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JEFFERSON REPORT: PROBING EDUCATION

University of Oxford and Roger Bacon

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Editor's note: This Jefferson Publications series examines ancient universities that thrive today – how they have shaped the world and influenced education methods, citizenship, the meaning of government, and cultural life. Today's article features Roger Bacon and the University of Oxford.

Eighth in a Series

The University of Oxford is one of the world's great universities. Sketchy evidence indicates that schools existed at Oxford by the early 12th century. By the end of that century, a university was well established, perhaps resulting from the barring of English students from the University of Paris around 1167. Oxford was modeled on the University of Paris, with initial faculties of theology, law, medicine, and the liberal arts.

In the 13th century, the university gained added strength, particularly in theology, with the establishment of several religious orders, principally Dominicans and Franciscans, in the town of Oxford. The university had no buildings in its early years; lectures were given in hired halls or churches. The various colleges of Oxford were originally merely endowed boardinghouses for impoverished scholars. They were intended primarily for those holding master's or bachelor's of arts degrees who needed financial assistance to enable them to continue study for a higher degree.

During the Renaissance, Desiderius Erasmus carried the new learning to Oxford, and such scholars as William Grocyn, John Colet, and Sir Thomas More enhanced the university's reputation. Since that time, Oxford has traditionally held the highest reputation for scholarship and instruction in the classics, theology, and political science.

In the 19th century, the university's enrollment and its professorial staff were greatly expanded. The first women's college at Oxford, Lady Margaret Hall, was founded in 1878, and women were first admitted to full membership in the university in 1920. In the 20th century, Oxford's curriculum was modernized. Science came to be taken much more seriously and professionally, and many new faculties were added, including ones for modern languages and economics. Politics, Philosophy, and Economics are the most popular undergraduate subjects. The program is integrative. Postgraduate studies also expanded greatly in the 20th century.

Encyclopedia Britannica online - This article was most recently revised and updated by Melissa Petruzzello.

Roger Bacon, nick-name Doctor Mirabilis ("Wonderful, Amazing Teacher"), (born c. 1220, Ilchester, Somerset, or Bisley, Gloucester?, England—died 1292, Oxford?), English Franciscan philosopher and educational reformer who was a major medieval proponent of experimental science. Bacon studied "everything everywhere all at once" – mathematics, astronomy, optics, alchemy, and languages. He was the first European to describe in detail the process of making gunpowder, and he proposed flying machines and motorized ships and carriages. Bacon (as he himself complacently remarked) displayed a prodigious energy and zeal in the pursuit of experimental science; indeed, his studies were talked about everywhere and eventually won him a place in popular literature as a kind of wonder worker. Bacon therefore represents a historically precocious expression of the empirical spirit of experimental science, even though his actual practice of it seems to have been exaggerated.

Bacon was born into a wealthy family; he was well-versed in the classics and enjoyed the advantages of early training in geometry, arithmetic, music, and astronomy. One account of his life is as follows (there are date differences among scholars): Bacon was educated at Oxford c. 1234–42; Master of Arts at Paris c. 1242–47/8, active again at Oxford c. 1248–51, back in Paris 1251, Franciscan Friar at Paris 1256/7 to 1279, returning to Oxford c. 1280, died c. 1292. Further precision on the chronology must await the critical edition of all the works of Roger Bacon and careful scientific study of these works in relation to other 13th century scholars.

In the earlier part of his career, Bacon lectured in the faculty of arts on Aristotelian and pseudo-Aristotelian treatises, displaying no indication of his

later preoccupation with science. His Paris lectures, important in enabling scholars to form some idea of the work done by one who was a pioneer in introducing Aristotle into western Europe, reveal an Aristotelianism strongly marked by Neoplatonist elements stemming from many different sources.

He set out his own new model for a reform of the system of philosophical, scientific, and theological studies, seeking to incorporate language studies and science studies, then unavailable, at the University of Paris. In this project, he was partly successful. He wrote a new and provocative text on semiotics and influenced the addition of perspectiva to mathematical studies (*the Quadrivium*) as a required university subject. He succeeded in setting out a model of an experimental science on the basis of his study of optics. The latter was used in his extension of experimental science to include new medicines and the general health care of the body. He did this in a new context: the application of linguistic and scientific knowledge for a better understanding of theology and in the service of the Res publica Christiana.

About 1247 a considerable change took place in Bacon's intellectual development. From that date forward he expended much time and energy and huge sums of money in experimental research, in acquiring "secret" books, in the construction of instruments and of tables, in the training of assistants, and in seeking the friendship of savants – activities that marked a definite departure from the usual routine of the faculty of arts. The change was probably caused by his return to Oxford and the influence there of the great scholar Robert Grosseteste, a leader in introducing Greek learning to the West, and his student Adam de Marisco, as well as that of Thomas Wallensis, the bishop of St. David's.

From 1247 to 1257 Bacon devoted himself wholeheartedly to the cultivation of those new branches of learning to which he was introduced at Oxford – languages, optics, and alchemy – and to further studies in astronomy and mathematics. It is true that Bacon was more skeptical of hearsay claims than were his contemporaries, that he was suspicious of rational deductions (holding to the superior dependability of confirming experiences), and that he extolled experimentation so ardently that he has often been viewed as a harbinger of modern science more than 300 years before it came to bloom.

Yet research on Bacon suggests that his characterization as an experimenter may be overwrought. His originality lay not so much in any positive contribution to the sum of knowledge as in his insistence on fruitful lines of research and methods of experimental study. As for actual experiments performed, he deferred to a certain Master Peter de Maricourt (Maharn-Curia), a Picard, who alone, he wrote, understood the method of experiment and whom he called dominus experimentorum ("master of experiments"). Bacon, to be sure, did have a sort of laboratory for alchemical experiments and carried out some systematic observations with lenses and mirrors. His studies on the nature

of light and on the rainbow are especially noteworthy, and he seems to have planned and interpreted these experiments carefully. But his most notable "experiments" seem never to have been actually performed; they were merely described.

He suggested, for example, that a balloon of thin copper sheet be made and filled with "liquid fire"; he felt that it would float in the air as many light objects do in water. He seriously studied the problem of flying in a machine with flapping wings. He was the first person in the West to give exact directions for making gunpowder (1242); and, though he knew that, if confined, it would have great power and might be useful in war, he failed to speculate further. (Its use in guns arose early in the following century.) Bacon described spectacles (which also soon came into use); elucidated the principles of reflection, refraction, and spherical aberration; and proposed mechanically propelled ships and carriages. He used a camera obscura (which projects an image through a pinhole) to observe eclipses of the Sun.

He said of himself: "I was always studious. Apart from two of these forty years I was always [engaged] in study [or at a place of study], and I had many expenses just as others commonly have ... And it is known that no one worked in so many sciences and languages as I did, nor so much as I did. Indeed, when I was living in the other state of life [as an Arts Master], people marveled that I survived the abundance of my work. And still, I was just as involved in studies afterwards, as I had been before. But I did not work all that much, since in the pursuit of Wisdom this was not required."

Amanda Power has provided a masterful interpretation of the new context of Bacon's post-1266 works for Pope Clement IV. She places Bacon in a Franciscan context within the wider mission of Christendom in its relations with other cultures and religions. This major study, the first in English for nearly sixty years, offers a provocative new interpretation of both Bacon and his environment. Power argues that his famous writings for the papal curia were the product of his critical engagement with the objectives of the Franciscan order and the reform agenda of the 13th century church. Fearing that the apocalypse was at hand and Christians unprepared, Bacon explored radical methods for defending, renewing, and promulgating the faith within Christendom and beyond. Read in this light, his work indicates the breadth of imagination possible in a time of expanding geographical and intellectual horizons.[1]

Bacon was very active in the early debates at Paris in which the unity of substantial form in Aquinas was strongly criticized by the Franciscan School. Bacon is so critical of Aquinas' position that he deems it heretical. He defends the notion of plurality of forms while strongly arguing for the essential substantial unity of the human being. Bacon also uses his remarks to let the reader know that his study of Perspectiva was undertaken to criticize the

common teaching on natural philosophy (including psychology) and medicine at the University of Paris.

He sees a universal revelation to the Hebrews that was transmitted through the Greeks, Romans, and Islam to medieval Christianity. This view would be influential in Philosophy up to the age of Francis Bacon and Descartes. Roger Bacon links it to a doctrine of illumination taken from Augustine, Avicenna, and the commentary on the Pseudo-Ptolemy: *Centiloquium*. He contrasts the tradition of the great philosophers such as Plato and Aristotle with the mythical traditions from ancient times.

Bacon offers a structural critique of scholastic practice in the universities. He favors both language study and science over the "Sentence-Method" as a way of interpreting the texts of Philosophy and of Scripture. And he advocates training in mathematics and the sciences as requirements for students in theology.

Second, Bacon's later works on language and science are written in the specific historical and political context of the Mongol invasion of Europe, the sack of Baghdad in 1258 by the Mongols, and the geo-political situation of a Europe hemmed in by both the Mongols and Islam.

The wider historical context for Bacon's concerns has recently been outlined by Amanda Power (referred to above). The general context is theological and Franciscan: the arts and sciences leading to human wellbeing in this world and the next. It is also clear that Bacon is constructing a "new model" for medieval philosophy, one in which Aristotelian concerns are taken up and transcended in a Neo-Platonism with significant Roman Stoic influence and adapted to moral philosophy and Christian theology. Logic is reduced to mathematics, and the applications of mathematics become central to an understanding of the sciences. The applications of mathematics can in turn be used in religion and theology. Bacon presents reasons for a reduction of logic to mathematics (a kind of reversal of modern logicism) and sees mathematics as the key to an understanding of nature. Clearly, he is proclaiming the "usefulness" of mathematics for knowledge; he is not doing mathematical theory. And the branch of mathematics that is important here is geometry.

Bacon introduces another important item for science. He refers to the "laws of reflection and refraction." In his account of nature in *Communia naturalium* and the later works in general, Bacon's view is that a general law of nature governs universal force. This universal law of nature is imposed on a world of Aristotelian natures. This notion would have a significant future in experimental science.

His aim is to provide a method for science, one that is analogous to the use of logic to test validity in arguments. This new practical method consists of a

combination of mathematics and detailed experiential descriptions of discrete phenomena in nature. It would be distinguished from the conjurations of magic and from moral and religious belief. It would also be different from philosophy of nature and from broad optical knowledge. These two areas are important for experimental science, but they constitute general principles, so that in themselves and without experiment, they do not provide access to minute, detailed experiments. Nevertheless, for his description of the first example of an experimental science, the study of the rainbow, Bacon depends on the accounts handed on by Aristotle, Seneca, and Avicenna. He is not uncritical of these accounts.

Regarding morals and politics, Bacon places great emphasis on magnanimity as a virtue for the Prince and Prelate. Magnanimity of the greatest of the natural virtues. And it must not be confused with Christian humility. This distances Bacon from Bernard of Clairvaux and Bonaventure. For Bacon, Christian humility has its own distinctive role reflecting the relation of the human to the cosmos and to God. Above all, Bacon is concerned with reproducing as much of the Aristotelian and Stoic accounts of virtues as possible, and he is concerned with making the *Dialogues of Seneca* known to Pope Clement IV. In particular, he is most of all concerned with Seneca's *De ira,* which he regards as a fundamental text for the moral instruction of princes and prelates. Certainly, Bacon, as he does in the *Secretum Secretorum*, presents himself as a moral advisor to Princes.

Bacon devoted considerable time to the study of this work, the Latin translation of the Arabic work on statecraft in the tradition of *Mirrors for Princes* titled *Sirr-al-'asrar*. He worked on the text at Paris and completed the edition of this text with introduction and notes at Oxford after his return there from Paris c. 1280. This is the most important text on government and the education of the prince prior to the writing of *The Prince* by Machiavelli.

Bacon was an important teacher of the Arts at Paris in the 1240s. He was ahead of his time in the vigorous way he integrated the new Aristotle with the traditional Latin traditions of grammar and logic. He later called himself an expert in the philosophy of Aristotle as interpreted by Avicenna and Averroes. He returned to England, where he was attracted to interests of ancient languages, experimental concerns such as optics and experimental science, and a renewed critical study of the text of Scripture. When Bacon returned to Paris in the 1250s, he was to oppose what had become a profound change in the methodology of university learning, that is, the introduction of the "Sentence-Method" into the study of theology. For Bacon, this was a destruction of practices that he associated with Robert Grosseteste. Taking up the flag of the Bishop of Lincoln (d. 1253), he became the great critic of the Parisian mode of doing philosophy and theology. As we saw above, Bacon was already by 1266 very concerned with the new heterodox interpretations of Aristotle found in the

Faculty of Arts. His later works for Pope Clement IV must be read in the context of the Parisian debates on Latin Averroism (1266–1277).

He held Islamic thinkers between 1210 and 1265 in especially high regard calling them "both philosophers and sacred writers" and defended the integration of Islamic philosophy into Christian learning.

Bacon projected yet another encyclopedia, of which only fragments were ever published, namely, the *Communia naturalium* ("General Principles of Natural Philosophy") and the *Communia mathematica* ("General Principles of Mathematical Science"), written about 1268. In 1272 there appeared the *Compendium philosophiae* ("Compendium of Philosophy"). In philosophy – and even Bacon's so-called scientific works contain lengthy philosophical digressions – he was the disciple of Aristotle; even though he did incorporate Neoplatonist elements into his philosophy, his thought remains essentially Aristotelian in its main lines.

Sometime between 1277 and 1279, Bacon was condemned to prison by his fellow Franciscans because of certain "suspected novelties" in his teaching. The condemnation was probably issued because of his bitter attacks on the theologians and scholars of his day, his excessive credulity in alchemy and astrology, and his penchant for millenarianism under the influence of the prophecies of Abbot Joachim of Fiore, a mystical philosopher of history. How long he was imprisoned is unknown. His last work (1292), incomplete as so many others, shows him as aggressive as ever.

The Pope instructed Bacon in 1266 to ignore the rules of his Order and to send him his remedies about matters of some importance. It would appear from the context of Bacon's works for the Pope that the remedies had to do with educational matters at Paris, which at this time was the foremost university of the Christian commonwealth. The remedies sought must also have concerned geo-political matters as well as the exigencies of Christian missions.

Pastiche from Theodore Crowley, The Editors of Encyclopedia Britannica; Stanford History of Philosophy, Apr 15, 2020 (online); Wikipedia (paragraph at the end about his influence)

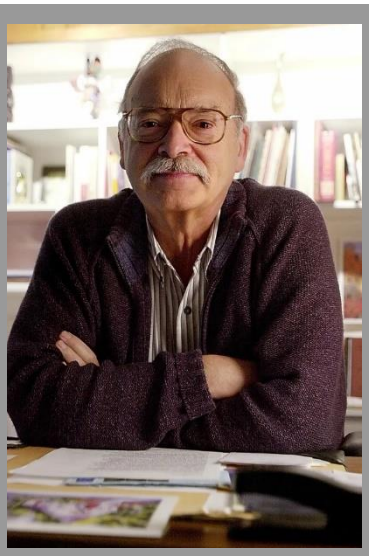
We can see from this short account what a genius Bacon was. He held orthodox and unorthodox views and was able to use his education at the Universities of Oxford and Paris to apply to many different and various fields of study and action.

I have only touched on a few areas of his work. His interests and output were prodigious. But he was open to both old and new knowledge and set the stage for the remarkable rise of science in the world and can help us now in politics and

philosophy to take account of other religions and cultures, not just our own. That is something that needs to be stressed especially in our day.
The Oxford undergraduate course PPE (above) is a modern example of integrative learning and that model is spreading, thankfully.

[1] Amanda Power, *Roger Bacon and the Defence of Christendom,* Cambridge UP, 2015

ABOUT THE AUTHOR



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