

Biographical Encyclopedia of Astronomers

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Thabit ibn Qurra

Born near Harran, Upper Mesopotamia, (Turkey), circa 830

Died Baghdad, (Iraq), 18 February 901

As a member of the Banu Musa circle of scholars in 9th-century Baghdad, Thabit ibn Qurra contributed significantly to the development of astronomy and other sciences through his translations and commentaries of Greek and Hellenistic works and through his original treatises. Notable astronomical contributions include a translation of Ptolemy's *Almagest* and treatises on the motion of the Sun and the Moon. More generally, Thabit's significance lies in the influence of his work on the development of the exact sciences in Islam

Thabit was a member of the Sabian religious sect. His heritage was steeped in traditions of Hellenistic culture and pagan veneration of the stars. This background, and in particular, his knowledge of Greek and Arabic, made him an attractive prospect for inclusion in one particular community of scholars—the Banu Musa and their circle in Baghdad. Thabit seems to have been asked to join this circle by a family member, the mathematician Muhammad ibn Musa ibn Shakir, who recognized his talents and potential.

Thabit remained mainly in Baghdad, becoming a noted translator, physician, and renowned scholar in a variety of disciplines. As in the case of his mentors and teachers, Thabit was part of a family tradition of scholarly activity, with son Sinan ibn Thabit and grandson Ibrahim ibn Sinan Thbit ibn Qurra also making contributions to medicine and the exact sciences

Thabit is credited with dozens of treatises, covering a wide range of fields and topics. While some were written in his native Syriac, most were composed in Arabic. Thabit was trilingual, a skill that enabled him to play a key role in the translation movement of 9th-century Baghdad. He translated works from both Syriac and Greek into Arabic, creating Arabic versions of important Hellenistic and Greek writings. Several of Thabit's Arabic translations are the only extant versions of important ancient works.

A large percentage of Thabit's corpus is devoted to mathematics. This includes translations of Books V–VII of Apollonius's *On Conics* and Archimedes' *Lemmata* and *On Triangles*. His work in mathematics also includes original treatises, with contributions in the many areas of geometry and number theory. His original contributions include proofs of the Pythagorean theorem, a proof of Menelaus's theorem, proofs of Euclid's fifth postulate, and work on composite ratios

Thabit's achievements in astronomy are closely linked to his work in mathematics. The application of his mathematical work (e.g., his theories of composite ratios) to the examination and development of Ptolemaic astronomy, as Morelon emphasizes, helped establish a tradition of mathematical astronomy in Islamic culture. Discussion of Thabit's ideas is found in the work of later astronomers, including Khāzinī and Nasir al-Din al-Tūsi

Thabit's revision of Hunayn ibn Ishaq's translation of the *Almagest* survives in manuscript. In addition, something less than a dozen astronomical treatises by Thabit have survived, about a fourth of the number he is credited with composing. Two of these present the basics of Ptolemaic astronomy, including the structure of the cosmos according to Ptolemy's *Planetary Hypotheses*, a work whose Arabic translation Thabit revised. In the other extant treatises, Thabit addresses the problem of the unequal motion of the Sun, the motion of the Moon, the determination of crescent visibility, and the theory of sundials

Two treatises traditionally attributed to Thabit are almost certainly not by him. One of these, which survives only in Latin translation, is *De motu octave spere* (On the motion of the eighth sphere). The misattribution may be due to the fact that a related treatise was written by his grandson, Ibrāhīm Ibn Sinan. The author of *De motu* addresses a type of problem that astronomers in the centuries following Ptolemy have all had to confront: changes in astronomical parameters as a consequence of elapsed time. A new model for the precession of the equinoxes is presented in order to account for such changes. Two time-related changes that this model addresses are the increase in the rate of precession and the decrease in the

value of the obliquity of the equinox since the time of the *Almagest*. In addition, a theory of oscillation or periodicity of these motions ("trepidation") is proposed

The other misattributed treatise deals with the solar year. The author of this work attempts to show why adopting a sidereal year is preferable to accepting Ptolemy's tropical year as the basic time-unit for solar motion.

In addition to his works in mathematical astronomy, Thabit also wrote on philosophical and cosmological topics, questioning some of the fundamentals of the Aristotelian cosmos. He rejected Aristotle's concept of the essence as immobile, a position Rosenfeld and Grigorian suggest is in keeping with his anti-Aristotelian stance of allowing the use of motion in mathematics. Thabit also wrote important treatises related to Archimedean problems in statics and mechanics.

Thabit's efforts provided a foundation for continuing work in the investigation and reformation of Ptolemaic astronomy. His life is illustrative of the fact that individuals from a wide range of backgrounds and religions contributed to the flourishing of sciences like astronomy in Islamic culture.

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