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Majrīṭī: Abū al-Qāsim Maslama ibn Aḥmad al-Ḥāsib al-Faraḍī al-Majrīṭī

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Born **Madrid, (Spain), first half of the 10th century**

Died **Cordova, al-Andalus, (Spain), 1007**

Maslama al-Majrīṭī was considered by his Andalusian contemporaries as the foremost authority of his time in the field of astronomy. He traveled as a young man to Cordova, the capital of the Umayyad caliphate, where he studied and worked until his death. His achievements are mainly in the field of mathematical astronomy, although it is known that he wrote on commercial arithmetic (*mu'āmalāt*) and was also a renowned astrologer. Historians have at times misattributed to Majrīṭī works on magic and alchemy.

In addition to his own compositions, Majrīṭī's importance lies within the context of Andalusian science and his activity in scientific teaching. Majrīṭī was the founder of an original school of Andalusian astronomers in which the disciplines of arithmetic and geometry were also cultivated. Majrīṭī's disciples, who include outstanding figures like **Ibn al-Samḥ**, **Ibn al-Ṣaffār**, and Ibn Barghūth (died: 1052), spanned three generations and greatly influenced the development and expansion of the exact sciences throughout al-Andalus. Majrīṭī brought together for the first time in al-Andalus two distinct mathematical traditions, namely the tradition of *farā'iḍ* (religiously based division of inheritances) and the tradition of mathematically based philosophical sciences, a category that included astronomy. Majrīṭī's combining of these two mathematical branches reflects the interests of his two known teachers: 'Abd al-Ghāfir ibn Muḥammad al-Faraḍī, who wrote a treatise on *farā'iḍ*, and 'Alī ibn Muḥammad ibn Abī 'Īsā al-Anṣārī, who is reported to have known astronomy.

In the field of astronomy, Majrīṭī was the first Andalusian to make his own astronomical observations. According to **Zarqālī**, he observed the star Regulus in the year 979 and found its ecliptical longitude to be 135° 40'. Starting from the determination of the longitude of this star, Majrīṭī was then able to determine the longitude for all fixed stars, thereby establishing a movement of precession of the equinoxes of 13° 10' with respect to the epoch of compilation of the catalog of stars in **Ptolemy**'s *Almagest*.

The above value for the longitude of Regulus appears in the table of stars that accompanies Majrīṭī's commentary on Ptolemy's *Planisphaerium*, which is a treatise on the stereographic projection of the sphere (the basic technique for the construction of the standard astrolabe). Some historians mistakenly thought that Majrīṭī may have learned Greek and translated the *Planisphaerium* himself, but recent investigation has shown that he most likely revised an eastern Arabic translation of the work. Indeed, Majrīṭī's text contains several additions to the work of Ptolemy that considerably improved the procedures for tracing the fundamental lines of the astrolabe and for locating the fixed stars of its rete, or star map on the instrument, using several kinds of coordinates. In the second part of this work, Majrīṭī deals with a number of problems of spherical astronomy using the Theorem of Menelaus, which was the unique trigonometric tool employed in his time and upon which he had previously written several notes in another work.

Majrīṭī's major work in astronomy was the adaptation that he made, together with his disciple Ibn al-Ṣaffār, of **Khwārizmī**'s *Sindhind zīj*. This 9th century astronomical handbook with tables and explanatory text was based primarily on Indian methods, and thus differed from later Islamic astronomical material, which relied on planetary models laid out in the *Almagest*. Although Khwārizmī's original text appears to be lost, a Latin version by **Adelard of Bath** (12th century) of Majrīṭī's revision is extant. This text, which is referred to as the *zīj* of Khwārizmī-Maslama (Majrīṭī), contains tables derived from Khwārizmī's original *zīj* (which had material based upon Persian and Ptolemaic traditions in addition to Indian ones) as well as material and tables that were adaptations, additions, or replacements introduced by Majrīṭī and Ibn al-Ṣaffār. The aim of the Andalusian astronomers was to adapt the original tables to the time and place in which they were living. For example, the Persian solar calendar used in Khwārizmī's tables was replaced by the Muslim lunar calendar, and some tables that were observer-specific were adapted to the geographical coordinates of Cordova. Khwārizmī's mean motion tables were calculated for radix positions corresponding to the meridian of Arīn (the center of the world in the Indian systems). A significant outcome of using Cordova's longitude was that Majrīṭī provides the earliest evidence of an important correction to the size of the Mediterranean Sea to its actual size; this was preserved in most Andalusian geographical tables. On the whole, the transformations affected the tables for chronology, mean motions, mean conjunctions and oppositions, and visibility of the lunar crescent. They also involved the addition of new tables related to the astrological practices of equating the houses and projecting the rays. Moreover, the contents of the final version of the *zīj* suggest the redactors included some elements that, though not strictly necessary, were in use in contemporary Andalusia. This is the case of the two trigonometric tables that are extant in the Latin translation, one for the sine (based on a radius of 60 parts) and the other for the cotangent (shadow length), which presumably were not used in the original *Sindhind*. Other Andalusian contributions found in the *zīj* are the reference to the Hispanic era (38 BCE) in the chronological part, the use of the meridian and latitude of Cordova for certain tables, and improved calculation methods that were both accurate and easier to use.

As a professional astrologer, Majrīṭī was also interested in the conjunction of Saturn and Jupiter, which took place in 1006/1007; with it he foretold a change of dynasty, ruin, slaughter, and famine.

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