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BANŪ MŪSĀ

BANŪ MŪSĀ, the name applied to three brothers, ʿAbbasid astronomers whose father was Mūsā b. Šāker, said to have been a robber in his youth in Khorasan and who became an astronomer (*monajjem*) and companion of the caliph al-Maʾmūn while the latter was still in Marv, before becoming caliph in 198/813. When Mūsā died he left his three sons, Moḥammad, Aḥmad, and Ḥasan, in the care of al-Maʾmūn, who in turn entrusted them to Esḥāq b. Ebrāhīm Mosaʿbī. They were trained by Yaḥyā b. Abī Manṣūr in the Academy of Science (*bayt al-ḥekma*) in Baghdad, where they seem to have spent the rest of their lives. In connection with their interests in the exact sciences, however, they sent scholars to Byzantium to seek out Greek scientific manuscripts and worked closely with several of the translators from Greek into Arabic, notably Ṯābet b. Qorrā and Ḥonayn b. Esḥāq. Moḥammad, in fact, is said to have discovered Ṯābet, who was then a money-changer in Ḥarrān, on his way back from a trip to Byzantium, and to have brought him to Baghdad, where he taught him astronomy (Ebn al-Nadīm, ed. Flügel, p. 272). It was perhaps on this trip that Moḥammad saw the place of the Seven Sleepers at Ephesus (Bīrūnī, *al-Āṯār al-bāqīa*, p. 290, tr. Sachau, p. 285).

The three brothers were commissioned by al-Maʾmūn to measure the length of a degree of latitude and therefrom the circumference of the earth; they carried this task out successfully in the desert plain near Senjār in northern Mesopotamia (Nallino, pp. 420-35). They also made astronomical observations together at Baghdad. The solar parameters that they established following the *zīj al-momtaḥan* are reported by Ebn Yūnes (pp. 149, 151); the sun's mean

motion in a Persian year there given agrees with the statement made by Bīrūnī (p. 52, tr. p. 61) that Moḥammad and Aḥmad had determined that a solar year was 365 days and less than 6 hours long. Aḥmad is said by Ebn Yūnes (pp. 151, 153) to have independently determined a similar set of solar parameters in 220 *Yazdegerdī*/851-52. The three brothers also observed the longitude of Regulus from their house on a bridge in Baghdad in 209 Y./840-41, 216 Y./847-48, and 219 Y./850-51 according to Ebn Yūnes (pp. 163, 165), who also refers to their observation of Sirius (p. 165). Bīrūnī (pp. 151-54, tr. pp. 147-49) used the lunar parameters resulting from their observations in his computations of the nativities (*mawleds*) of the years.

From Ṭabarī, we know that Moḥammad and Aḥmad were employed as civil engineers by the caliph al-Motawwakel (232-47/847-61), and that Moḥammad was deeply involved in the politics surrounding the caliphate of al-Mostaʿīn (248-52/862-66; Hill, p. 5). Moḥammad died in Rabīʿ I, 259/January, 873 (Ebn al-Nadīm, p. 271).

The three brothers together were responsible not only for astronomical observations and the lost *zīj* that reported them but also for the *Ketāb maʿrefat mesāḥat al-aškāl al-basīṭa wa'l-korīya* (Book of knowing the measurement of plane and spherical figures), as it is entitled in the redaction (*taḥrīr*) made by Naṣīr-al-Dīn Ṭūsī (Sezgin, *GAS* V, pp. 251-52); this *taḥrīr* has been published in the *Majmūʿ al-rasāʾel* of Ṭūsī (II, sec. 1). The original was translated into Latin by Gerard of Cremona in the twelfth century as the *Verba Filiorum Moysi Filii Sekir*. An edition of the Latin text with an English translation is given by Clagett (pp. 223-367), who has also summarized the enormous impact that this treatise had on medieval Latin geometry in the thirteenth and fourteenth centuries. Apparently the three brothers together also joined in writing a no longer extant *Ketāb fi'l-qarasṭūn* (Book concerning the balance) according to Ebn al-Nadīm (p. 271). And they wrote an exposition of astrology entitled *Ketāb al-darajāt* (Book of the degrees; Sezgin, *GAS* VII, pp. 129-30).

The oldest brother, Moḥammad, was also the most productive, though only one of his many works is still extant. This is the *Ketāb ḥarakat al-falak al-ūlā* (Book of the first motion of the celestial sphere), which is a lengthy treatise on Ptolemaic astronomy (Sezgin, *GAS* VI, p. 147). There also survives one manuscript of a work depending on one of his that is lost, the *Roʾyat al-helāl ʿalā raʾy Abī Jaʿfar Moḥammad b. Mūsā b. Šāker* (The Sighting of the new moon according to the opinion of Abū Jaʿfar Moḥammad b. Mūsā b. Šāker; ibid.). Ebn al-Nadīm (p. 271) ascribes to Moḥammad four other mathematical works and

one on linguistics.

The only surviving work of the second brother, Aḥmad, is his *Ketāb al-ḥīal* (Book of ingenious devices), which describes various hydraulic automata operated by pneumatics. It has recently been edited and translated by Hill. Ebn Yūnes, as indicated above, knows of a *zīj* by Aḥmad. Ebn al-Nadīm (p. 271) ascribes to the two brothers two cosmographical works that no longer exist: one by Moḥammad on the beginning of the world, the other by Aḥmad denying the existence of a ninth celestial sphere beyond that of the fixed stars. The same bibliographer mentions two treatises concerning a discussion between Aḥmad and Sanad b. ʿAlī, perhaps concerning the difficulties that the Banū Mūsā faced because of the failure of their agent, Farḡānī, to construct the Jaʿfarīya canal properly.

To the third brother, Ḥasan, is attributed only one work (*Ketāb al-šakl al-modawwar al-mostaṭīl*), now lost, on the ellipse.

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