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Ibn al-Samḥ: Abū al-Qāsim Aṣbagh ibn Muḥammad ibn al-Samḥ al-Gharnāṭī

Mònica Rius

Born **Cordova, al-Andalus, (Spain), 979**

Died **Granada, al-Andalus, (Spain), 29 May 1035**

Ibn al-Samḥ, known also as al-Muhandis (the geometer), was a noted mathematician and astronomer in Andalusia and an important member of the school of **Maslama al-Majrīṭī** centered in Cordova. Because of political unrest, Ibn al-Samḥ fled to Granada where he lived out the rest of his life. There he worked in the service of the local chief, the Berber Ḥabbūs ibn Māksan (reigned: 1019–1038), whose Jewish Minister, Samuel ben Nagrella, was also interested in mathematics and astronomy.

Ibn al-Samḥ worked in the fields of astronomy, mathematics, and, possibly, medicine. The 14th-century historian Ibn al-Khaṭīb states that Ibn al-Samḥ wrote an essay on history, but there is no other evidence for this assertion. Ibn al-Nāshī, one of Ibn al-Samḥ's most important disciples, gives a list of nine books written by his teacher.

In astronomy, Ibn al-Samḥ, like his teacher Maslama al-Majrīṭī, composed a *zīj* (an astronomical handbook with tables) based on **Khwārizmī**'s *Sindhind*, which had been composed in 9th-century Baghdad. Ibn al-Samḥ also composed a treatise on the construction of the astrolabe and another on its use (*Kitāb al-ʿAmal bi-ʾl-asṭurlāb*). Although **Ibn al-Ṣaffār**'s treatise on the astrolabe gained more popularity, this long book (129 chapters on the use of the instrument) is the most complete tract written in the Iberian Peninsula during the Middle Ages. The text is especially interesting because it deals with questions not usually analyzed in works of this kind, such as the visibility of the Moon and its latitude and longitude. His *Kitāb al-ʿAmal* is also important because in it he quotes an unknown work by **Ḥabash al-Ḥāsib**, clear evidence that this eastern astronomer was known in Andalusia at the end of the 10th century. The text also shows that the school of Maslama knew and used the works of **Battānī**. The *Kitāb al-ʿAmal* was the source of a treatise on the use of the spherical astrolabe composed at the court of **Alfonso X**. Since the king's astronomers did not have an Arabic text on the spherical astrolabe from which to make the Castilian translation, they took Ibn al-Samḥ's treatise and made an adaptation of it. His treatise on the construction of the equatorium – an instrument originally conceived in Andalusia and later developed in Latin Europe – is another of Ibn al-Samḥ's major contributions to astronomy. Indeed, this treatise is the first known work dealing with this instrument and was followed by works written by **Zarqālī** and **Abū al-Ṣalt** of Denia. The instrument described by Ibn al-Samḥ is a hybrid astrolabe/equatorium, and his treatise is preserved in the Alfonsine translation included in the *Libros del Saber de Astronomia*.

Ibn al-Samḥ gives the numerical parameters necessary for the construction of the instrument and uses Battānī's values for the longitudes of the apogees of the planets, Khwārizmī-Maslama's values for the ascending nodes of the planets, and the eccentricities and radii of the epicycles of the planets from the *Almagest*. The equatorium has eight plates (one for the Sun, six for the deferents of the Moon and the five planets, and one for the planetary epicycles) carefully explained and placed within the mater of an astrolabe. This instrument helps to determine the longitude of a planet and saves astronomers a great deal of time, especially considering that one of their main aims in the Middle Ages was to cast a horoscope. The historian Ibn Khaldūn mentions that Ibn al-Samḥ wrote an abstract of the *Almagest*.

Ibn al-Samḥ is well known for his many compositions in mathematics. His range of subject matter includes calculation, numbers, commercial arithmetic, theory of proportions, arithmetical operations, and the solution of quadratic and cubic equations. His work in geometry includes a commentary on the book of Euclid, and a general treatise that includes an important study of straight, curved, and broken lines. The latter is partially extant in a Hebrew translation.

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