Biographical Encyclopedia of Astronomers

Ibn al-Banna': Abū al-'Abbās Ahmad ibn Muhammad ibn 'Uthman al-Azdī al-Marrākushi

Born Marrakech, (Morocco), 29 or 30 December 1256

Died 31 July 1321

Ibn al-Banna' al-Marrākushi, mathematician and astronomer, was born in Marrakech where he studied a variety of subjects, reportedly earning at least 17 master's degrees. However, he frequently went to Aghmāt, near Marrakech, where he was a student of Abū Abd Allah al-Hazmīrī (died 1279); it may have been due to his influence that Ibn al-Banna' became interested in both astronomy and astrology, and gained the reputation of being a Sufi Ibn al-Banna was probably a practicing astrologer in the service of the Marinid sultan Abū Sa'id (reigned 1309-1331), and he is said to have predicted the exact circumstances of the latter's death, which took place some 10 years after his own. He was dedicated to his teaching, which took place both in the great mosque of Marrakech and in his own home, and he had at least eight disciples.

The catalog of Ibn al-Banna's works comprises about 100 titles, of which some 50 are dedicated to mathematics and astronomy (including astrology), but the list also includes Quranic studies, theology (*usül al-din*), logic, law (*fiqh*), rhetoric, prosody, Sufism, the division of inheritances (*farā'id*), weights and measures, surface measurement (*misāha*), talismanic magic, and medicine. His reputation is based mainly on his mathematical works (especially arithmetic and algebra); he has been considered the last creative mathematician in the Maghrib, meaning that he approached new problems and gave original solutions. His works were extremely popular and inspired an enormous number of commentaries, which were still being written until the beginning of the 20th century

In the field of astronomy, Ibn al-Banna' is a clear follower of the Andalusian tradition represented by the Toledan astronomer Zarqali, whose works reached him either directly or indirectly. He wrote short works on the two varieties of universal astrolabes (*shakkaziyya* and *zarqaliyya*) designed by this author, as well as an astronomical handbook with tables (*zij*) ultimately derived from Zarqali's research. The title of this *zij* is *Minhaj al-tālib fi ta dīl al-kawakib* (The Student's Method for the Computation of Planetary Positions), and it became extremely popular in the Maghrib. There were at least three commentaries, and it was still in use in the 19th century The direct source used by Ibn al-Banna was the unfinished *zij* of Ibn Ishaq, which appears to have exerted the predominant influence on Maghribi astronomy during the 13th and 14th centuries. Ibn al-Banna's *Minhaj* contains a selection of Ibn Ishaq's tables, accompanied by a collection of easily understandable canons, making the *zij* accessible for the computation of planetary longitudes. This is accompanied by some modifications to the structure of the tables, designed to simplify calculations. Both the tables of the solar equation and those of the planetary and lunar equations of the center are "displaced" (a constant is added to each table entry to avoid negative values), a technique used for the first time in the Maghreb. Although Ibn al-Banna used the standard structure, derived from the *Handy Tables*, for the

tables of the equation of the anomaly of Mars, Venus, and Mercury, he changed them entirely in the cases of Jupiter and Saturn—planets that have small epicycles for which the equation of the anomaly is calculated in the same way as for the Moon.

The *Minhaj* is not the only *zij* produced by Ibn al-Banna, who prepared a summary of it entitled *al-Yasāra fi taqwim al-kawākib al-sayyāra* (The simple method for the computation of planetary positions). This smallest possible form of a *zij*, concerned mainly with the computation of planetary longitudes, was most likely prepared for popular astrologers who, apparently, were expected to learn the very short text of his canons by heart. The very few numerical tables are also simplified as much as possible, and in the case of the Moon, we go back to a simple model with only one inequality and a maximum equation of 5° (either a rounding of the standard Indian value 4° 56' or of Ptolemy's first lunar inequality of 5° 1'). The Yasara met with some success, and Ibn al-Banna' himself summarized it even further in his *al-Ishāra fi ikhtişār al-Yasāra* (How to summarize the Yasāra). The Yasāra was also the subject of commentaries, adaptations, and corrections of defects, such as that written by Ibn Qun-fudh al-Qusantīnī (1339–1407).

It is evident from his writings that Ibn al-Banna' wrote mainly for his students and always tried to be extremely brief and concise He was also interested in the practical applications of his knowledge. For example, he wrote on the applications of geometry to land surveying, on the use of arithmetic and algebra to solve problems of partitioning inheritances, on weights and measures, and on the procedures for calculating with the *Rūmi* ciphers (apparently derived from the Greek cursive alphanumeric system of numeration), which were often used in Maghribi legal documents. In a field more related to astronomy, Ibn al-Banna' wrote the *Kitab fi al-anwa'*, a book on the pre-Islamic Arabic calendar system and meteorological predictor based on the heliacal risings and acro-nychal settings. He was also interested in the problems of timekeeping applied to Islamic worship and wrote short works, such as his *Qānūn fi ma'rifat al-awqat bi'l-hisab* (Rules to Know Time by calculation [i.e., without instruments]), which seems to have been directed toward the elementary astronomical education of muezzins and imams, who were responsible for determining prayer times and for fixing the beginning of lunar months. Furthermore, Ibn al-Banna' wrote a short report on the visibility of the New Moon of Ramadan in the year 1301, due to the fact that the people of Fez had begun their fast one day earlier than those of Marrakech and Tlemcen. A similar practical/religious concern appears in his two short texts on the *qibla* (direction toward Mecca): Ibn al-Banna's contemporaries were worried about the problem posed by the different orientations of mosques, and he tried to ease their concerns by stating that all of them had a correct orientation, which should not be changed as it had been established through due intellectual effort (*ijtihad*). Surprisingly enough, this astronomer rejected the use not only of the imprecise methods of folk astronomy but also of those of spherical astronomy, which had provided exact solutions to the problem since the 9th century. He gave two reasons: The results obtained were not necessarily precise, for the differences in geographical longitude between Mecca and other Islamic cities were not reliably known; and the knowledge required could not be expected of a lay Muslim.

A difficult problem is that of Ibn al-Banna's attitude toward astrology. It has been well established that he had been interested in the subject during the early stages of his scholarly

life and that he wrote a number of short astrological works that have little originality and very limited appeal. They do, though, bear witness to the fact that he is following an Andalusian-Maghribi tradition that has certain characteristics different from those of the Eastern Islamic one On the other hand, it seems that he wrote a nonextant work entitled *Radd alā al-ahkam al-nujūmiyya* (Refutation of Astrological Judgments), which appears to have been written in the second period of his scholarly life (1290–1301). It is difficult to establish clearly whether Ibn al-Banna lost his faith in the scientific character of astrology since the Minhaj (apparently written during the same period) describes techniques of mathematical astrology and the Marinid sultan Abū Sa'id reportedly consulted him as an astrologer.

Julio Samsó

Alternate name

al-Banna'

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