

# Biographical Encyclopedia of Astronomers

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Bacon, Roger

Born England, circa 1214–1220

Died England, circa 1292

Roger Bacon is known for promoting the mathematical sciences and encouraging the use of observation and experience in scientific study.

Very little of Bacon's life can be dated securely. His date of birth is calculated backwards from a comment in his *Opus tertium*, written about 1267, in which he states that he had learned his alphabet 40 years earlier and spent all but two of those 40 years in studio. If "in studio" refers to Bacon's time at universities, this places his entry into university life at about 1227; typically, students entered university at age 13, thus placing his birth in about 1214. On the other hand, if he truly learned his alphabet in 1227, this would place his birth in about 1220, as his elementary education would probably have begun around age seven. No authoritative records of Bacon's birthplace have survived, though both Ilchester in Somerset and Bisley in Gloucestershire have been suggested. Because he was able to spend large sums of money on books and instruments for his scholarly work, he was probably from a relatively well-to-do family.

Bacon seems to have received his education at both the universities of Oxford and Paris, and received his MA around 1240 from one of these universities. In the early 1240s he was in Paris, lecturing on Aristotle in the faculty of arts at the university; he left the faculty around 1247. For the next 10 years Bacon spent time at both Oxford and Paris, perhaps earning a Master's degree in theology.

In 1256 or 1257, Bacon entered the Franciscan Order. The next 10 years were a somewhat difficult time for him, as he later complained that his superiors hampered his efforts to continue his studies. In the early 1260s, he contacted Cardinal Guy le Gros de Foulques, asking for patronage. The cardinal responded positively, asking to see the writings Bacon had produced, misunderstanding that Bacon in fact wished support to produce writings. In 1265, the cardinal became Pope Clement IV, and Bacon received an order from him in 1266 to begin producing the works they had previously discussed. This put Bacon in a difficult situation, as rules of the Order prevented friars from publishing books without the approval of their superiors—approval he would have been hard-pressed to receive, as many of his ideas about philosophy and the arts were suspect. Nonetheless, Bacon produced a large number of works after 1266, including his *Opus maius*, *Opus minus*, *Opus tertium*, *De multiplying specierum*, *De speculis comburentibus*, *Communia mathematica*, *Communia naturalium*, *Compendium studii philosophie*, and *Compendium studii theologie*, all of which include portions on astronomy and natural philosophy. He died around 1292, probably shortly after completing the final work in the preceding list.

Bacon has been pictured both as a magician and as a proto-modern experimental scientist. Neither of these characterizations accurately portrays the medieval context in which he operated. Bacon's foremost concern was to promote an educational program that would benefit Christendom. Among the more revolutionary aspects of this program were an increased role for the mathematical sciences, which included astronomy, and the establishment of a *scientia*

*experimentalis*, often translated as "experimental science," but perhaps better translated as "experiential science."

Bacon's arguments promoting the mathematical sciences were largely practical ones: that a greater understanding of the mathematical sciences would ultimately benefit theology; aid in directing Christendom, for example, by predicting famines and wars or creating marvelous new inventions; and assist in the conversion of infidels. Astronomy, one of those mathematical sciences, brought with it a complication, for medieval astronomy was inextricably bound up with notions of astrological influence and had thus been the subject of theological polemic for a number of centuries. Aristotelian science, which was becoming better known to Latin readers through the translation efforts of the 12th and 13th centuries, assumed

that the eternal, unchanging celestial realm exerted an influence upon the changeable terrestrial realm. Bacon wished to promote the practical benefits that astrological prediction was assumed to hold under this principle of celestial influence

A significant issue for Bacon was to determine the limits of astronomy and the astrological predictions it could make, and in particular to differentiate between proper astronomy and "magic." Bacon proposed that, through the refinement of astronomical knowledge, the astronomer could produce accurate predictions of the future, though within certain limitations, such as those imposed by an incomplete knowledge of the positions and motions of the celestial bodies. Material things are more strongly influenced by the heavens; for example, Bacon reinforced the medical knowledge of the day by stating that astrological influences upon the body and its parts are a necessary consideration for the physician. The human soul, on the other hand, while it can be influenced, cannot be compelled by celestial influences. Bacon repeated the Ptolemaic dictum that astrological predictions by necessity remained fallible and were more accurate when concerned with universals rather than particulars

Bacon also argued that the study of astronomy would aid in the correction of the calendar. It had been recognized that the solstices did not fall on the proper days, and that the length of the year in the Julian calendar was not correctly calculated. Incorrect dates could lead to religious festivals, especially Easter, being celebrated on the wrong day. Bacon advocated the removal of one day every 125 years. (Essentially the same as the later Gregorian reform, Bacon was not the first to propose this.)

Bacon argued that astronomy, along with the other mathematical sciences, would benefit from the increasing application of a *sci-entia experimentalis*. Experience, as an aid to (but not a replacement for) reason, could establish the certainty of deductive reasoning, add new knowledge to the existing sciences, and reveal new sciences that might lead to marvelous new inventions. Bacon's ideas about the role of experience surely had some effect in increasing the role of observation and experimentation in natural philosophy

Bacon himself was no astronomer, though his works do demonstrate familiarity with the basics of astronomy that was being taught in the universities of that period, such as the motions of the planets and the nature of the celestial bodies. His works range over a much wider variety of issues than just astronomy. He promoted, for example, the study of *perspectiva*, a science related to optics, as well as the science of alchemy. He composed Greek and Hebrew grammars and wrote on a number of other philosophical and theological issues. But an examination of Bacon's astronomical concerns demonstrates the different methods and goals that medievals used to investigate a scientific field, as well as Bacon's place within the history of astronomy.

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