



Roger Bacon and the beginnings of experimental science in Britain

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DECLARATIONS

Roger Bacon is something of an enigma. He has been called many things – ‘Britain’s first scientist’, ‘wonderful doctor’, ‘conjurer’ and ‘magician’. Many of the details of his life are uncertain and they have been discussed and argued about by scholars for centuries. He is generally thought to have been born in Ilchester, Somerset, around 1214, although some authors have put his date of birth as late as 1220. There is good evidence that he was in Paris in 1245 and 1251, but it is uncertain if he ever actually studied in Oxford. If he did, he would have met Robert Grosseteste, often described as Oxford University’s first Chancellor (although his role is better described as ‘master of students’ (*magister scholarium*)).

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Bacon’s entry into the Franciscan order, plausibly in 1257, is also conjectural; but it is clear that his relationship with the Franciscan hierarchy was, at times, rather stormy.¹ He was openly critical of some of their values and beliefs and it was not surprising that they sometimes tried to muzzle him. Again the details of his alleged ‘imprisonment’ are unclear.

It is likely that Bacon spent the last years of his life in the Franciscan House in Oxford, where he died and was buried in 1292.

Bacon’s writings

Although Bacon is often celebrated as the first true experimental scientist in Britain, this accolade may more properly be accorded to Robert Grosseteste (c 1170–1253). Grosseteste definitely influenced Bacon and may well have taught him. Although much is now known about Bacon’s extensive writings – and they are rightly admired for their scholarship and lucidity – it is not clear how far they are original or the extent to which they were derived from contact with contemporary scholars such as Grosseteste, Adam Marsh, Thomas Wallensis and others.

I am puzzled that RW Southern’s biography of Grosseteste does not mention Roger Bacon,² despite the Preface in AC Crombie’s *Robert Grosseteste and the origins of experimental science*, published half a century earlier, which states: ‘In the 13thC, the Oxford school, with Robert Grosseteste as its founder, assumes a paramount importance: the work of this school in fact marks the beginning of the modern tradition of experimental science’.³

What is clear is that Roger Bacon was an innovative thinker and a courageous scholar, not afraid to challenge current beliefs about philosophy, science and religion. His writings were extensive and have probably been more intensively studied than those of Grosseteste.

It was possibly Bacon’s acquaintance with Guy Foulquois, formerly a lawyer and military man who became a cardinal in 1261 and Pope Clement IV in 1264, which stimulated Bacon’s most famous writings. Indeed, as Pope Clement, Foulquois commanded Bacon to send, ‘as quickly as possible and in a fair hand’ his written works on philosophy, science and religion. There must have been some misunderstanding because Bacon was asking the Pope at that time to bless his intention to write a comprehensive ‘encyclopaedia of current knowledge’. The Pope’s request provoked a flurry of activity on Bacon’s part, which resulted in the completion of his *Opus maius* in 1266. This was intended to be a summary (somewhat lengthy) of knowledge about the natural world and was divided into seven parts:

- (I) The causes of human ignorance
- (II) The relation of the sciences to theology
- (III) Grammar and the power of languages
- (IV) Mathematics, including astronomy and astrology
- (V) Optics (perspectiva)
- (VI) Experimental science
- (VII) Moral philosophy

Part VI of Bacon's *Opus maius* – *Experimental Science* – contains the passages for which he is principally remembered. The various abbreviations used by scribes make it hard for non-medievalists to recognize the key passages.⁴

P 389 of the 15th Century Digby manuscript in the Bodleian Library in Oxford states:

Positis radicibus sapientiae Latinorum penes Linguas et Mathematicam et Perspectivam, nunc volo revolvere radices a parte Scientiae Experimentalis, quia sine experiential nihil sufficientia sciri potest [my emphasis]

Having laid down fundamental principles of the wisdom of the Latins so far as they are found in language, mathematics, and optics, I now wish to unfold the principles of experimental science, since without experiment nothing can be sufficiently known. There are two ways of acquiring knowledge, one through reason, the other by experiment. Argument reaches a conclusion and compels us to admit it, but it neither makes us certain nor so annihilates doubt that the mind rests calm in the intuition of truth, unless it finds this certitude by way of experience. Thus many have arguments toward attainable facts, but because they have not experienced them, they overlook them and neither avoid a harmful nor follow a beneficial course. Even if a man that has never seen fire, proves by good reasoning that fire burns, and devours and destroys things, nevertheless the mind of one hearing his arguments would never be convinced, nor would he avoid fire until he puts his hand or some combustible thing into it in order to prove by experiment what the argument taught. But after the fact of combustion is experienced, the mind is satisfied and lies calm in the certainty of truth. Hence argument is not enough, but experience is.

Bacon is making a point that brings to mind a passage in Ibn Sina's *Qanun*, written two centuries earlier, namely:

If it is said that some parts of medicine are theoretical and other parts are practical, this does not mean that one part teaches medicine and the other puts it into practice . . . both parts of medicine are science, but one part is the science dealing with the principles of medicine, and the other with how to put those principles into practice.⁵

After dispatching his *Opus maius* to Rome, Bacon apparently worried that it may not have reached the Pope, or that it might have been too long for a busy Pope to read, and that it was incomplete. Accordingly he rapidly wrote his *Opus minus*, to summarise and supplement the *Opus maius*. This was despatched by 'special courier' – a favourite pupil of Bacon's named John. Bacon then worked on his *Opus tertium*, a much expanded volume. Unfortunately, the Pope died in 1268 without apparently ever communicating his opinions on Bacon's works.

Oxford's celebrations of Roger Bacon

There are several visible reminders of Roger Bacon's link with Oxford in the 13th century. Around the corner from Roger Bacon Lane, there is a memorial plaque on the south wall of the Westgate Centre (nearly opposite the street-level entrance to the car park, and overlooking a litter-strewn area of waste land). The plaque marks the site of Greyfriars Church, which stood there from about 1246 until 1538, when Franciscan houses were closed by Henry VIII. The inscription on the plaque records in English and Latin the life of one of England's most distinguished Franciscans:

The great philosopher, Roger Bacon, known as the wonderful doctor who by the Experimental Method extended marvellously the realm of science, after a long life of untiring activity near this place, in the home of his Franciscan brethren, fell asleep in Christ AD 1292.

Words from Bacon's *Opus maius* are inscribed above the entrance to the Daubeny Building of Oxford's Botanic Garden:

Sine experientia nihil sufficienter sciri potest [Without experiment nothing can be properly known]

Finally, in the court of the University's Museum of Natural History, there is a statue of Roger Bacon carved in Caen stone by Henry Hope Pinker. Bacon is depicted holding an astrolabe and callipers – the former representing his scientific studies, the latter suggesting an aspiration to

harmony. The statue was unveiled at a lavish celebration in 1914, on the 700th anniversary of Bacon's birth. The event was reported at length in *Nature*.⁶

After the statue had been unveiled at the museum, eulogies were given ('Bacon was the most important phenomenon of the Middle Ages' – Humboldt) and graciously accepted by the University Chancellor, Lord Curzon. A lunch was then served at Merton College, at which Sir William Osler thanked visitors from the Vatican, the French Academy, the Franciscans and Cambridge University for their contributions. Delegates were then offered the choice of going either to the Sheldonian Theatre to hear a Romanes Lecture on 'Atomic Theory' given by Sir JJ Thompson; or to the Bodleian Library to view an exhibition of Baconian books, manuscripts and prints. The celebration ended with a garden party at Wadham College.

Sir Archibald Gekie – President of the Royal Society – summed up the rationale for such an extensive celebration:

Dispensing with the futile disputational subtleties of the schoolmen of his day, [Bacon] strove to

concentrate attention on things rather than words. He led the way towards the conception of science as the inductive study of nature, based on and tested by experiment.

I wonder whether the 800th anniversary in 2014 will be celebrated in such style!

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