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A TURKISH SULTAN IN QUEST OF KNOWLEDGE: MEHMED II'S PATRONAGE OF SCIENCE AND SCHOLARS IN FIFTEENTH CENTURY ISTANBUL

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Abstract: The Turkish Sultan Mehmed II (r. 1451–1481), known as The Conqueror (*Fatih*) after his conquest of Istanbul in 1453 undertook a vast program for promoting the new capital city as a scientific centre of the Islamic World by assembling leading scholars from Central Asia, Iran, Egypt, and Syria. The social complex (*Fatih Külliyesi*) which included a mosque, eight large and eight small *madrasas*, a timekeeper's office, a hospital and other facilities was Mehmed II's main enterprise in sciences. *Madrasas* providing religious and legal scholars needed by the state represent one aspect of his patronage of sciences. Besides, due to his personal interest in astronomy, mathematics and cartography, the Sultan set up a multilingual private library, commissioned science books to be copied and translated and maps composed. Among the scholars he invited to Istanbul was Alī Qushjī (d. 1474), the Director of Samarkand Observatory and a collaborator of Ulugh Beg. Qushjī moved to Istanbul where he taught mathematical sciences during the last two years of his life, bringing a breath of fresh air to Ottoman scientific life. In this paper Sultan Mehmed II's patronage of science and scholars and al-Qushjī's work in Istanbul will be revisited.

Keywords: Mehmed II; Ulugh Beg; Alī Qushjī; *madrasas*; Islamic science; history of cartography; sundials; mobility of scholars; Ottoman Empire; Istanbul.

1 INTRODUCTION

Two statesmen who left their mark on Turkish scientific life in the fifteenth century were Mirza Ulugh Beg (1394–1449) and Sultan Mehmed II (1432–1481). The former was to be the patron of science and scientists in Samarkand and the latter in Istanbul. Ulugh Beg, Timur's grandson, was the founder of the *madrasas* in Samarkand and the Observatory where the astronomical tables (*zij*) bearing its name were compiled. Mehmed II, known as the Conqueror or *Fatih* was the Ottoman ruler who founded the *Madrasas* bearing his name, with the aim of making Istanbul a centre for the sciences. The scientific institutions founded by Ulugh Beg and Mehmed II as well as the funding and social status they provided for scholars, attracted them to Samarkand and subsequently to Istanbul.

Qādīzāde al-Rūmī (d. circa 1436) who travelled from Anatolia to Samarkand at a young age to improve his knowledge, worked there under the patronage of Ulugh Beg in the preparation of the *zij* and served as the head of the *Madrasa*.

Ulugh Beg's murder had a profound impact on Samarkand's scientific life. Soon, scholars left the city in search of new inspiration and patrons. Among them was Alī Qushjī (d. Istanbul, 17 December 1474), the Director of Samarkand Observatory. After spending years in Herat, he left for Tabriz and in 1469 joined the court of Uzun Hassan (1423–1478) the Aq Qoyunlu ruler. Then upon the invitation of Mehmed II, he moved to Istanbul where he taught during the last two years of his life, bringing a breath of fresh air to Ottoman scientific life. In the following pages, Sultan Mehmed II's sponsorship of science as well as Qushjī's work in Istanbul will be re-evaluated.

Mehmed II was only 17 years old when Ulugh Beg passed away. He ascended the throne for the second time in 1450, one year after Ulugh Beg's death, and conquered Istanbul in 1453. Had these two patrons of science ruled at the same period of time, how would Istanbul–Samarkand scientific relations have evolved? Perhaps Alī Qushjī would not have come to Istanbul as Ulugh Beg's patronage would have continued. Still, scientific exchanges between the two cities could have developed thanks to the cooperation of the two patrons of science. More scholars from Samarkand arriving in Istanbul would undoubtedly have accelerated the teaching of mathematics and astronomy in the Ottoman Empire. Although this is mere speculation, it is thrilling to contemplate the possible development of science at the two centres even centuries later. For instance, would this have led to the establishment of an observatory in or near Istanbul that was on a par with the one in Samarkand?

2 SCHOLARS MEET IN ISTANBUL UNDER MEHMED II'S REIGN

The Ottoman Empire was founded in Asia Minor in the early years of the fourteenth century. Although the early Ottoman *madrasa*s were

established in Iznik, Bursa and Edirne from 1331 on to train religious men and jurists, scientific and philosophical thought began to flourish during the reign of Mehmed II (1444–1446, 1450–1481) (Adıvar, 1939: 21). Mehmed II's (Figure 1) one aim was to summon the most respected and learned scholars in Istanbul to create a scientific centre for the Islamic World. There is no doubt that his interest in the sciences, as well as his desire to impose his political power, played a role in this initiative. By showing high respect to the scholars of Islamic sciences flourishing in Central Asia, Iran, Egypt, and Syria, he invited them to Istanbul by high salaries and presenting precious gifts (Heiderzadeh, 1998: 216). For governing the expanding territory of the Empire, Mehmed II needed religious and legal scholars in growing numbers. The scholars he recruited or who chose to move to Anatolia from abroad, formed the teaching staff of Ottoman *madrasas* established in Istanbul and other cities of the Empire. Among the scholars Mehmed II convened in Istanbul were those who had travelled to Anatolia during the reign of his father Murad II (r.1446–1451). Mehmed II assigned some of them to the *madrasas* he established in Istanbul or to his palace. For example, four of Sultan Mehmed II's seven personal physicians had come from Iran. Two of the *erkân-ı erbaa* (the four dignitaries) in the Sultan's entourage were Iranian scholars (Heiderzadeh, 1998: 218).

3 PATRONAGE AND ESTEEM

Among the scholars who arrived in Istanbul, there were those who were born and trained in Anatolia. One example is Muslihiddin Efendi of Bursa (d. 1488), who would later be known as Hodjazāde (Balıkçıoğlu, 2023: 59–62). The young man who was denied financial support from his wealthy father for choosing the path of scholarship, completed his education under difficult conditions. When he learnt that Mehmed II was gathering men of learning in Istanbul, he borrowed money from one of his students and traveled to Istanbul, where he was accepted by the Sultan, who was debating with scholars Molla Zeyrek and Seyyid Alī (Şen, 2024: 515) (Figure 2). After proving his knowledge, he returned to Bursa, but Mehmed II sent Hodjazāde 10,000 *akçe*s (silver coins)[1] and invited him to Istanbul to become his personal instructor (*muderris*). Mehmed II also patronised Alā al-Dīn al-Tūsī (d. 1482), who after having studied in Samarkand and Egypt came to Anatolia during the reign of Sultan Murad II and worked as a *muderris* in Bursa. Mehmed II assigned him to the Zeyrek *Madrasa* (Istanbul) with a daily salary of 100 *akçe*s and allocated the income of a village[2] to him in addition to his salary (Ünver, 1946: 13–14). The Sultan, who attended one of al-Ṭūsī's lectures, admired his teaching and rewarded him with 10,000 dirhams and donned him with a fur caftan. Al-Ṭūsī's students were also bestowed with 500 dirhams each (Ünver, 1946: 17). Mehmed II also granted houses or plots to the *muderris* appointed to the *madrasas* he founded in Istanbul in 1470, named presently as 'Fatih Medreseleri' (Ünver, 1948: 8).

The Sultan was exceptionally generous to Alī Qushjī. Informed of his departure from Tabriz to Istanbul, he sent a delegation to the Ottoman–Iranian border and allocated 1000 *akçe*s for each stop along the way to be used to accommodate Qushjī and his entourage. Following his return from the military campaign of Otlukbeli (1473), Alī Qushjī was appointed as *muderris* to the Hagia Sophia *Madrasa* with an exceptional *per diem* of 200 *akçe*s (Özcan, 1989: 183). Members of Qushjī's family and those of his entourage were also given high civil official positions in the state service (Ünver, 1948: 16–17). Interestingly, no distinct term for patronage existed in medieval Arabic and Persian languages. Instead, terms such as *ni'ma* (benefit), *ikram* (honour) or *khidma* (service) were used over the centuries (Brent-

Figure 1: A portrait of Sultan Mehmed II painted by Gentile Bellini in 1480 in Istanbul (https://tr.m.wikipedia.org/wiki/Dosya:Bellini,_Gentile_-_Sultan_Mehmet_II.jpg).

Figure 2: A debate in the presence of Mehmed II (circa 1453–1456). Left to right: Molla Zeyrek, Sultan Mehmed II, Molla Sayyid Alī al-Ajamī, Vizier Mahmud Pasha and Hodjazade. The sitting of the *muderris* in the presence of the Sultan while the vizier remains standing is an indication of the Sultan's recognition of the scholars (after Balıkçıoğlu, 2023: 55).

jes, 2012: 12). Again, in the chapter on Alī Qushjī within ***eş-Şekāiku'n-nu'maniyye fī ʿulemāʾi'd-Devleti'l-ʿOṣmāniyye*** (*Red peonies within the scholarship of the Ottoman State*), a compilation of biographies by Taşköprizâde Ahmed Efendi (d. 1561), a specific word for patronage does not appear. One reads that he was honoured (*ikram*) by Mehmed II, appointed to the *madrasa* and that his retinue was given support (Özcan, 1989: 180–184).

Sultan Mehmed II's appreciation and encouragement towards *ulema* (scholars of religion and jurisprudence) ensured that scholars enjoyed a high social status within the state. The circumcision ceremony held in Edirne in 1457 for the Sultan's sons Bayezid (1447–1512) and Mustafa (1450–1474) witness Sultan's regard and esteem. In the event, the Sultan gave a banquet to the *ulema* on the first day demonstrating their place in the state hierarchy. The Iranian scholar from Samarkand, Alā al-Dīn al-Tūsī, the *muderris* of the Zeyrek *Madrasa* was seated on Fatih's left side and the Mufti Fakhr al-Dīn Ajamī who had studied in Iran, took place on his right. Opposite him were Hızır Bey, the Qadi of Istanbul, and Shukrullah al-Shirvānī (d. 1486), the Sultan's physician. These four people were the 'four dignitaries' mentioned earlier. Other scholars were also seated close to them. Although the names of the scholars at Mehmed II's table are given differently in the sources, there were only *ulema* at the table. Sheikhs were invited on the second day, the viziers and amirs on the third and the public on the fourth day (Ünver, 1946: 18, 199; Heiderzadeh, 1998: 218).

The Sultan's table order sometimes caused jealousies and resentments. In 1472–1473, Molla Hüsrev (d. 1480) left Istanbul and went to Bursa because he did not find it fitting for his scholarly degree that Molla Gürânî (d. 1488), the Mufti of Istanbul, one of the Sultan's teachers, was given a seat on the Sultan's right and he was shown a seat on his left. He built the Hüsrev *Madrasa* there and taught for a while, but returned as the Mufti of Istanbul upon the Sultan's invitation (Koca, 2020: 252–254).

Towards the end of the Mehmed II's reign,

scholars had reached a position to challenge the Sultan's decisions. After granting Sinan Pasha (Sinān ud-Dīn Yusuf, d. 1486) the highest official rank (*vizier*) of the state and appointing him *muderris* at the new *madrasas* with the title of 'Sultan's Hodja' and grand vizier in 1476, Mehmed II dismissed and imprisoned him as a result of intrigues. *Ulema* reacted strongly to this incident. They petitioned the Sultan and asked for Sinan Pasha's release from prison. Otherwise, they threatened to burn their books and leave the Ottoman land altogether. This reaction resulted in Sinan Pasha's release from prison and his banishment from Istanbul by being appointed as the kadi of Sivrihisar, a township in Eskişehir (Fazlıoğlu, 1996: 87).

4 MEHMED II'S *MADRASAS*: IMPRINTS OF MATHEMATICS AND ASTRONOMY IN THE TEACHING OF ISLAMIC SCIENCES

Created by pious foundations (*waqfs*), the *madrasas*, besides training religious functionaries, jurists, and administrative officials, were the very institutions providing opportunities of patronage. According to the deed, the donor had the right of appointing professors (*muderris*) and other functionaries, decide on the number of students etc. (Brentjes, 2012: 18). When Mehmed II conquered Istanbul, he first converted the monks' rooms of abandoned monasteries into *madrasas* and then had a complex (*külliye*) of eight *madrasas* built in 1470. The *Pantocrator* monastery, the largest monastery complex in Istanbul, was converted into the Zeyrek *Madrasa*. Fifty rooms were allocated to students. Books were sent from the palace to the *madrasa* library. As mentioned above, Mehmed II appointed Alā al-Dīn al-Tūsī as *muderris* of the Zeyrek *Madrasa* with a daily salary of 100 silver *akçe*s. Another *muderris* of the Zeyrek *Madrasa* was the Sufi/Bayramī scholar Molla Zeyrek (d. 1497–1498?), who, like al-Tūsī, was formerly a *muderris* in Bursa. A *muderris* with a daily wage of 50 *akçe*s, he was dismissed when he was defeated in the 'Unicity of God' debate he had with Hodjazāde in the presence of Mehmed II, and eventually was replaced by Hodjazāde himself (İpşirli, 2020a).

Another *madrasa* of Istanbul was the Hagia Sophia *Madrasa*. It was established in the empty rooms of the monastery next to the Hagia Sophia basilica. It is known that books were supplied from the palace during its foundation years. Its first Professor was the *fiqh* scholar Molla Hüsrev (d. 1480), whom Mehmed II called the *imam-ı azam* (great imam) of the time. Molla Hüsrev was born and raised in Anatolia. He took part in the campaigns in support of Mehmed II during the conquest of Istanbul. After the conquest, he was appointed as the qadi of Istanbul as well as that of the Galata and Üsküdar (Scutari) districts, and as a *muderris* of the Hagia Sophia *Madrasa*. He received 100 *akçe*s a day (Koca, 2020). Note that when Alī Qushjī came to Istanbul, he was appointed to the Hagia Sophia *Madrasa* with a daily salary of 200 *akçe*s.

In 1463, Mehmed II started the construction of a large social complex (*külliye*) including a mosque surrounded by eight large and eight small *madrasas*, a hospital, a timekeeping office, a bath and other facilities (İpşirli, 2020b). The *madrasa* complex can be considered as Mehmed II's largest enterprise in sciences. While the large *madrasas* gave advanced teaching in Islamic sciences, the small ones provided preparatory education for those aspiring for advanced studies.

Although sources mention that Qushjī prepared the syllabus of Mehmed II's *madrasas* together with Molla Hüsrev and grand vizier Mahmud Pasha, such a syllabus has not survived. However, the *Kanunname-i Talebe-i Ulum* (*Law for Students in Sciences*), which is accepted as a curriculum, lists 10 courses (books) to be taught by the *muderris*. All of these are on the Islamic sciences (Unan, 2003: 337–356). Apparently, mathematical sciences were not among the compulsory subjects to be taught. However, in the first two endowments of the *madrasa* complex (the second one is dated 1495) (Ünver, 1946: 70, 74), it is requested that *muderris* to be appointed to each *madrasa* be knowledgeable in both Islamic sciences[3] and rational sciences.[4] As a result, scholars teaching in Mehmed II's *madrasas* were scholars of theology and jurisprudence, informed, to a lesser degree, in mathematical sciences. Alī Qushjī seems to be the only scholar who taught mainly in mathematics and astronomy. The number of students who attended his lectures in Istanbul is unknown.[5] Although Mehmed II wanted to sow the seeds of mathematical sciences in *madrasa* teaching during his reign, the ratio of works on mathematical sciences were significantly low when compared with those produced in Islamic sciences. The reason why mathematical sciences remained in the background in *madrasa* education and deprived of *muderris*' interests, was that these sciences were not considered as particularly useful sciences (*ulum-i nafıa*). Scholars often stated that they themselves were engaged in the useful sciences as much as they were in line with state's demands (Unan, 2003: 377–381).

However, in order to carry out inheritance calculations, accounting/finance, title deed finance, to make calendars, and to determine religious dates correctly, the *muderris* had to have basic knowledge of mathematics and astronomy. Therefore, mathematical sciences must have been taught, even if they were not included in the programme. It is noteworthy that there are many copies of astronomy and mathematics textbooks by some authors in libraries. Copies of Qādīzāde al-Rūmī's commentary on *al-Mulahhas fi'l-Hay'a* by the Khwarazmian scholar al-Chaghmīnī (d. 1221), written at the request of Ulugh Beg, were popular among Ottoman *madrasa* students. Sinan Pasha, after the death of Mehmed II, prepared a gloss (*ḥāshiya*) on Qādīzāde's commentary and taught this book at *madrasas* (Fazlıoğlu, 1996: 88–89). Among mathematics textbooks studied in Ottoman *madrasas* was the commentary made by Qāḍīzāda-i Rumī on Shams al-Dīn al-Samarqandī's (d. 1303) *Ashkāl al-taʾsīs*. Qādīzāde's commentaries were used as intermediate-level astronomy and geometry textbooks for many years. To these can be added Alī Qushjī's *al-Risāla al-Muhammadiyya* on arithmetic and *al-Risāla al-Fatḥiyya* on astronomy, which he translated into Arabic in Istanbul and dedicated to Mehmed II.

5 MEHMED II'S LIBRARY: A MULTILINGUAL TROVE

Mehmed II's, motivated by his interest in sciences (both Islamic and mathematical) and history, collected books since his princely days in Manisa (Magnesia ad Sipylum). When ascending to the throne, he transferred his books first to Edirne and then to Istanbul, and he enriched his collection over time. According to an inventory book drawn up 20 years after his death, there were some 7200 titles in 5700 volumes in the Palace in 1503 (Necipoğlu et al., 2019b). It is known that the Sultan sent books to Zeyrek and Hagia Sophia *Madrasas*. Mehmed II's intellectual interests were not confined to Islamic culture as witness the presence of 120 Greek manuscripts from the Byzantine period as well as Latin texts. The works of Euclides, Heron of Alexandria, Galenos, Hippocrates, Aristotle, Pythagoras, Ptolemy were among the holdings of the Palace Library. The collection also included the histories of Michael Psellos of Byzantium, John Kantakuzenos and that of Michael Kritovulos (Deissmann, 1933). These must have been collected during the reign of Mehmed II, because during and after the reign of Beyazıt II (1481–1512) his son, the Sultans' interests in non-Islamic manuscripts declined, and many were discharged in later centuries.

Mehmed II appointed a versatile scholar at the head of his library: Molla Lütfi (Lütfullah Muhammed b. Hasan Tokadī, d. 1495). Molla Lütfi attended Alī Qushjī's courses on mathematics and astronomy. He tried to solve the 'doubling the cube' problem known as the Delian problem (Adıvar et al.; 1940). Molla Lütfi served as a *muderris* during the reign of Beyazıt II, and thereafter was accused of heresy and executed.

The distribution of the works in Arabic composed during the time of Mehmed II is as follows: linguistics, literature and oratory, philosophy and ethics, mathematics, natural sciences, technology, medicine, Islamic law, Islamic religion and history. Texts on mathematics, natural sciences, technology and medicine were relatively numerous. Mehmed II not only collected books but also had many books in Greek and Islamic languages copied in the palace workshops. According to Şengör (2017: 138), the number of books copied in the Sultan's scriptorium on linguistics, philosophy, natural sciences, technology and law is higher than the number of books on religion and literature.

6 MEHMED II AND THE STUDY OF MATHEMATICAL SCIENCES

The first-hand witness of Mehmed II's interest in mathematical sciences is his teacher Sinan Pasha. In the introduction of his gloss to *Sharh al-Mulahhas fi'l-Hay'a*,[6] he wrote that the Sultan was fond of the knowledge provided by the *hikemī* (philosophical) sciences and always encouraged those around him to engage in astronomy and to pay special attention to all mathematical sciences. He adds that the Sultan frequently questioned them with various problems in these subjects, and that he urged them to study geometry and arithmetic (Fazlıoğlu, 1996: 93). Mehmed II was the one who directed Sinan Pasha, who was previously more inclined to Islamic sciences, towards mathematical sciences, and the Sultan asked him to attend Alī Qushjī's lessons. Although Sinan Pasha did not attend the courses personally,[7] he improved his knowledge of mathematics and astronomy by following the notes of his student Molla Lütfi, who attended the courses regularly. Sinan Pasha wrote the above-mentioned gloss after the death of Qushjī and Mehmed II, and Qushjī's instructions must have helped him to compose it. This example suggests that advanced mathematical knowledge entered the Ottoman *madrasas* after the arrival of Alī Qushjī in Istanbul and that it was through his lectures that the

scholars and novices in Istanbul were trained in the mathematical sciences.

7 DEBATES IN THE PRESENCE OF MEHMED THE CONQUEROR

Mehmed II enjoyed and appreciated the debates between different currents and schools of thought, namely the theologians, the philosophers and the Sufis. Discussions (*münâzara*) were regularly held among the scholars representing these three classes. Almost all of these discussions centred on the ideas of Sad al-Dīn al-Taftāzānī (d. 1390/1395) and Sayyid Sharīf al-Jurjānī (d. 1413), who were renowned in the *ulum-i nakliyye* (tafsir, kalam, fiqh, logic, Arabic language) (Fazlıoğlu, 1996: 92). These debates not only provided the Sultan with answers to questions he posed, but also provided scholars with the opportunity to present themselves to the Sultan and in turn be rewarded. Consequently, losers of the debates fell out of favor and left Istanbul.

We have information about only a few of these scholarly debates. One of them aimed to prove the 'Unicity of God'. It was held in 1466 between Molla Zeyrek, one of the *muderris* of Zeyrek *Madrasa*, and the Sultan's *hodja*, the *muderris* Hodjazāde, and lasted seven days.[8] The debate was not only a dialogue, but each orator had to write a treatise containing his opinions and arguments. On the sixth day, when the Sultan realised that the debate could not be carried on in this vein, he gave each speaker a copy of their treatise and asked them to be prepared for further discussions. Finally, the arbiter Molla Hüsrev ruled that Hodjazāde, who had better proof of the 'Unicity of God' was the winner. Hodjazāde succeeded because, besides drawing from classical and post-classical texts to validate his arguments, he corrected, commented and modified them in order to craft his own formulation, while Molla Zeyrek had confined himself to rely on texts alone. This debate on *ḥikma* (post-Avicennan philosophy) and *kalām* (philosophical theology), also reflects how Ottoman scholars could respond to the conflicts of past schools and articulate their own 'take' through referencing other contemporaries (Balıkçıoğlu, 2023: 148–153). This was probably Mehmed II's intention in initiating this debate.

Another topic of discussion was the contrasting views of al-Ghazālī and Ibn Rushd (Ünver, 1946: 210). As is known, al-Ghazālī (d. 1111) in his *Tahāfut al-falāsifah* (*The Incoherence of the Philosophers*) criticised the Aristotelian school of Islamic philosophers (Ibn Sīnā, al-Fārābī) for considering reason superior to faith, and even accused them of heresy. Ibn Rushd (Averroës, d. 1198) wrote *Tahāfut al-Tahāfut* (*The Incoherence of the Incoherence*) to refute al-Ghazālī's ideas and argued that reason was superior to faith. The Sultan asked for the matter to be scrutinized and discussed. Upon Sultan's order, Hodjazāde who was educated in Bursa, and Alā al-Dīn al-Tūsī in Samarkand and Egypt, each wrote a treatise on the issue. Both scholars justified al-Ghazālī and produced works defending his righteousness. Since Hodjazāde's work was more admired than al-Tūsī's, Hodjazāde was more successful. But both scholars were given 10,000 *akçe*s each, although Hodjazāde was also given a mule and a saddle inlaid with gold (Ünver, 1946: 210–211). After a while, al-Tūsī returned to Samarkand and spent the rest of his life with his students in this city (Öz, 2012).

The first of the two discussions above was in the field of theology and the other in the field of philosophy. Although regular debates were held in Mehmed II's presence, there is no detailed information about their subjects. Which of them discussed Sharī'ah sciences and which discussed mathematical sciences? Considering that *madrasa* scholars were mainly specialised in Islamic sciences, these debates should have been on those sciences. For example, when Hodjazāde travelled from Bursa to Istanbul to seek a post, he found Molla Zeyrek and Sayyid Ali al-Ajemi (b. 1456) debating in the presence of the Sultan **(**Figure 2). What topics were discussed at this meeting and what questions were asked of Hodjazāde? Considering that he had been educated in the Islamic sciences from a young age it is conceivable that the discussions revolved around *ulum-i nakliyye*.

The only discussion on mathematical sciences recorded is on a geometry problem raised by Alī Qushjī. This problem is as follows: Let us construct such an acute angle that when one side of this acute angle is moved towards the direction of expansion, it becomes an obtuse angle without being a right angle. Mehmed II wanted the local scholars to solve the problem without consulting Alī Qushjī. Thus, Mehmed II wished to prove to Qushjī—who came from Samarkand—the aptitude of his native scholars. He did not ask a particular person to solve the problem; Sinan Pasha, whom we assume to have been the most knowledgeable Professor of Mathematics in those years, undertook the challenge and wrote a treatise on it (Adıvar, 1943: 35; Fazlıoğlu, 1996: 85–106; Ünver, 1948: 55–58). The five extant copies of the treatise are recorded in library catalogues under different titles. Fazlıoğlu believes that the most approp-

riate title for the treatise is *Risale fi'z-zaviyeti'l-hadda iza furidatharaketu ehadi dil'ayha tahsilu zaviye münferice*, which defines the problem itself. Sinan Pasha proved in seven steps that an acute angle can be converted to an obtuse angle without becoming a right angle at any one point; in his proof he may have resorted to Nasīr al-Dīn al-Tūsī's *Taḥrīr Uṣūl al-Handasa wa al-Ḥisāb* (translation of Euclides' *Elements*). It is understood that Sinan Pasha

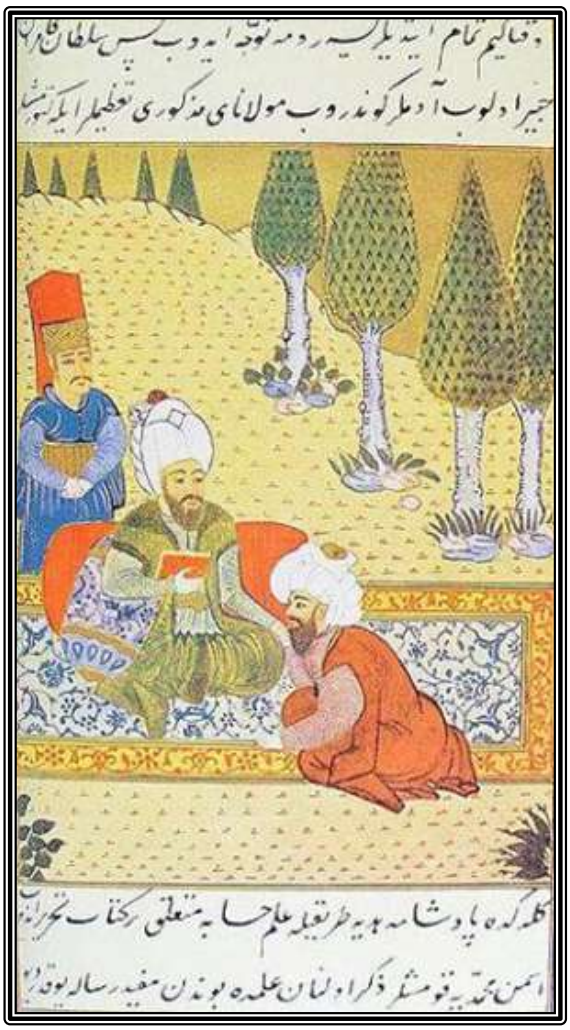

Figure 3: A sixteenth century miniature representing Alī Qushjī offering *al-Risāla al-Muhammadiyya* to the Mehmed II in 1472 (https://tr.m.wikipedia.org/wiki/Dosya:Fatih_Sultan_Mehmed_und_Ali_Ku%C5%9F%C3%A7u.jpg).

completed his treatise on the issue, which was raised between 1472 and 1474, ten years after the death of Alī Qushjī and Mehmed II (1481) (Fazlıoğlu, 1996: 93; Ünver, 1946: 216).

Although not in the presence of Mehmed II, a scholarly conversation took place between Alī Qushjī and Hodjazāde, who the welcomed Alī Qushjī and his retinue in Üsküdar on the Asian outskirts of Istanbul. While travelling by boat to the city both scholars discussed the tidal phenomenon.

8 ALĪ QUSHJĪ IN ISTANBUL

Alī Qushjī first came to Istanbul as the envoy of Uzun Hassan, the ruler of Aq Qoyunlu state (Adıvar, 1943: 35; Ünver, 1948: 55–58). It is related that Uzun Hassan respected Alī Qushjī highly when he was in his retinue during the pilgrimage to Mecca. Mehmed II's desire to expand his empire towards the east and his conquest of Trabzon in 1461 had created problems between the Ottomans and the Aq Qoyunlus, and Qushjī was delegated to mediate. His mission to Istanbul allowed Mehmed II to became acquainted with Qushjī, one of the learned prodigies of Samarkand. The Sultan invited him to Istanbul in line with his policy of assembling the leading scholars in the capital city. In this invitation, Qushjī's high knowledge in both mathematical and Islamic sciences had certainly played a role. The fact that Qushjī was a student of Qādīzāde al-Rūmī can also be considered a factor in this move. Mehmed II may have thought of strengthening the teaching of rational sciences (*ulum-i akliyye*) in the *madrasas* of Istanbul, where mainly the Islamic sciences (*ulum-i nakliyye*) were studied. Undoubtedly Qushjī's presence in Istanbul, however brief, gave impetus to the study of mathematical sciences. On the other hand,

> Mehmed II's genuine interest in recruiting Qushjī seems to have been related to the political prestige and instrumentality accorded to the patronage of the science of the stars in late medieval and early modern courtly culture. (Şen and Fleischer, 2019: 769).

Alī Qushjī came to Istanbul for the second time in 1472. This is also the composition date (877/1472) of his work on *hisāb* (arithmetics), *al-Risāla al-Muhammadiyya* (Ünver, 1948:19). He dedicated and presented it to Mehmed II (Figure 3). He participated in Mehmed II's military campaign against Uzun Hassan, which ended with Mehmed II's victory at Otlukbeli (August 1473). Upon his return to Istanbul, Mehmed II appointed him *muderris* to the Hagia Sophia *Madrasa* where Qushjī was to lecture until his death (Ünver, 1948: 17, 35). If this information about his appointment is true, one wonders why Mehmed II waited until 1473 to appoint him as *muderris* to the said Hagia Sophia *Madrasa*. Bearing in mind that the construction of the new social complex which included eight *madrasas*, was completed in 1470 (Unan, 2003: 50–52). Why did Mehmed II appointed him to the old Hagia Sophia *Madrasa* and not to the new 'Fatih' *madrasas*? The Sultan may have wished Qushjī to teach in a

madrasa close to the Palace in order to keep him in his close circle. In this way, Qushjī became the head of a single and independent *madrasa*, and not one of the heads of eight *madrasas*. In a sense, Mehmed II allocated a special madrasa to Qushjī, which became known as the 'Alī Qushjī *Madrasa*'. This would indicate the prestige bestowed upon him by the Sultan.

It is certain that Qushjī taught mathematical sciences at the Hagia Sophia *Madrasa* in Istanbul: Molla Lütfi and Sinan Pasha (indirectly through his student Molla Lütfi) benefited from his teachings. On the other hand, together with Molla Hüsrev and the grand vizier Mahmud Pasha, his name is mentioned in the trio who prepared the syllabus of the Fatih *madrasas* (Unan, 2003: 71). However, it is noteworthy that none of the 10 courses (books) in the *Kanunname-i Talebe-i Ulum (Law of Students in Sciences*), which were accepted as a syllabus, was related to the mathematical sciences. Neither is there any reference to the programme in the endowments.

9 THE CONQUEROR AND ALĪ QUSHJĪ: A COMMON PASSION FOR ASTRONOMY

The history of astronomy during Mehmed II's time remains somewhat obscure. Research—albeit limited—done on writers, treatises and instruments show that the Sultan was interested in astronomy (King and Charette, 2024: 91). Mehmed II's patronage of Alī Qushjī is a prime witness of this interest. Despite his short stay in Istanbul, Qushjī wrote on both mathematics and astronomy, mostly in Arabic, the preferred language of the Sultan. The commentary he wrote on the *zīj* of Ulugh Beg is in Persian, the original language of the *zīj*. In this commentary, he not only corrected the mistakes made at Samarkand Observatory when compiling the *zij*, but also those in Nasīr al-Dīn al-Tūsī's *Zīj Ilkhanī* (Heiderzadeh, 1997: 42–49). He also prepared the Arabic version of his *Risāla dar' Ilm-i Hay'a* in Persian, and he dedicated his work (*al-Risāla al-Fatḥiyya)* to the Sultan: Qushjī presented it to the Sultan after his victory against Uzun Hassan in Otlukbeli (Eastern Anatolia) in 1473. This was a treatise on theoretical astronomy dealing with the configuration and positions of celestial bodies as well as as Qushjī's views about the possibility of a heliocentric Universe (Ragep, 2005: 359–371). Did he actually discuss his 'heliocentric' views at the lectures he gave at the Hagia Sophia *Madrasa* or at the meetings held in the presence of the Sultan? No documentation is available.

Alī Qushjī erected a sundial (*basite*) in the courtyard of the mosque built by Mehmet II (presently the Fatih Mosque). While this no longer exists, according to Wilhelm and Joan Blaeu's seventeenth-century translation of the *Atlas Maior* by Abū Bakr b. Behrām ed-Dimashkī (d. 1691), it was located on the primary school side of the mosque, near the Boyacılar Gate (Ünver, 1948: 61–64). Süheyl Ünver was unable to find a sundial at this location during his research in the 1940s. However, he suggested that two vertical sundials, one large and one small drawn on the base of the south minaret of the mosque, could be those of Qushjī. King and Charette (2024: 120) rejected this idea because if this sundial was in the courtyard, it must have been a horizontal sundial and at present there is no horizontal sundial in the courtyard of the mosque. The vertical sundials and their numerals must belong to the early modern period because if they had been made during the reign of Mehmed II the numerals would have been written in *abjad* numerals. They suggest that after the destruction of Alī Qushjī's sundial, possibly during the earthquake of 1766, two vertical sundials must have been engraved on the bottom part of the minaret when repairs were made to the mosque. These 'modern' vertical clocks were themselves repaired in 2012–2013 (Bir, Barutçu, and Kaçar, 2013).

A brass sundial dedicated to Mehmed II which surfaced in recent years can be seen as another indication of the Sultan's interest in astronomy. It is the sole surviving example of a universal 'spiral' sundial in Islamic astronomy (King and Charette, 2024: 15). The instrument serves to determine the seasonal hours and the time of the afternoon prayer. It is, at the same time a mathematical device. This universal sundial dates from 1477, and can be used in all climates with classical geography, that is from the equator to about 45° North. It is rectangular in shape (19.5 cm by 15.3 cm). The markings consist of a series of snail-shell-shaped spirals characteristic of the *ḥalazūn* (spiral) type sundial that appeared only in treatises compiled in Mamluk Egypt. Its construction during the time of Mehmed II, bears witness to the impact of Mamluk astronomy on Ottoman culture. The inscription does not imply that Mehmet II himself was involved in any serious astronomical activities. It simply associates the instrument with the Treasury of the Sultan, and thus particularly enhances its historical importance, inviting a closer look at astronomical activities under his patronage

and raising them from the legendary to the curious and even a degree of sophistication (King and Charette, 2024: 19). Abū 'l-Ḥasan' Alī al-Marrākushī's (fl. Cairo c. 1220) encyclopaedic work on timekeeping (*Jāmiʿ al-mabādiʾ wa-ʾl-ghāyāt fī ʿilm al-mīqāt*) which was the main source on spherical astronomy and sundial theory in the Islamic World, was available in Istanbul during the reign of Mehmed II. Thus, Mehmet II's interest in the theory and construction of sundials, is of substance rather than legendary (King and Charette, 2024: 92).

Alī Qushjī also seems to have used a new value for the longitude of Istanbul (Ünver, 1948: 58–59). Mustafa bin Ali, a sixteenth-century *muwakkit* noted on the back page of his copy of *Rub' Mukantara* that the longitude of Istanbul (*tûl-i Kostantiniye*) was 60°. Then without further explanation he added that the value given by Alī Qushjī was 59°. The longitude of Istanbul in Ptolemy's (second century) *Geography* was 56° (Nothaft, 2022: 5). In the Middle Ages, starting with Al-Khwarizmi (ninth century) errors in Ptolemaic coordinates were gradually reduced by Muslim scholars (Macías, 2014: 13). In the *Zīj* of Ulugh Beg to which Qushjī had contributed, Istanbul's longitude is given as 59° 50′ as calculated from the prime meridian going through the Canary Islands (Kaçar and Bir, 2012: 237). In the Turkish translation of the *Zīj* made in the seventeenth century by Abdurrahman bin Osman, the longitude of Istanbul is 53°. In case Mustafa bin Ali's information is correct, Alī Qushjī used neither the longitude popular among Ottomans nor the one recorded in the *Zīj* of Ulugh Beg. Did he calculate the longitude of Istanbul anew? If so, did he also calculate it from the Canary Islands? Which method did he use, and which feature in Istanbul did the meridian pass through (the dome of the Fatih Mosque or that of the Hagia Sophia)? Some sources mention that Ulugh Beg laid out a large-scale meridian line within the Hagia Sophia basilica in 1437, but again this information is without foundation (see Hannah, 2007).

Although the activities in the field of theoretical and practical astronomy during the reign of Mehmed II have not been sufficiently analysed, the arrival of Alī Qushjī, one of the leading Oriental astronomers of the fifteenth century in Istanbul, the astronomical works he composed and dedicated to the Sultan, and the dedication of a spiral sundial to Mehmed II, reveal his interest in and support for astronomy. However, the Sultan did not express support for Georgios Trapezuntios, who was working on a Latin translation of the *Almagest*, Ptolemy's book on astronomy. This does not mean that he showed no interest in astronomy. The fact that an Arabic summary (*al-Mulakhkhas fi'l-hay'a*) of the *Almagest* had already been made by al-Caghmīnī (ca. 1220) and became popular in the Islamic world, must have made the Latin translation not as significant for the Sultan. On the other hand, the values given in the *zij* of Ulugh Begh were certainly better than those given by Ptolemy.

10 PATRONAGE OF GEOGRAPHICAL AND CARTOGRAPHICAL MATERIAL

Geography books and maps were at the centre of Mehmed II's interest. It is not clear whether or not his attention was due to an expansionist policy. Whatever the reason was, he commissioned the translation of Ptolemy's *Geographike Hyphegesis* (*Handbook of Geography*) into Arabic and ordered al-Istakhri's (d. 957) *Kitāb al-Masālik al-Mamālik* (Book of the Routes of Realms) be copied in his palace workshops. These imperial orders reflect his interest in the Ptolemaic and Islamic traditions of mapping.

Currently, there are two copies of Ptolemy's (second century AD) *Geographike Hyphegesis* in the Topkapı Palace Museum Library.[9] Codex Seragliensis Gİ 27 does not contain a world map, and its maps are incomplete and disorganised. The other copy (Codex Seragliensis GI 57) contains a world map along with other maps (Ptolemy, 2017). Both copies belonged to Mehmet II's library. It is not known how they came into the Sultan's possession. However, he must have first acquired GI 27, the copy without the world map. According to the Greek historian Mikhael Kritovoulos, the Sultan who had cancelled his military capaign of 1465, had dedicated himself to the study of Arabic, Persian and Greek Philosophy. In the course of his readings, he came across Ptolemy's *Geography*. Fascinated, he commissioned a world map that would synthesize all the information in the partial maps in the manuscript, and a translation of the entire book into Arabic (Hagen, 2023: 247–248). The Byzantine scholar Georgios Amiroutzes (ca. 1400–1475)[10] and his son, who were fluent in Arabic and Greek undertook this enterprise and delivered the translation[11] and the map to Mehmed II in 1465 (Figure 4).

Gottfried Hagen observed that the translation featured many ancient toponyms transliterated into Arabic according to early modern Greek pronunciation that had little to do with the Ottoman denominations. Also, provincial boundaries shown on Ptolemy's maps did not correspond to the contemporary political and administrative facts on the ground. Moreover,

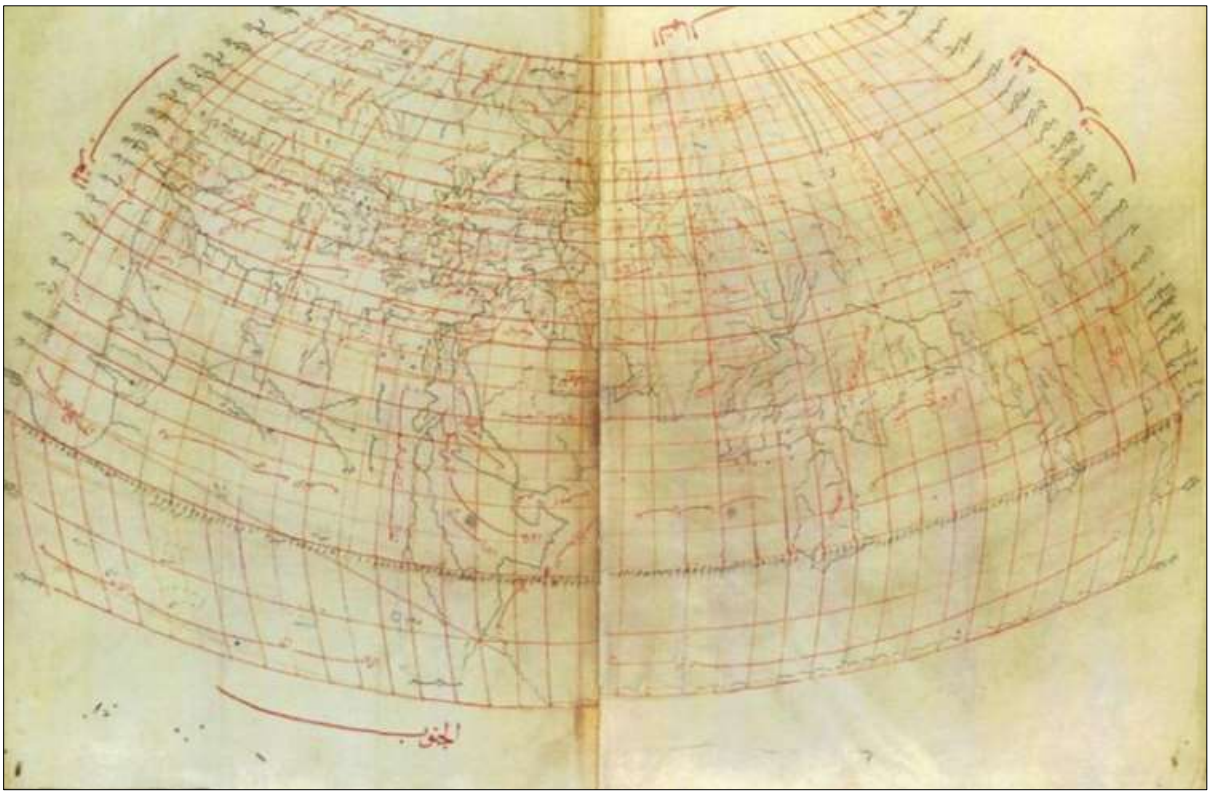

Figure 4: World map in the Arabic translation of Ptolemy's *Geography: Coğrafya-yı Batlamyus Tercümesi*, Süleymaniye Library (Istanbul), MS Ayasofya 2610 (after Özdemir, 2008: 42–43).

delineations of climes, methods of projection, and lists of coordinates were of little use for administrative purposes (Hagen, 2023: 247).

Mehmed II's patronage of geography and maps, was not confined to Ptolemaic tradition. His patronage of classical Islamic cartographic material went unnoticed until Karen Pinto brought to light a lot of copies of *Kitāb al-Masālik was al-Mamālik* (Book of the Routes and Kingdoms) composed by the geographer and traveler Muḥammad al-Fārisī al-Istakhrī's in Topkapi Palace Museum.

Masālik al-Mamālik comprises one world map (Figure 5) and 20 regional maps (Istanbul). The lot consists of six manuscripts, the earliest manuscripts being produced upon the order of Mehmed II and witnesses the Sultan's patronage of traditional Islamic maps (Pinto, 2011). In early 1470 the Sultan was presented a copy of *al-Masālik wa al-Mamālik*, beautifully illuminated. This copy was probably part of a ransom payment to Mehmed II from Uzun Hasan, in exchange for his nephew Yusuf Mirza's release. Mehmed II commissioned the replicating of the entire manuscript with its full complement of maps for the public libraries of Istanbul. It has been proposed that Alī Qushjī may have been one of the bearers of Uzun Hasan's ransom payment, and it could have been Qushjī himself who first brought the *al-Masālik wa al-Mamālik* to Mehmet II's attention and encouraged him to commission copies for Istanbul libraries bearing in mind that *al-Masālik wa al-Mamālik* was part of a popular geographical tradition among the Timurids of Iran and Central Asia (Pinto, 2011 :168).

The above cases of patronage exemplify Mehmed II's enthusiasm to draw in both Greek and Islamic scientific cultures without any differentiation. Thus, Ptolemaic mapping tradition based on mathematical and astronomical calculations as well as the Islamic cosmographic maps coexisted in fifteenth century Istanbul. Seemingly the Arabic translation of Ptolemy's *Geography* was of little use for the planning of Mehmed II's military campaigns and remained confined to the palace since there is no indication of an impact in subsequent centuries (Hagen, 2023: 238, 247). This confinement probably hindered further studies on and recognition of Ptolemy style maps. As copies of al-Iṣṭakhrī's *Masalik al-Mamalik* were sent to public libraries of Istanbul, they were possibly read, studied and commented.

11 CONCLUDING REMARKS

The title of this paper begins with "A Turkish Sultan in Quest for Knowledge". What kind of knowledge was Mehmed II looking for? Was this knowledge embedded in Islamic science

Figure 5: Al-Istakhri's world map in *Kitāb al-Masālik wa al-Mamālik*, dated 1193 (https://www.myoldmaps.com/early-medieval-monographs/211-al-istakhris-world-map/).

(sciences of the *Quran*, *kalām*, *fiqh*) or the knowledge provided by rational sciences such as mathematics, astronomy, medicine, mechanics? From the above account, it is clear that Mehmed II patronised primarily the scholars in Islamic sciences with the aim of improving the education given in *madrasas*, which were designed primarily to educate qualified personnel to administer the religious and legal affairs of the Empire. By inviting Alī Qushjī, a scholar who excelled in mathematical sciences, he probably aimed to bring the teaching of mathematical sciences to the fore in Istanbul *madrasas*. However, his desire to patronise a famous scholar from the court of his political rival Uzun Hasan can be considered also as a political move. His move in this direction, however, did not bring sustainable results. The overall number of books produced by *madrasa* scholars who died between 1470 and 1603 was 189. Out of these, only 20 (10.6%) were in mathematical sciences, the remaining 169 (89.4%) being on Quranic sciences and jurisprudence. Out of 294 commentaries written from 1470 to the end of the sixteenth century, only 3% were on mathematical sciences. Similar results are also valid for the seventeenth and eighteenth centuries (Unan, 2003: 359–360).

These numbers show that mathematical sciences were not reflected in the production of *madrasa* education. The main reason for this is that *madrasas* were foundation institutions established in training religious and legal scholars. Since they continued their life in line with this mission, one should not expect mathematicians and astronomers to be trained in the same *madrasas*. Although Mehmed II had an interest in the sciences and wished the study of mathematical sciences to flourish in the empire, he appointed a mathematician–astronomer as a *muderris* to a *medrese*. Alī Qushjī is probably the first *muderris* specialized in mathematical sciences appointed as head of a *madrasa*. Mehmed II also patronized scholars who specialised in Islamic sciences, because 'education of science' in fifteenth century Turkey consisted essentially of Islamic sciences.

Although Mehmed II had a great interest in mathematics, astronomy and cartography, unlike Ulugh Beg he was not a scientist himself. We do not know whether the Sultan and Qushjī talked about Samarkand Observatory or the creation of an observatory in Istanbul. Mehmed II did not need to pursue the Islamic tradition of building observatories, because the

Zij-i Ulugh Beg (1437), produced 35 years earlier and a product of years-long observations, was precise enough to meet the needs of Ottoman *munejjims* (astronomers, astrologers) and *muwaqqits* (time-keepers).

Would Mehmed II have invited Alī Qushjī to teach mathematical sciences in Istanbul had Qushjī not moved to Tabriz after Ulugh Beg's death and Uzun Hasan had not sent him to the Ottoman capital? Qushjī's arrival to Istanbul can be regarded as historically fortuitous. He arrived at a time when the new *madrasas* planned by the Sultan became operational. Such coincidences have occurred in the history of science. An example from Turkish recent history is the reception of German professors of Jewish origin fleeing Hitler's persecution in the 1930s—one of whom happened to be Professor Erwin Finlay-Freundlich (1885–1964), a leading astronomer of his day, who helped to create a modern observatory at Istanbul University. This event coincided with Mustafa Kemal Atatürk's (1881–1938) educational reforms and provided the cadre of professors that he needed in establishing Istanbul University. Thus, it can be deemed that Mehmed II and Atatürk invigorated science education in their own eras, with an interlude of five centuries.

12 NOTES

1. carat = 0.2 g; 1 akçe = 5.25 carats = 1 gram of silver = 1 USD (February 2025) → 10.000 akçes = 10.000 USD; Alī Qushjī's salary (200 *akçes per diem*) amounts to US$6000 monthly.
2. This village became known as *Müderris* Köyü (*Müderris*' Village) because its income was given to *müderris* al-Ṭūsī. Today it is located in the Esenler district of Istanbul, and is known as Metris Farm. Yıldırım, B. Esenler *Müderris* Village Metris Farm. https://mobil.esenlervizyonhaber.com/yazarlar/beytullah-yildirim/esenler-muderris-koyu-metris-ciftligi/63/
3. *Ulum-i nakliyye*: sciences of the Quran: *hadith* (sayings of the Prophet), *tafsir* (commentary of the Quran), *kalam* (philosophical theology), and *fiqh* (jurisprudence).
4. *Ulum-i akliyye*: mathematics, astronomy, physics, medicine etc.
5. Heiderzadeh (199717–19) cites the names of five students who attended Qushjī's lectures in Istanbul. Not all of them became specialists in mathematics. Among them Sheikh Mühiyeddin Iskelebī received from Qushjī a diploma (i*cazetname*) on the sayings of the Prophet (*ilm-i hadith*).
6. The gloss is titled *Hāşiya ala Sharh al-Mulahhas*, written by Sinan Paşa on the commentary that Qāḍīzāda wrote on al-Chaghmīnī's treatise *al-Mulahhas fi'l-hay'a* on astronomy. It is an intermediate-level astronomy textbook taught at *madrasas*.
7. Sinan Pasha, as a *vizier* (highest ranking civil servant) and a *muderris* at the Fatih *madrasas* at the time, may not have found it appropriate to attend classes as a student. On the other hand, Ottoman scholars seem to have disliked Ali Qushjī: in a letter he wrote to Samarkand (Adıvar, 1978: 322) he mentioned the envy and criticism of the Ottoman scholars in Istanbul. His wisdom and learning, Mehmed II's high esteem, and Qushjī's salary seem to have been the cause of this bitterness (Fazlıoğlu, 1996: 93). Whereas the *mudarris* usually received 100 *akçe*s daily, as mentioned above Qushjī was paid 200 *akçe*s (Ünver, 1948: 18). It is noteworthy that Sinan Pasha did not mention Alī Qushjī at the beginning of his *ḥāshiya*.
8. For the first annotated edition of this debate in classical Arabic along with its translation, analysis and contextual significance in Islamic intellectual and cultural history see Balıkçıoğlu (2023).
9. The original of Ptolemy's *Geography* is lost. It contained a list of latitudes and longitudes of about 6500 geographical places; three world maps and 26 regional maps. Maximos Planudes (1260?–1395), a Byzantine monk of the Khora Monastery in Constantinople, found a copy in Istanbul, of which two copies were made by order of the Byzantine Emperor. One of the copies must have been presented to the Emperor and the other to the monastery. The latter was taken to the Vatican. Probably other copies also were made.
10. Georgios Amiroutzes was a scholar of the Late Byzantine period. For many years he served the Pontic kings who ruled in Trabzon. He was on the Ottoman side during the conquest of Trabzon by Mehmed II, and when Trabzon was conquered in 1461, Amiroutzes was able to enter The Conqueror's palace with his relatives. He discussed Aristotelianism (Neoplatonism), Islam and Christianity with The Conqueror. Knowledgeable in Ptolemy's work, Amiroutzes also wrote a treatise to help find the locations of sites and the distances between them, based on longitudes, latitudes and the meridian (Monfasani, 2021).

11. Two copies of the translation are kept in the Süleymaniye Library in İstanbul: MS Ayasofya 2610 is the original copy made during Mehmed II's reign. Some maps of the MS Ayasofya 2596 are lacking.

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