Ibrāhīm ibn Sinān ibn Thābit ibn Qurra

Glen Van Brummelen

Born  Baghdad, (Iraq), 908/909

Died  Baghdad, (Iraq), 946

Ibrāhīm ibn Sinān was a creative scientist who, despite his short life, made numerous important contributions to both mathematics and astronomy. He was born to an illustrious scientific family. As his name suggests his grandfather was the renowned Thābit ibn Qurra; his father Sinān ibn Thābit was also an important mathematician and physician. Ibn Sinān was productive from an early age; according to his autobiography, he began his research at 15 and had written his first work (on shadow instruments) by 16 or 17. We have his own word that he intended to return to Baghdad to make observations to test his astronomical theories. He did return, but it is unknown whether he made his observations. Ibn Sinān died suffering from a swollen liver.

Ibn Sinān's mathematical works contain a number of powerful and novel investigations. These include a treatise on how to draw conic sections, useful for the construction of sundials; an elegant and original proof of the theorem that the area of a parabolic segment is 4/3 the inscribed triangle (Archimedes' work on the parabola was not available to the Arabs); a work on tangent circles; and one of the most important Islamic studies on the meaning and use of the ancient Greek technique of analysis and synthesis.

Ibn Sinān composed several astronomical works. *On the Motions of the Sun* presents his approach to the apparent motion of the Sun, including the question of the motion of the solar apogee. He includes a critical analysis of Ptolemy and his Arabic predecessors but apologizes for not being able to test his own theory, hoping for someone to make the relevant observations in future. In this work he also takes a stand against Aristotle's authority, especially with respect to meteorological optics, accusing Aristotle's supporters of adopting his positions without question. Ibn Sinān evidently wrote on the trepidation of the equinoxes, a theory that he combined with a variable obliquity of the ecliptic. Though this work has not survived, later writers ascribe such a theory to him and there are hints of it in his work *On the Motions of the Sun*. Ibn Sinān's theory explaining an apparent variation in the obliquity of the ecliptic did not impress Birūnī sufficiently to change his position that the obliquity is constant. Another treatise by Ibn Sinān, *The Determination of the Anomalies of Saturn, Mars, and Jupiter*, contains a critique of Ptolemy's models of the motions of the planets.

Like his grandfather, Ibn Sinān wrote a book on shadow instruments (such as sundials and gnomons). It contains discussions of sundials erected on plane surfaces, errors in the application of
sundials, how one might use a sundial as a replacement for the astrolabe, and how to draw time lines on various surfaces.

A short tract, On the Astrolabe, must have been written late in life, since it is not included in Ibn Sinān's own summary of his works. In it he proves the fundamental theorem of stereographic projection required to construct an astrolabe, namely that circles on the sphere (other than those that pass through the pole) are mapped to circles in the plane.

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Selected References


