

Abū Sahl al-Kūhī on Rising Times

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Abū Sahl al-Kūhī (fl. ca. AD 980), one of the great mathematicians of medieval Islam, was rare among his colleagues for seldom venturing into mathematical astronomy. Almost all of his works are devoted to practicing geometry in the Islamic style within the tradition of Euclid, Archimedes and Apollonius. Those that do relate to astronomy (for example, “On The Distance to the Shooting Stars”¹ and “What is Seen of Sky and Sea”²) further reveal his geometric preferences; they propose geometric means of solving astronomical problems, but give no computations and report no observations.³

The current treatise, which we shall call “Rising Times of a Known Arc of the Ecliptic” (it is untitled in the manuscript), is no exception. Astronomers of al-Kūhī’s time often compiled their work in *zīj*es, large manuals which contained reports of observations, trigonometric computations to derive parameters, and many mathematically-computed tables to allow readers to determine (among other things) the positions of celestial bodies, events of astrological significance, and rising times. These works followed the tradition established by Ptolemy in his *Almagest*, sometimes improving the parameters, shortening the exposition of the mathematical underpinnings, and making the astronomical tables more useful. Although this treatise deals with a topic usually handled by the “the experts in the *zīj* operations”, as al-Kūhī calls them, he does not actually compute any rising times, much less compile a table; but simply provides a trigonometric method by which one could compute them. He recognizes that this work is a departure for him, and indeed, expresses some uncertainty concerning its usefulness in practice.

Al-Kūhī’s treatise is of particular interest for the history of spherical trigonometry. Until the tenth century AD, the workhorse of this discipline was Menelaus’s

¹This treatise is listed by Fuat Sezgin in his *Geschichte des Arabischen Schrifttums*, vol. VI, *Astronomie*, Leiden: Brill, 1978, as the second entry under al-Kūhī, p. 219. See also J. L. Berggren and Glen Van Brummelen, “Abū Sahl al-Kūhī on the Distance to the Shooting Stars”, *Journal for the History of Astronomy* **32** (2001), 137–151.

²This treatise, which we are preparing for publication, is listed by Fuat Sezgin in *Geschichte des Arabischen Schrifttums*, vol. VI, *Astronomie*, as the fourth entry under al-Kūhī, p. 219.

³It is worth noting that near the end of the treatise on rising times, al-Kūhī lists among his research interests centers of gravity, optics, and conic sections. Although centers of gravity and conic sections occur within his extant writings, any work he did on optics is lost.