided at the opening of the Sheldonian Theatre in 1669. In a long speech on that occasion he had observed that Fellows of the fledgling Royal Society 'can admire nothing except fleas, lice, and themselves', no doubt causing acute embarrassment to the Fellows present, including Christopher Wren, architect of the theatre. South's reservations about the programme of the Royal Society were owing to his scepticism about the extent to which Adamic knowledge could be re-established in the modern age and to his concerns about the links between such projects and a discredited Puritan utopianism. Indeed one of the major themes of South's sermon was the vast disparity between the ease with which Adam had acquired knowledge and the difficulties encountered by his latter-day progeny: 'Study was not then a Duty, night-watchings were needless; the light of Reason wanted not the assistance of a Candle.' For Adam's fallen issue, however, it was a very different matter: 'This is the doom of faln man to labour in the fire, to seek truth in *profundo*, to exhaust his time and impair his health, and perhaps to spin out his dayes, and himself into one pittiful, controverted, Conclusion.'[4] Adam's knowledge, on this more sober account, would not be easily reacquired. Yet, whatever the differences between South and the Fellows of the Royal Society, it was agreed on all sides that those seeking to determine the rightful course for the advancement of knowledge needed to reckon with Adam and what befell him as a consequence of his sin.

The narrative of the Fall has always exercised a particular fascination over Western minds. It has been described in recent times as 'the anthropological myth *par excellence*', 'the most elemental of myths', and 'the central myth of Western culture'.[5] During the seventeenth century, this myth assumed

[3] Thomas Sprat, *History of the Royal Society of London* (London, 1667), pp. 349f. The Society had met informally from 1660, but was officially incorporated on 15 July 1662.
[4] South, *Sermons*, pp. 127f.
[5] Paul Ricoeur, *The Symbolism of Evil* (Boston, 1967), p. 281; T. Otten, *After Innocence: Visions of the Fall in Modern Literature* (Pittsburgh, 1982); Philip Almond, *Adam and Eve in Seventeenth-Century Thought* (Cambridge, 1999), p. 1.

a particular importance. At this time, the bible came to occupy a position of unparalleled authority, informing discussions about the nature of the state, the rights of the individual, private property, education, international sovereignty, the status of indigenous peoples, work and leisure, agriculture and gardening, anthropology and moral psychology. In each of these spheres, the story of Adam had a significant place. According to historian Christopher Hill, 'The Fall then was central to seventeenth-century debates about the nature of the state and its laws, as well as about the justification of private property, social inequality and the subordination of women.'[6] This was particularly so in England, where Calvinist understandings of the doctrine of original sin predominated. It is no exaggeration to say that this dogma dominated the theological agenda and became a crucial point of reference in broader social and intellectual discussions.[7]

The central concern of this book is to illustrate the ways in which the myth of the Fall informed discussions about the foundations of knowledge and influenced methodological developments in the nascent natural sciences. While the first half of the book will be devoted to making this general case, the second half will focus on the more specific example of experimental science in seventeenth-century England. What should become apparent from the more general discussion is that the differences between competing strategies for the advancement of knowledge put forward during the sixteenth and seventeenth centuries can be accounted for largely in terms of different assessments of the Fall and of its impact on the human mind. The renewed focus on the Fall and original sin that is characteristic of the early modern period was occasioned by the religious upheavals of the sixteenth century. These events not only precipitated a crisis of confidence in the traditional sources of knowledge, but also coincided with a revival of an Augustinian anthropology that emphasised the corruption of human nature and the limitations of the intellect. Four aspects of this development will be examined.

First, the early modern preoccupation with sin meant that in the realm of epistemology error was often equated with sin, and the human propensity to invest false claims with the character of truth was attributed to Adam's fall. Considerations such as these explain why philosophers of the seventeenth century tend to be preoccupied with error and its prevention, and commonly assume that avoidance of error is not merely a necessary

[6] Christopher Hill, 'Sin and Society', *The Collected Essays of Christopher Hill*, 3 vols. (Amherst, 1986), II, 117–40 (125).

[7] *Ibid.*, p. 132; W. M. Spellman, *John Locke and the Problem of Depravity* (Oxford, 1988), pp. 8, 9; William Poole, *Milton and the Idea of the Fall* (Cambridge, 2005), pp. 4f., 21–39.

condition for knowledge, it is in fact sufficient for it.[8] The tradition according to which Adam was in possession of the perfect philosophy implies that human minds had originally been designed to know the truth, and that if those impediments that arose as a consequence of the Fall could be identified and neutralized, the mind would once again, of its own nature, arrive at truth or at least be better equipped to do so. Francis Bacon, as is well known, saw in the sciences the prospect of restoring, or at least repairing, the losses to knowledge that had resulted from the Fall.[9] His emphasis lay on purging the mind of those flaws introduced by Adam's defection. Describing his goal as 'the true end and termination of error', he suggested that this could only be accomplished if knowledge was 'discharged of that venom which the serpent infused into it'.[10] Later in the century a number of those involved in the establishment and running of the Royal Society set out a similar strategy. Joseph Glanvill, an early and influential fellow of the Society, explained that knowledge could not be set on a sure foundation until a full account had been given of the causes of ignorance: 'And therefore besides the general reason I gave of our intellectual disabilities, The *Fall*; it will be worth our labor to descend to a more particular account: since it is a good degree of *Knowledge* to be acquainted with the *causes* of our *Ignorance*.'[11] Even opponents of the experimental method of the Royal Society adopted this approach. John Sergeant, a champion of Aristotelianism who opposed both English experimentalism and Cartesianism, observed in his *Method to Science* (1696) that even the greatest minds 'still miss of Reasoning rightly, and so fall short of True Knowledge, which is their Natural Perfection'. Once again, the proposed solution involved an analysis of the primordial cause of error: 'Whence, our First Enquiry ought to be, how Man's Nature came to be so Disabled from performing its Primary Operation, or from Reasoning rightly.'[12]

This preoccupation with error and its causes was by no means the sole preserve of English philosophers, although admittedly it was they who most enthusiastically focused their attentions on the history of Adam. An important feature of Descartes' programme to establish new foundations

[8] On the avoidance of error as sufficient for truth, see Thomas Lennon's introduction to Nicolas Malebranche, *The Search after Truth*, tr. and ed. Thomas Lennon and Paul Olscamp (Cambridge, 1997), p. xii.

[9] Bacon, *Novum Organum* II.lii (*Works* IV, 247–8). Cf. *Valerius Terminus* (*Works* III, 222).

[10] Bacon, *Great Instauration,* (*Works* IV, 20–21).

[11] Joseph Glanvill, *The Vanity of Dogmatizing. or, Confidence in opinions manifested in a discourse of the shortness and uncertainty of our knowledge, and its causes: with some reflexions on peripateticism, and an apology for philosophy* (London, 1661), p. 63; cf. *Scepsis Scientifica, or, Confest ignorance, the way to science* (London, 1665), p. 48.

[12] John Sergeant, *The Method to Science* (London, 1696), Preface, sig. a1v–a2r.

for knowledge was 'to investigate the origin and causes of our errors and to learn to guard against them'.[13] While Descartes makes no mention of the Fall in this context – indeed he is typically silent on matters relating to sacred history – his compatriots were less reticent. The subtitle of Nicolas Malebranche's *Search after Truth* (1674–5) reads: 'Wherein are treated the nature of man's mind and the use he must make of it to avoid error in the sciences'. Malebranche went on to explain that this approach called for a specific investigation into 'how we might conceive the order found in the faculties and passions of our first father in his original state, as well as the changes and disorder that befell him after his sin'.[14] Blaise Pascal went further, castigating Descartes for not having taken the Fall seriously enough. Had he done so he might not have spoken so confidently about attaining certain knowledge. Pascal allowed that 'if man had never been corrupted, he would, in his innocence, confidently enjoy both truth and felicity'. The present situation, however, was rather different: 'We perceive an image of truth and possess nothing but falsehood, being equally incapable of absolute ignorance and certain knowledge; so obvious is it that we once enjoyed a degree of perfection from which we have unhappily fallen.'[15]

For all the attention directed towards sin and error, the ultimate aim was to determine the conditions under which knowledge would be possible and, more particularly, what kinds of things could be known and by what methods. Writing in the Preface of *Micrographia* (1665) Robert Hooke, curator of experiments at the Royal Society, declared that 'every man, both from a deriv'd corruption, innate and born with him, and from his breeding and converse with men, is very subject to slip into all sorts of errors . . . These being the dangers in the process of humane Reason, the remedies of them all can only proceed from the real, the mechanical, the experimental Philosophy.'[16] Hooke's statement neatly encapsulates the positive aspect of proposals to advance knowledge in the seventeenth century. Having identified the specific privations suffered by the mind on account of Adam's lapse, an argument could be made as to how they could be most successfully redressed by the suggested procedures. The 'mechanical and experimental philosophy', while it will be a major focus of this book,

[13] Descartes, *Principles of Philosophy* I, §31, CSM I, 203–4. It is also significant that one of Spinoza's chief criticisms of both Descartes and Bacon was that 'they never grasped the true cause of error'. Letter to Henry Oldenburg, September 1661, *The Collected Works of Spinoza*, ed. and tr. Edwin Curley (Princeton, 1985) I, 167.

[14] Malebranche, *Search after Truth*, I.5 (p. 19).

[15] Blaise Pascal, *Pensées*, L 131, tr. A. J. Krailsheimer (London, 1966), p. 65. This edition uses the Lafuma (L) numbering. Cf. L 45, L 199, L 401.

[16] Robert Hooke, *Micrographia* (London, 1665), Preface.

was not the only solution proposed to overcome the inherent incapacity of fallen minds. Despite a general consensus about the limitations of the intellect and the need to overcome its deficiencies, projects to address these shortcomings varied considerably. The priority accorded to proposed sources of knowledge – be it reason and innate principles; the senses, observation, and experimentation; or divine revelation through the scriptures or personal inspiration – were intimately related to analyses of the specific effects of original sin. Similar considerations apply to the certitude with which various forms of knowledge could be held.

The second aspect of the thesis of this book, then, is that the various solutions offered to the problem of knowledge in the early modern period are closely related to assessments of exactly what physical and cognitive depredations were suffered by the human race as a consequence of Adam's original infraction. If, for example, the Fall were understood as having resulted in the triumph of the passions over reason, the restoration of Adamic knowledge would be accomplished through re-establishing control of the passions, thus enabling reason once again to discharge its proper function. If the Fall had dulled Adam's senses, this deficiency might be overcome through the use of artificial instruments capable of restoring to weakened human senses some of their original acuity. If the Fall had altered nature itself, rendering its operations less obvious and less intelligible, intrusive investigative techniques would be required to make manifest what had once been plain. Varying estimates of the severity of the Fall, moreover, gave rise to different assessments of the prospects of a full recovery of Adam's knowledge. Those who regarded the Fall as a relatively minor event were generally far more optimistic about the possibility of constructing a complete and certain science than were those for whom the Fall was an unmitigated catastrophe. As will become apparent, the contrasting experimental, speculative, and illuminative solutions to the early modern problem of knowledge were informed by varying conceptions of the nature and severity of the Fall. To express it in more familiar (but historically more problematic) terms, advocates of 'rationalism' and 'empiricism' largely fall out along lines related to an underlying theological anthropology. Descartes' confident assertion that the 'natural light' of reason could provide the basis of a complete and certain science presupposed the persistence of the natural light and the divine image even in fallen human beings. This was strongly contested by those who believed that the Fall had effaced the divine image and all but extinguished the natural light. On this latter view, if knowledge were possible at all, it would be painstakingly accumulated through much labour, through trials and the testing of nature, and would give rise to a modest

knowledge that did not penetrate to the essences of things and was at best probable rather than certain. Such mitigated scepticism characterised the experimental approach commonly associated with such figures as Francis Bacon and Robert Boyle.

The third element of this argument concerns the religious background of these early modern discussions of the Fall and its impact on knowledge. One event that led to a renewed interest in the human condition and its inherent fallibility was the Protestant Reformation and the resurgence of Augustinian thought that accompanied it. The reformers' focus on human depravity, originally articulated in the context of a particular view of justification, was also to set the agenda for the epistemological debates of the following two centuries. In general, those influenced by the anthropology of Luther and Calvin were to adopt the position of mitigated scepticism characteristic of empiricism and the experimental philosophy. Those who took a more positive view of human nature were more inclined to assert the reliability of human reason, the possibility of *a priori* knowledge, and the perfectibility of the sciences. To a degree, then, the methodological prescriptions offered by philosophers in the seventeenth century mirror their confessional allegiances. Hence, the Catholic Descartes held fast to a relatively optimistic Thomist account of human nature and aspired to attain, in his own words, a 'perfect knowledge of all things that mankind is capable of knowing'.[17] By way of contrast, Francis Bacon, raised as he was in a Calvinist environment, thought that knowledge would be accumulated gradually and only with meticulous care. The work of many unexceptional minds, science would ultimately amount to 'judgment and opinion, not knowledge and certainty', as John Locke would later express it.[18] These confessional correlations are, admittedly, far from perfect, partly because of the emergence of a Protestant scholasticism that reverted to the optimistic Thomist/Aristotelian view of knowledge and human nature, and partly because early modern Catholicism witnessed its own Augustinian revival, most conspicuously in the Jansenist movement that exercised such a profound influence over Blaise Pascal and Antoine Arnauld. Nevertheless, it is possible to establish significant links between particular thinkers' commitments in the sphere of theological anthropology and their methodological prescriptions in the realm of the sciences.

Finally, and following directly from the previous point, the trajectories of the major philosophical projects of the seventeenth centuries can be

[17] Descartes, *Principles*, CSM I, 179.
[18] John Locke, *Essay concerning Human Understanding* IV.xii.10, ed. A. C. Fraser, 2 vols. (New York, 1959), II, 349.

understood to some extent as developments of different aspects of Augustinianism. While Augustine's influence on early modern philosophy has long been taken for granted by French authors, Anglophone writers are now increasingly aware of the significance of aspects of Augustine's thought for this period.[19] In keeping with the received version of the history of philosophy, according to which the chief concern of modern philosophy is epistemology, Augustine's theories of knowledge have been the primary focus of attention. Accordingly, Augustine is seen to have had most impact in the rationalist epistemologies of Descartes and Malebranche. While not wishing to deny the significance of this line of investigation, I shall trace an alternative avenue of Augustinian influence in the early modern period, namely, his views on human nature and his doctrine of original sin. While these are not unrelated to his epistemological views, Augustine's understanding of the Fall and original sin, as already indicated, was to play a vital role in traditions of investigation rather different from that of the Cartesians. The experimental approach, I shall argue, was deeply indebted to Augustinian views about the limitations of human knowledge in the wake of the Fall, and thus inductive experimentalism can also lay claim to a filial relationship with the tradition of Augustinianism. In much the same way that both Protestantism and early modern Catholicism can quite legitimately be regarded as heirs of Augustine, so too can both of the chief sects of seventeenth-century philosophy.

The claims set out in this book represent a significant challenge to some common assumptions about the origins of modern philosophy and science, and about the onset of modernity generally. At this point it is worth giving a preliminary indication of where the thesis stands in relation to a number of standard positions. At the most general level, the book seeks to challenge the idea that early modern philosophy, including natural philosophy, is concerned largely with issues of method and epistemology *per se*. The primary focus, I shall suggest, was rather human nature – 'anthropology' in its broadest sense – and epistemological concerns, while undoubtedly present,

[19] See, e.g., Etienne Gilson, 'The Future of Augustinian Metaphysics', in *A Monument to St. Augustine* (London, 1934); Jean Laporte, *Le cœur et la raison selon Pascal* (Paris, 1950); Jean Delumeau, *Le Péché et la peur: La culpabilisation en Occident XIIIe–XVIIIe siècles* (Paris, 1983); G. B. Matthews, *Thought's Ego in Augustine and Descartes* (Ithaca, 1992); 'Post-medieval Augustinianism', in Eleonore Stump and Norman Kretzmann (eds.), *The Cambridge Companion to Augustine* (Cambridge, 2001), pp. 267–79; Stephen Menn, *Descartes and Augustine* (Cambridge, 1998); Zbigniew Janowski, *Cartesian Theodicy* (Dordrecht, 2000); Michael Moriarty, *Early Modern French Thought* (Oxford, 2003), pp. 41–9 and passim. See also Louis-Paul Du Vaucel, 'Observations sur la philosophie de Descartes', in E. J. Dijksterhuis (ed.), *Descartes et le Cartésianisme Hollandais* (Paris, 1950), pp. 113–30; Michael Hanby, *Augustine and Modernity* (London, 2003), esp. pp. 134–77.

were secondary to this.[20] This contrasts with a widespread view that regards the seventeenth century as preoccupied with the foundations of knowledge and which characterises the transition from the medieval to the modern in terms of a shift from metaphysics to epistemology. On this account, it is Descartes who inaugurates the modern age by issuing a sceptical challenge and then solving it with his own radical foundationalism. The agenda thus set, the British empiricists react against Descartes' rationalism, leaving it to Immanuel Kant (or possibly Hegel, depending on one's philosophical predilections) to offer the definitive solution to the problem of knowledge. This version of the history of modern philosophy can be found, for example, in the influential writings of Kuno Fischer (1824–1907).[21] Fischer secured the place of Descartes' *Meditations* as the founding document of modernity, and enshrined the view that modern philosophy was characterised by a split between rationalists and empiricists that was healed by the critical philosophy of Immanuel Kant. Many introductions to modern philosophy still follow this line, and undergraduates are typically introduced to the subject through the *Meditations*. Integral to this received view is the assumption that the modern epistemological project is essentially a secular one, representing the ascendancy of reason over faith, and setting up the conditions for the age of Enlightenment to follow. Descartes' reliance on God as the guarantor for his foundational project is thus often dismissed as window dressing designed to placate potential ecclesiastical critics. Certainly, it is true that Descartes avoids making reference to the revealed truths of Christianity, including the doctrine of original sin, and he is quite forthcoming about his reluctance to engage in 'theological' discussions. In this respect, however, he is rather atypical and thus a poor exemplar for seventeenth-century philosophy generally. Very few discussions of knowledge in the seventeenth century are devoid of references to the problem of sin in relation to knowledge. Indeed, surprising as it may seem, what distinguishes seventeenth-century discussions of knowledge from scholasticism is not their secular character but rather the fact that they tend to be more explicit in their reliance on the resources of revealed theology than their medieval equivalents. Hence, as we shall see, one of the most

[20] Wilhelm Dilthey observed, at the close of the nineteenth century, that the advent of modernity can be characterised as a turn from metaphysics to anthropology. 'Die Funktion der Anthropologie in der Kultur des 16. und 17. Jahrhunderts', in *Weltanschauung und Analyse des Menschen seit Renaissance und Reformation. Wilhelm Diltheys Gesammelte Schriften* II (Leipzig, 1914).

[21] Kuno Fischer, *Metaphysik oder Wissenschaftslehre* (Stuttgart, 1852); *Geschichte der neueren Philosophie*, 6 vols. (Mannheim, 1860). See Knud Haakonssen, 'The History of Early Modern Philosophy: The Construction of a Useful Past', in C. Condren, S. Gaukroger and I. Hunter (eds.), *The Philosopher in Early Modern Europe: The Nature of a Contested Identity* (Cambridge, 2006).

common seventeenth-century objections to scholastic philosophy was that it was 'pagan' in character.

A variation on this thesis, and one closer to that set out in this book, is that the Protestant Reformation precipitated an intellectual crisis by challenging traditional sources of authority. Because this challenge extended to the very criteria for what counted as true belief, the problem of knowledge became particularly acute. The rediscovery of ancient scepticism, which coincided with the Reformation, greatly exacerbated the problem, providing an impressive range of arguments to the effect that nothing could be known with certainty.[22] Michel de Montaigne, whose *Apology for Raymond Sebonde* masterfully rehearses the sceptical arguments of Pyrrho of Elis, played a major role in the revival of the ideas of these ancient schools and, along with his disciples, made scepticism a fashionable philosophical option in the seventeenth century. To a degree, sceptical arguments proved useful to the Counter-Reformation because they could be deployed against Protestant claims to doctrinal certainty. Moreover, one of the standard sceptical prescriptions – in the face of our ignorance it is best simply to follow the customs and traditions of one's own country – counselled against the adoption of novel religious views (such as those of the Protestants). Again Descartes is the key figure. The sceptical intellectual atmosphere that flourished in the early seventeenth century provided the point of departure for Descartes' *Meditations*, which begins with a radical scepticism, but concludes by triumphantly dispelling all doubts with clear and distinct ideas. These provide the indubitable foundations for knowledge. Richard Popkin, who has done most to highlight the role of scepticism in early modern philosophy, thus considers Montaigne's *Apologie* to be 'the womb of modern thought, in that it led to the attempt either to refute the new Pyrrhonism, or to find a way of living with it'.[23] Descartes provided just such a refutation, and in doing so inaugurated the era of modern philosophy.

[22] L. Floridi, 'The Diffusion of Sextus Empiricus's works in the Renaissance', *JHI* 56 (1995), 63–85; and 'The Rediscovery of Ancient Scepticism in Modern Times', in M. Burnyeat (ed.), *The Skeptical Tradition* (Berkeley, 1983), pp. 225–51; Charles B. Schmitt, *Cicero Scepticus: A Study of the Influence of the 'Academica' in the Renaissance* (The Hague, 1972).

[23] Richard H. Popkin, *The History of Scepticism from Erasmus to Spinoza* (Berkeley, 1979), p. 54. Cf. Ernst Cassirer, *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neueren Zeit*, 2 vols. (Berlin, 1906–7), I, 162, 181. Popkin's work appeared in three successively expanded editions, the earlier work being *The History of Scepticism from Erasmus to Descartes* (Van Gorcum, 1960), the later, *The History of Scepticism from Savonarola to Bayle* (Oxford, 2003). Also see Popkin's 'Scepticism and Modernity' in T. Sorell (ed.), *The Rise of Modern Philosophy: The Tension between the New and Traditional Philosophies from Machiavelli to Leibniz* (Oxford, 1993), pp. 15–32; 'Theories of Knowledge', in CHRP, pp. 668–84. For discussions or developments of this important thesis see Richard A. Watson and James E. Force, (eds.), *The High Road to Pyrrhonism* (San Diego, 1980); R. Popkin and Arjo Vanderjagt (eds.), *Scepticism and Irreligion in the Seventeenth and Eighteenth Centuries* (Leiden,