Biographical Encyclopedia of Astronomers

Qushji: Abū al-Qāsim 'Ala' al-Din 'Alī ibn Muhammad Qushči-zāde

Born probably Samarkand, (Uzbekistan)

Died Istanbul, (Turkey), 1474

'Alī al-Qūshji was a philosopher-theologian, mathematician, astronomer, and linguist who produced original studies in both observational and theoretical astronomy within 15th-century Islamic and Ottoman astronomy. He contributed to the preparation of Ulugh Beg's *Zij* at the Samarkand Observatory, insisted on the possibility of the Earth's motion, and asserted the need for the purification of all the scientific disciplines from the principles of Aristotelian physics and metaphysics

Qūshji was the son of Ulugh Beg's falconer, whence his Turkish name was Qushči-zāde. He took courses in linguistics, mathematics, and astronomy, as well as other sciences, taught by scholars in Ulugh Beg's circle. These included Jamshid al-Kashi, Qādīzāde al-Rūmī, and Ulugh Beg himself. It has been claimed that he was also taught by al-Sayyid al-Sharif al-Jurjānī; if so, Qūshji would have been quite young.

In 1420, Qūshji secretly moved to Kirman where he studied astronomy (circa 1423–1427) with Mollā Jāmī, as well as the mathematical sciences Upon his return to Samarkand circa 1428, Qūshji presented Ulugh Beg with a monograph (*Hall ishkal al-mu'addil li-l-masir*) in which he solved the problems related to Mercury; Ulugh Beg was reported to have been quite pleased. Sources say that Ulugh Beg referred to Qūshji as "my virtuous son" (= "ferzend-i ercümend" [Nuruosmaniye MS 2932, f. 2b]). Indeed, after the death of Qādīzāde, it was Qūshji whom Ulugh Beg commissioned to administer the observational work at the Samarkand Observatory that was required for his *Zij* (astronomical handbook). Qūshji, often referred to as "sahib-i rasad" (head of observation), contributed to the preparation and correction of the Zij, but it is unclear to what extent and at what stage. This question becomes especially problematic in view of Qūshji's criticisms of it, and his pointing out of mistakes, in his *Sharh-i Zij Ulugh Beg* (Commentary on Ulugh Beg's *Zij*).

Upon Ulugh Beg's death in 1449, Qūshji, together with his family and students, spent a considerable time in Herat where he wrote his theological work*, Sharh al-Tajrid*, a commentary on Nasir al-Din al-Tūsi's work *al-Tajrid fi ilm al-kalam*, which he presented to the Timurid Sultan Abū Said. After Abū Said's defeat by Uzun Hasan in 1469, Qūshji moved to Tabriz where he was welcomed by the latter. It is said that Qūshji was sent to Istanbul to settle a dispute between Uzun Hasan and Mehmed the Conqueror; after completing the mission, he returned to Tabriz. However, around 1472, Qūshji, together with his family and students, left permanently for Istanbul, either of his own accord or because of an invitation from Sultan Mehmed

When Qūshji and his entourage approached Istanbul, Sultan Mehmed sent a group of scholars to welcome them. Sources say that in crossing the Bosphorus to Istanbul, a discussion ensued

about the causes of its ebb and flow. Upon arrival in Istanbul, Qūshji presented his mathematical work entitled *al-Muhammadiyya fi al-hisab* to the Sultan, which was named in his honor.

Qūshji spent the remaining two to three years of his life in Istanbul. He first taught in the Ṣahn-i Thaman Madrasa (founded by Sultan Mehmed); then he was made head of the Ayasofya Madrasa. In this brief period, Qūshji educated and influenced a large number of students, who, along with his writings, were to have an enormous impact on future generations. He was buried in the cemetery of the Eyyüb Mosque

Qūshji, especially when compared with his contemporaries such as Kāshi and Qādīzāde, was a remarkable polymath who excelled in a variety of disciplines including language and literature, philosophy, theology, mathematics, and astronomy. He wrote works in all these fields, producing books, textbooks, and short monographs dealing with specific problems. His commentaries often became more popular than the original texts, and they themselves became the subject of numerous commentaries. Thousands of copies of Qūshji's works exist, many of which were taught in the madrasas

Qūshji's philosophy of science, which had important repercussions for the history of astronomy, is contained in his commentary to Tūsi's *Sharh al-Tajrīd*. Besides being one of the most important theological works in Islam, Qūshji lays down the philosophical principles of his conception of existence, existents, nature, knowledge, and language. As for the mathematical sciences, Qūshji generally tried to free them from hermetic-Pythagorean mysticism and to provide an alternative to Aristotelian physics as the basis for astronomy and optics. He sought to define body (jism) as being predominantly mathematical in character. Qūshji claimed that the essence of a body is composed of discontinuous (atomic) quantity while its form consists of continuous (geometrical) quantity. When a body is subject to the senses, it then gains its natural properties (qualifications).

One consequence of Qūshji's anti-Aristotelian views was his striking assertion that it might well be possible that the Earth is in motion. Here Qūshji followed a long line of Islamic astronomers who rejected Ptolemy's observational proofs for geostasis; Qūshji, though, refused to follow them in relying on Aristotle's philosophical proofs, thus opening up the possibility for a new physics in which the Earth was in motion. Qūshji's views were debated for centuries after his death, and he exerted a profound influence on Ottoman-Turkish thought and scientific inquiry, in particular through the *madrasa* and its curriculum. His influence also extended to Central Asia and Iran, and it has been argued that he may well have had an influence, either directly or indirectly, upon early modern European science to which his ideas bear a striking resemblance

Qushji wrote five mathematics books, one in Persian and four in Arabic. His *Risāla dar ilm al-hisab* (Persian), written during his stay in Central Asia (along with its enlarged Arabic version, *al-Risala al-Muhammadiyya fi al-hisab*), was taught as a mid-level textbook in Ottoman madrasas. In these works, in accordance with the principles he laid down in the Sharh al-Tajrīd, he tried to free mathematics from hermetic-Pythagorean mysticism. As a result, Ottoman

mathematics took on a practical character, which hindered traditional studies such as the theory of numbers

In the field of astronomy, one of Qūshji's most important contributions is in the observational program for the *Zij-i Ulugh Beg* and in his corrections to the work, both before and after publication. In addition, he has nine works on astronomy, two in Persian and seven in Arabic. Some of them are original contributions, while others are pedagogical. In his theoretical monograph entitled *Hall ishkal al-mu addil li-l-masir*, Qūshji criticizes and corrects opinions and ideas pertaining to Mercury's motions mentioned in Ptolemy's *Almagest*. Another work is his *Risāla fi anna asl al-khārij yumkinu fi al-sufliyayn*, which deals with the possibility of using an eccentric model for Mercury and Venus, which, as he says, goes against both Ptolemy and Qutb al-Din al-Shīrāzī

Qūshji's *Risāla dar ilm al-hay'a* (Persian), written in Samarkand in 1458, was commonly used as a teaching text; there are over eighty manuscript copies of it in libraries throughout the world. It was also translated into Turkish. Two commentaries were written on it, one by Muslih al-Din al-Lārī, the other by an anonymous author. Lārī's commentary was widely taught in Ottoman madrasas. Qūshji's *Risāla* was also translated into Sanskrit and thus represents the transmission of Islamic astronomy to the Indian subcontinent. Qūshji wrote an enlarged version of the work in Arabic under the name *al-Fathiyya fi 'ilm al-haya* which was presented to Sultan Mehmed in 1473. This work was taught as a middle-level textbook and was commented on by Gulām Sinan (died 1506) and Qūshji's famous mathematician-astronomer great-grandson Miram Čelebi. It was also translated into Persian by Mu'in al-Din al-Husaynī and into Turkish by Seydi Ali Reîs. In the *Risala* and the *Fathiyya*, Qūshji followed the principles he had laid down in his *Sharh al-Tajrīd* and excluded an introductory section on Aristotelian physics that had customarily introduced almost all previous works of this kind.

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