INTRODUCTION

During the thirteenth century the ambitions and fears of the inhabitants of Latin Christendom took on new forms as their horizons expanded. The Mongol conquests in Asia at once menaced Europeans and opened up the unknown lands of Central Asia and the Far East to diplomacy, trade and evangelism. The conquest of Constantinople and the struggle to regain Jerusalem involved them more than ever in the societies of the eastern Mediterranean. Victories over their Muslim and pagan neighbours swelled their lands on all sides, but gave them uncomfortable responsibilities. There was a growing awareness of the sheer size of the world in relation to the small corner occupied by Latin Christians. In the same period many lost texts of ancient Greece, together with commentaries and treatises from the Muslim world, were obtained and translated. This diverse body of material included works on philosophy, medicine, natural sciences, astronomy, astrology, alchemy and magic. Its introduction into the courts and universities of Europe radically affected Latin thought, at once suggesting new possibilities and posing an uneasy challenge to existing orthodoxies.

For many observers these developments had an uncertain historical resonance. The community of the faithful seemed fragile in the face of so many challenges. The spread of heresies and the endless wars and tensions within Europe suggested that darker forces were at work. The appearance of Antichrist was widely anticipated. Yet theirs was also a society of increasing prosperity and sophistication. A powerful, reforming papacy and new religious orders worked to renew the faith and to convert unbelievers. Successive popes and councils called for responses to this array of threats, problems and opportunities. Many people sought to address the troubles of Christendom, but few were able to propose overarching or enduring solutions. One exception was an English Franciscan, Roger Bacon. In the late 1260s he wrote a series of treatises at the request of Pope Clement IV, analysing the perilous situation of Christendom and

outlining a programme of reform that would turn Latin weakness into strength. His work has rarely been read in this context, but it was one of the most dynamic attempts of its time to empower the Latin West in the face of internal divisions and external threats.

Roger Bacon occupies a prominent, if ambiguous, position in the history of the medieval period. He is widely regarded as a significant figure in the development of modern scientific thought, playing an important role in the assimilation of Graeco-Arabic learning into the Latin world. He was one of the first to teach Aristotle's natural philosophy in Paris, and his later investigations were imaginative and diverse. In particular, he explored controversial fields such as astrology, alchemy and magic, which sought to harness the power of nature at the very boundaries of the licit. Although he was one of a number of scholars who were involved in the process of adapting this material for Christian use, he was unique in producing a series of treatises for the papal curia in which he offered pungent analyses of his society and its intellectual life. These, together with his programme for its reform, have brought him lasting attention and repute. Displaced from their original setting, his ideas have been valued as a remarkable early statement of a set of aspirations central to Western secular identity: the rejection of prejudice and superstition and the continuing advance of science. As a result, his work seemed to belong to one of the great narrative arcs of human progress, rather than to a particular place and time. This impression was fostered by the view that Bacon was isolated in his own society by the nature of his interests and the originality of his mind – and the persecuting zeal these aroused in his contemporaries. During the centuries after his death something of a 'black legend' grew up around his memory, suggesting that he had been silenced and imprisoned by his order and a complicit pope. His experience has been represented as exceptional, difficult and obscure: historically significant, but peripheral to the main currents of the day rather than indicative of them.

Something of this perception of a disjunction between Bacon and his environment has lingered on, permitted by the directions in which study has proceeded. His social and intellectual criticisms and his reform programme can still seem curiously adrift in modern discussion, cast loose by the centuries from the vital currents of thought in which they had been anchored. His work has not often been read as characteristic of the wider discourses of its day, or as evidence of them. In particular, the seriousness of his commitment to the Franciscan order has been largely overlooked. The consequence of this is not only the perpetuation of some grave misrepresentations of his life and thought, but also the persistent neglect of a group of important and relatively accessible sources for the order's

history. The present study seeks to address both of these deficiencies in the historiography. It offers a new reading of Bacon's work, arguing that he wrote out of a keen personal engagement with the objectives of his order and the contemporary Church. In the process, it challenges the image of Bacon as a marginalised and suspect figure, suggesting that his work rather provides an indication of the breadth of imagination possible where mendicant aspirations met the intellectual dynamism generated by the early universities. Following from this, it shows how, as a neglected witness to the thought of the friars, he offers us an unsettlingly new perspective on terrain that has, perhaps, grown too familiar.

ROGER BACON IN HISTORY

A new study cannot be undertaken without setting out plainly the nature of our current understanding of Bacon and the reasons for it. Modern views of him have surprisingly deep roots. Unlike many other medieval intellectuals, he did not at his death pass soberly into sainthood or obscurity, but continued to be read and discussed throughout the centuries. This has generated a rich interpretative legacy that continues to affect representations of him.[1]

During his life Bacon wrote on a wide range of topics. His treatises for Pope Clement IV criticised the ignorance and prejudice that, in his view, were endangering the Latin West. He set out a bold new programme of studies that would remedy the situation. Embedded within these larger texts were treatises on neglected subjects that Bacon thought necessary to the Church. He was particularly interested in mathematics, optics and *scientia experimentalis*, which encompassed, in addition to the more obvious elements, branches of learning such as astrology, alchemy and magic. This material was popular with contemporaries and continued to be copied, disseminated and supplemented in the centuries after his death. He was much admired, not least because he had addressed difficult questions about the limits that should be imposed upon the study and use of controversial arts and sciences. These were early contributions to a debate that has persisted, in one form or another, to the present day. At some point in the fourteenth century it began to be rumoured that he had been condemned by members of his order for holding suspect views, and sentenced to prison. As far as we can tell, the stories did him little harm: official histories of his order continued to boast of his achievements while tales of his magic exploits proliferated.

[1] Some of the material presented here and in the following paragraphs is given in greater detail in A. Power, 'A Mirror for Every Age: The Reputation of Roger Bacon', *EHR*, 121.492 (2006), 657–92.

In the course of the sixteenth and seventeenth centuries he became a notable historical figure. On the Elizabethan stage he was a benign counterpart to the darker figures of Prospero and Dr Faustus. In literature he was associated with knowledge of occult arts: sometimes as a practitioner with demons at his command; sometimes as a critic; occasionally as a wily rescuer of souls ensnared by Satan.[2] Scholars of the time, anxious to defend the legitimacy of their own scientific endeavours, were irritated by the popular stories of Friar Bacon achieving technological marvels with the aid of demons or magical practices. They mounted a strident defence of him, insisting that he achieved everything as a good Christian, through the use of mathematics and natural philosophy, and that allegations to the contrary were the slanders of his jealous and uncomprehending contemporaries.[3] They were eager to insist that only the ignorant could suppose Bacon – and, by extension, themselves – to be interested in magic or other 'unscientific' arts. This was something of a misrepresentation, but it has taken a long time for the more esoteric aspects of Bacon's thought to be investigated on their own terms. Instead, there were recurring efforts to insist, for example, that he was superior to 'ordinary alchemists' and 'worthy of being placed among the chemists'.[4] This hindered recognition of his view of nature, its powers and the application of them to ecclesiastical affairs, although matters have greatly improved in recent decades.[5]

A second, more serious, consequence of this early enthusiasm for Bacon has been the secularisation of his objectives. The prevailing view that he was not particularly dedicated to his order and the Church almost certainly had its roots in the hostility to the friars that developed in England during his own lifetime and greatly intensified with the Reformation.[6] The

[2] *The famous history of Fryer Bacon contayning the wonderfull things that he did in his life: also the manner of his death, with the lives and deaths of the two conjurers, Bungey and Vandermast* (London, 1640). The stories vary across the different editions of this popular 'history'. See A. Kavey, *Books of Secrets: Natural Philosophy in England, 1550–1600* (Chicago, 2007), esp. pp. 32–58.

[3] E.g. J. Bale, *Scriptorum Illustrium maioris Brytanniae, quam nunc Angliam & Scotiam uocant* (Basle, 1557), p. 342; the prefaces to *Frier Bacon his discovery of the miracles of art, nature, and magick. Faithfully translated out of Dr Dees own copy, by T.M. and never before in English* (London, 1659); Roger Bacon, *Epistola Fratris Rogerii Baconis, De secretis operibus artis et naturae, et de nullitate magiae . . . opera Johannis Dee* (Hamburg, 1618), pp. 11–12; and the indignation of Anthony Wood: *Survey of the Antiquities of the City of Oxford, composed in 1661–6, by Anthony Wood*, ed. A. Clark (3 vols. Oxford, 1889–99), vol. II, p. 385. For further references see Power, 'Mirror', pp. 664–8.

[4] M. M. Pattison Muir, 'Roger Bacon: His Relations to Alchemy and Chemistry' in A. G. Little (ed.), *Roger Bacon Essays* (Oxford, 1914), 285–320, p. 320.

[5] Now regularly discussed in *Micrologus*, and notably by Chiara Crisciani and Agostino Paravicini Bagliani. See also the essays by W. R. Newman, F. Getz, S. J. Williams, together with J. Hackett's essay 'Roger Bacon on Astronomy-Astrology: The Sources of the *Scientia Experimentalis*' in *RBS*, 175–98.

[6] P. R. Szittya, *The Antifraternal Tradition in Medieval Literature* (Princeton, 1986); C. Z. Wiener, 'The Beleaguered Isle: A Study of Elizabethan and Early Jacobean Anti-Catholicism', *Past and Present*, 51

Introduction

Tudor 'Friar Bacon' was an English luminary, a patriot and a defender of his country against its foreign foes. It was important to preserve him from the stigma of loyalty to the Pope, the Roman Catholic Church and the Franciscan order. The rumours of a condemnation came into their own and took on a new significance in this climate. It was frequently claimed that the papacy or the friars had actively objected to his work: 'The silly Fryers envying his too prying head, by their craft had almost got it off his shoulders.' Popes Clement IV and Nicholas IV were each said to have imprisoned him.[7] This did not merely establish Bacon's nationalist credentials, it enhanced his scholarly prestige. For Protestant England, Roman Catholicism was the embodiment of Dark Age superstitions and intellectual backwardness. The rejection of Bacon's ideas by Rome was to his credit: it showed that he was modern and enlightened. His ill-attested condemnation was thus made central to narratives of his life and came to function rhetorically as the main indication of the reaction of his contemporaries to his work. This use of the condemnation story persists, although with our very different understanding of the medieval Church it now tends, if anything, to discredit Bacon among scholars, although it remains the basis for popular lionisation.[8] Beyond the condemnation, it is noticeable that while Elizabethans did not present Bacon as a religious sceptic, they did construct him as a man whose aims were antithetical to those of the papacy and the friars. This, too, has its echoes in time – the idea persists that Bacon sought, as Daniel put it, 'to deflect the purpose and approach given [to the Franciscans] by their founder'.[9]

From the end of the seventeenth century interest shifted towards Bacon's originality as a thinker. He was credited with having invented certain useful technologies, such as telescopes and gunpowder. In the nineteenth century he emerged as a visionary scientist, struggling against the forces of ignorance and religious conservatism, prophesying a bright future for humanity if it adopted his rational *modus operandi* – namely, experimental method. His supposed persecution at the hands of the medieval Church imbued him with a tragic heroism, and even an oblique contemporary relevance. Everyone from Positivists to liberal Catholics

(1971), 27–62; D. Williams, '*Friar Bacon and Friar Bungay* and the Rhetoric of Temporality' in G. McMullan and D. Matthews (eds.), *Reading the Medieval in Early Modern England* (Cambridge, 2007), 31–48.

[7] *Frier Bacon his discovery*, quotation from Preface. See also G. Powell, *Disputationum theologicarum & scholasticarum de Antichristo & eius Ecclesia* (London, 1605), p. 14.

[8] P. Sidelko, 'The Condemnation of Roger Bacon', *JMH*, 22.1 (1996), 69–81. The condemnation is, for example, made much of in a recent popular biography: B. Clegg, *The First Scientist: A Life of Roger Bacon* (London, 2003) and a highly inaccurate sketch in D. Sharpes, *Outcasts and Heretics: Profiles in Independent Thought and Courage* (Lanham, MD, 2007), pp. 187–90.

[9] E. R. Daniel, *The Franciscan Concept of Mission in the High Middle Ages* (Lexington, KY, 1975), p. 66.

found this figure attractive. It was an acolyte of Auguste Comte who produced what remains the standard edition of the *Opus maius*. The seventh centenary of his birth was celebrated in Oxford in 1914 and drew distinguished guests from across Europe. Inevitably, perhaps, the backlash began in earnest the same year.

A far more critical approach to Bacon's work had begun to appear from the end of the nineteenth century, among scholars such as Pierre Mandonnet, Emile Charles and Hastings Rashdall. Their concerns were developed and brought to a wider audience by Lynn Thorndike in a series of articles beginning in 1914 and later consolidated by a contextualised portrait in the influential *History of Magic and Experimental Science*. He asserted that there was no evidence that Bacon anticipated modern discoveries in any practical sense or was persecuted by his contemporaries. On the contrary, Bacon's reputation was based largely on extrapolations from his boastful account of his own merits and his criticisms of his contemporaries. In fact, he was not particularly original in his interest in natural science or even his advocacy of experimental method. The importance of his writings, when read in their proper context, lay in the fact that they gave 'a most valuable picture of medieval thought' at its advanced stages.[10]

Thorndike's arguments convinced most people, perhaps all the more powerfully because they fitted into a general revulsion against Victorian biography and intellectual hagiography. Yet the grounds on which he attacked the nineteenth-century stereotype were not quite as encompassing as they appeared. He was suspicious about the way the known evidence was used and sceptical of fashionable theories of scientific progress, basing his analysis firmly in a more sophisticated sense of historical context. He suggested that attention be paid to Bacon's interest in astrology and magic. He showed that the evidence for the dramatisation of Bacon's relationship with his order was extremely slender. Yet there were misunderstandings about Bacon that Thorndike did not specifically address, and indeed that he perpetuated in the very studies that purported to signal a clean break with the past. In particular, he did very little to address the secularisation of Bacon's life and work, paying no serious

[10] L. Thorndike, 'Roger Bacon and Experimental Method in the Middle Ages', *Philosophical Review*, 23 (1914), 271–92. He continued to develop his argument in 'The True Roger Bacon, I', *AHR*, 21.2 (1916), 237–57 (quotation from p. 238); 'The True Roger Bacon, II', *AHR*, 21.3 (1916), 468–80; *A History of Magic and Experimental Science During the First Thirteen Centuries of Our Era* (8 vols. London, 1923–58), vol. II, pp. 616–91. On Thorndike's 'deflationary' approach to historical study see D. B. Durand, 'Magic and Experimental Science: The Achievement of Lynn Thorndike', *Isis*, 33.6 (1942), 691–712, esp. p. 702. On Mandonnet, Charles and Rashdall see Thorndike, 'Roger Bacon and Experimental Method', pp. 272–6; Thorndike, *History*, vol. II, pp. 686–7.

attention to the significance of Bacon's Franciscan vocation.[11] Thorndike also largely accepted and reproduced the Victorian view that 'before Jebb had edited the *Opus maius* in 1733, Roger Bacon was unappreciated and unknown'.[12] This had the effect of obscuring the origins of many enduring ideas about Bacon.

In the first half of the twentieth century most of Bacon's lesser-known extant writings were printed, filling out the picture of his life and thought. Of particular importance was Robert Steele's monumental *Opera hactenus inedita*, which appeared between 1905 and 1941. While it revealed the range of Bacon's work, it tended to destroy the legend of singularity still further, since much of it seemed hardly outstanding in a thirteenth-century context that was now far better known. However, in the 1930s there was a renewed hunger for improving biographies of great men, which was reflected in the rising once more of Bacon's star, especially in Britain where he was lauded in Whiggish and nationalistic histories.[13] It is likely that this jingoistic popular enthusiasm provoked the growing scholarly hostility to him. A negative view of his 'character' emerged amid a fashion for magisterial vignettes. These, as David Knowles put it, depicted historical figures 'as in truth they were' and sought to assess their 'moral worth'.[14] Unfortunately, judgements about Bacon's moral worth were not pronounced on the basis of a fresh reading of his writings, but made in reaction to the existing representations of him. Among twentieth-century scholars, who were predisposed by long tradition to assume that his contemporaries resented him, and who prized modesty and academic courtesies, Bacon's self-promotion and attacks on his colleagues earned him the reputation of an outsider; a vain and unreliable witness with a bitter tongue.[15] The tendency to castigate rather than examine the emotions and language of medieval writers was perhaps also the corollary of the then conventional view that medieval passions had been inherently

[11] His sole comment was that he was not surprised that Bacon had joined the order, 'for both Orders were rich in learned men, including students of natural science': 'True Roger Bacon, I', p. 237.

[12] Thorndike, 'Roger Bacon and Experimental Method', p. 271.

[13] R. Partin, 'Biography as an Instrument of Moral Instruction', *American Quarterly*, 8.4 (1956), 303–15. See, for example, G. M. Trevelyan, *Illustrated History of England* (3rd edn. London, 1956), p. 183. Curiously, in Soviet popular scholarship he was glorified as an atheist, a scientist and an 'ideologist of the urban working classes': A. Klemeshov, 'Roger Bacon's Life and Ideas in Russian Historiography' in J. Carvalho (ed.), *Religion, Ritual and Mythology: Aspects of Identity Formation in Europe* (Pisa, 2006), 253–63, p. 257.

[14] D. Knowles, 'The Historian and Character' (1954), reprinted in *The Historian and Character and Other Essays* (Cambridge, 1963), 1–15, quotations at p. 14.

[15] The point is illustrated by a reproof given to the notoriously combative historian George Coulton, at the end of a lecture to the British Academy in 1932, when the chairman told him firmly: 'I cannot feel that controversy can *ever* be respectable': G. G. Coulton, *Fourscore Years: An Autobiography* (Cambridge, 1945), p. 326.

uncontrolled and childish.[16] Bacon's enthusiasm, which had moved the nineteenth century to sympathy and respect, was often seen by subsequent authors as overwrought and eccentric. The cliché of the 'flawed genius' was routinely deployed to describe him.[17] These basic ideas about his personality have, on the whole, persisted up to the present day in the face of considerable evidence that could modify them.

It was in this climate that two monographs on Bacon appeared almost simultaneously: those of Theodore Crowley and Stewart Easton, in 1950 and 1952 respectively. They remain, in the absence of anything more recent, the standard Anglophone biographies.[18] They both provide detailed evaluations of the often patchy and ambiguous evidence for Bacon's life. Many of their conclusions are persuasive, or at least thought-provoking. However, Easton, in particular, constructed a deliberately unsympathetic portrait of Bacon, partly on the basis of hypotheses about his psychology that cannot be substantiated and now seem dated. In his view, Bacon was a 'crank' who had neglected to study theology as a young man, and as a consequence spent his life watching resentfully as fame and status was achieved by those who had. 'It seems to me', wrote Easton, 'that the subconscious realisation that he had made a wrong decision accounts for the whole of Bacon's later career and his peculiar psychological disposition.' He believed – again, without any real evidence – that Bacon was closely supervised by his superiors and his work censored, and that this was because he was a Joachite with leanings towards the 'left-wing' of the order: the proto-Spirituals. He attributed Bacon's criticisms of the state of study to jealousy and 'hatred' of men more successful than himself, and saw him as a genius, but one flawed by credulity, malice, arrogance, a lack of generosity and other failings.[19] Easton, it should be noted, was not a medievalist. Crowley, a theologian, also felt that Bacon was an 'erratic genius', and his depiction of Bacon's psychology, while less overtly speculative and rather less aggressive in tone, was in essential agreement with that of Easton.[20] It is hard to escape the impression that

[16] Represented in Johan Huizinga's *Herfsttij der Middeleeuwen* (1919) and Norbert Elias' *Über den Prozess der Zivilisation* (1937).

[17] For example: D. Knowles, *The Religious Orders in England* (3 vols. Cambridge, 1948–59), vol. I, pp. 214–16.

[18] A number of shorter biographical essays, particularly by Jeremiah Hackett, David Lindberg and A. G. Molland, critique and update Crowley and Easton, but cite them in support of many fundamental points. For the current state of Bacon biography see below, pp. 10–11.

[19] S. C. Easton, *Roger Bacon and his Search for a Universal Science* (New York, 1952), esp. pp. 19–34, 144–5; quotations at pp. 144, 30–1.

[20] T. Crowley, *Roger Bacon: The Problem of the Soul in his Philosophical Commentaries* (Louvain, 1950), esp. pp. 27, 70–1, 196–8.

both authors read Bacon through the lens of prevailing moralised assessments. They have, however, been highly influential.

These biographies were followed by several studies from Italian historians, who had their own perspectives on Bacon. In 1953 Eugenio Massa published a critical edition of the seventh part of the *Opus maius*, the section on moral philosophy. This was the basis for his 1955 monograph, which was partly devoted to an investigation into Bacon's use of classical philosophy.[21] In 1957 Franco Alessio published a biographical study that contextualised Bacon more sensitively than had his predecessors. He characterised Bacon as a reformer who drew deeply on the ideas of those around him, including the poor; a man whose work came out of the very intensity of his experiences and the events of his life.[22] He saw the development of the Franciscan order in terms that made Bacon's place among the friars seem more natural, but only by emphasising that he was acting within an intellectualised order greatly changed from the days of Francis of Assisi. He investigated Bacon's relationships with his contemporaries, particularly Grosseteste and Bonaventure. He argued that Bacon had sought to reform the order along distinctive lines suggested by the study of science and philosophy, and that this had been opposed by Bonaventure.[23] The view that Bonaventure and Bacon were in antagonistic dialogue, and that this was a major cause of Bacon's problems, was further developed by Camille Bérubé in several studies of the two men, and is still the subject of debate.[24] Finally, additional contextualisation of Bacon among the Oxford friars was offered in 1971 by Davide Bigalli, in a close analysis of the relationship between the eschatological thought of Bacon and Adam Marsh and the wider affairs of the Church in the shadow of the Mongol threat.[25]

Despite the general disenchantment with Bacon as a personality, the later decades of the twentieth century saw a sustained effort to clarify the nature and importance of his thought by scholars working within the history of ideas. There have been few academic monographs in any language, although there have been several biographies aimed at a more

[21] *MP*; E. Massa, *Ruggero Bacone: etica e poetica nella storia dell' 'Opus maius'* (Rome, 1955).
[22] F. Alessio, *Mito e scienza in Ruggero Bacone* (Milan, 1957), pp. 10–11.
[23] Alessio, *Mito*, pp. 79–105. See also Crowley, *Roger Bacon*, pp. 55–76.
[24] C. Bérubé, 'Le dialogue de S. Bonaventure et de Roger Bacon', *CF*, 39 (1969), 59–103; C. Bérubé, *De la philosophie à la sagesse chez St Bonaventure et Roger Bacon* (Rome, 1976); D. Hattrup, *Ekstatik der Geschichte: Die Entwicklung der christologischen Erkenntnistheorie Bonaventuras* (Paderborn, 1993), esp. pp. 126–71.
[25] D. Bigalli, *I Tartari e l'Apocalisse: Ricerche sull'escatologia in Adamo Marsh e Ruggero Bacone* (Florence, 1971).

popular audience.[26] Instead, literally hundreds of articles have been written to examine Bacon's work across a range of highly specialised disciplines.[27] The main research questions have concerned Bacon's sources, the development of his ideas and their influence on later thinkers. Although the notion of 'genius' has gone out of fashion, a chorus of scholars confirm that he was indeed exceptional in many areas: 'It might be correct to describe Roger Bacon as the Middle Ages' greatest apostle of natural science.'[28] 'Bacon not only deserves an important place in the history of language studies as a philologist, but as a student of semantics as well.'[29] 'Taylor's epithet describing [Bacon] as "Father of Modern Geography" still holds a grain of truth.'[30] 'Light was one of the most important entities in the medieval cosmos, and Roger Bacon was its most accomplished medieval student.'[31] 'Roger Bacon's bold synthesis of alchemy and medicine, in which both are subordinate to *scientia experimentalis*, was a significant novelty for its time.'[32] 'It was Bacon who showed western scholars how to do optics the mathematical way.'[33] 'No medieval thinker had ever argued the case of utility so forcefully or hammered it home so often. In his repeated insistence on the practical application of scientific knowledge, on its beneficiality for the individual and the state, Bacon is the advocate for a program that has become our own.'[34]

Away from the specialist studies of Bacon's thought, many medievalists touch on him in passing. In the last few decades his views on other

[26] The best introduction to the modern study of Bacon is the collection of essays edited by Jeremiah Hackett: *Roger Bacon and the Sciences: Commemorative Essays* (Leiden, 1997) and the German translation of some of these and other essays in F. Uhl (ed.), *Roger Bacon in der Diskussion* (2 vols. Frankfurt, 2001–2). See also the biographical introduction in A. Boadas i Llavat, *Roger Bacon: subjectivitat i ètica* (Barcelona, 1996), pp. 7–69. The bibliographies of two recent publications confirm this picture: F. Finkenberg, *Ancilla theologiae? Theologie und Wissenschaften bei Roger Bacon* (Mönchengladbach, 2007), pp. 107–13; G. Mensching, *Roger Bacon* (Münster, 2009), pp. 131–2.

[27] Some indication of the extent of publishing on Bacon may be gained from the International Medieval Bibliography, which, although far from comprehensive, lists 206 articles on Bacon for the period from 1976 to the beginning of 2011.

[28] S. J. Williams, 'Roger Bacon and his Edition of the Pseudo-Aristotelian *Secretum Secretorum*', *Speculum*, 69 (1994), 57–73, p. 70.

[29] J. Pinborg, 'Roger Bacon on Signs: A Newly Recovered Part of the Opus Maius' in J. P. Beckmann *et al.* (eds.), *Sprache und Erkenntnis im Mittelalter* (Berlin, 1981), 403–12, p. 412.

[30] D. Woodward and H. M. Howe, 'Roger Bacon on Geography and Cartography' in *RBS*, 199–222, p. 221.

[31] D. C. Lindberg, 'Roger Bacon on Light, Vision and the Universal Emanation of Force' in *RBS*, 243–75, p. 243.

[32] W. R. Newman, 'An Overview of Roger Bacon's Alchemy' in *RBS*, 317–36, p. 335.

[33] D. C. Lindberg, 'Roger Bacon and the Origins of *Perspectiva*' in E. Grant and J. E. Murdoch (eds.), *Mathematics and its Application to Science and Natural Philosophy in the Middle Ages* (Cambridge, 1987), 249–69, p. 264.

[34] S. J. Williams, 'Roger Bacon and the *Secret of Secrets*' in *RBS*, 365–93, p. 391.