From: Thomas Hockey et al. (eds.). *The Biographical Encyclopedia of Astronomers*, *Springer Reference*. New York: Springer, 2007, pp. 1129-1130

http://dx.doi.org/10.1007/978-0-387-30400-7_1369

Thābit ibn Qurra

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Born **near Ḥarrān, upper Mesopotamia, (Turkey)**, ***circa* 830**

Died **Baghdad, (Iraq), 18 February 901**

As a member of the **Banū Mūsā** circle of scholars in 9th-century Baghdad, Thābit 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, Thābit's significance lies in the influence of his work on the development of the exact sciences in Islam.

Thābit 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 Banū Mūsā and their circle in Baghdad. Thābit seems to have been asked to join this circle by a family member, the mathematician **Muḥammad ibn Mūsā ibn Shākir**, who recognized his talents and potential.

Thābit 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, Thābit was part of a family tradition of scholarly activity, with son Sinān ibn Thābit and grandson **Ibrāhīm ibn Sinān Thābit ibn Qurra** also making contributions to medicine and the exact sciences.

Thābit 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 Thābit's Arabic translations are the only extant versions of important ancient works.

A large percentage of Thābit'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.

Thābit'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 Thābit's ideas is found in the work of later astronomers, including **Khāzinī** and **Naṣīr al-Dīn al-Ṭūsī**.

Thābit's revision of **Ḥunayn ibn Isḥāq**'s translation of the *Almagest* survives in manuscript. In addition, something less than a dozen astronomical treatises by Thābit 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 Thābit revised. In the other extant treatises, Thābit 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 Thābit are almost certainly not by him. One of these that 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 Sinān. 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, Thābit 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. Thābit also wrote important treatises related to Archimedean problems in statics and mechanics.

Thābit'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.

Selected References

Carmody, Francis J. (1960). *The Astronomical Works of Thabit b. Qurra*. Berkeley: University of California Press.

Goldstein, Bernard R. (1964). "On the Theory of Trepidation." *Centaurus* 10: 232–247.

Morelon, Régis (1994). "Ṯābit b. Qurra and Arab Astronomy in the 9th Century." *Arabic Sciences and Philosophy* 4: 111–139.

——— (1996). “Eastern Arabic Astronomy between the Eighth and the Eleventh Centuries.” In *Encyclopedia of the History of Arabic Science*, edited by Roshdi Rashed. Vol. 1, pp. 20–57. London: Routledge.

Neugebauer, Otto (1962). Review of *The Astronomical Works of Thabit b. Qurra*, by Francis Carmody. *Speculum* 37: 99–103.

Ragep, F. J. (1993). *Naṣīr al-Dīn al-Ṭūsī's* Memoir on Astronomy (*al-Tadhkira fī ʿilm al-hayʾa*). 2 Vols. New York: Springer-Verlag. (For a discussion of trepidation and the authorship of *De motu octave spere*.)

Rosenfeld, B. A. and A. T. Grigorian (1976). “Thābit ibn Qurra.” In *Dictionary of Scientific Biography*, edited by Charles Coulson Gillispie. Vol. 13, pp. 288–195. New York: Charles Scribner's Sons.

Thābit ibn Qurra (1987). *Oeuvres d'astronomie*, edited by Régis Morelon. Paris: Les Belles Lettres.