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A NEW LETTER FROM JAMSHID KASHANI TO HIS FATHER ABOUT THE SCIENTIFIC STATUS DURING THE ULUGH BEG ERA

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Abstract: Ghiyath al-Din Jamshid Kashani (al-Kashi) who lived in the fifteenth century AD, went from Kashan to Samarkand upon Ulugh Beg's invitation. He designed a huge sextant in Samarkand and arranged regular astronomical observations there. The results of the observations were composed in Ulugh Beg's *Zij* known as *Zij Gurkani*. During his stay in Samarkand, Kashani wrote at least two letters to his father who lived in Kashan. One of these two letters was known since 1910 and its edition and translations into several languages have been published. In 1994, I found another letter from Kashani to his father, to which I refer here as the 'newly found' letter. The two letters contain interesting first-hand reports of the scientific activity in Ulugh Beg's school in Samarkand and Ulugh Beg's capacities and characteristics. Kashani admired Ulugh Beg as a man of literature and science who supported art and science.

Keywords: Ulugh Beg, Jamshid al-Kashi, Samarkand, Islamic mathematics, Islamic astronomy

1 INTRODUCTION

Thirty years ago, in the summer of 1994, I was invited to Samarkand to participate in the conference held to celebrate the 600th anniversary of Ulugh Beg. After my return to Iran, when I was arranging the notes and manuscript copies relating to my paper for that conference, I noticed that among them there was a copy of a manuscript of Kashani's letter to his father who lived in Kashan (in Iran, between Tehran and Isfahan), which was not known. It was immediately after the already known letter in the codex.[1]

The Persian text of the already known letter from Jamshid Kashani (al-Kashi) (Majlis MS 5138/142) was published in Iran several times, beginning with 1910. Its translations into English (twice, by Aydin Sayili (1960) in Ankara together with an earlier Turkish translation and Persian text, and by Edward Stewart Kennedy (1960) in Italy), Russian (twice, by G. Sabirov and N. Babayev in Dushanbe in 1973, and by Dilorom Yusupova in Tashkent in 1979), Arabic (by Ahmad Damardash in Cairo, in 1963 and 1967) and Uzbek (by D. Yusupova in 1996) were also published. The Tajiki version of the letter prepared by Khurshid F. Abdullozoda was published in 2005, and its Italian translation by Claudio Cecotti has not been published yet. See, also, Kennedy (1989) and Matveyvskaya and Rosenfeld (1983).

2 THE NEWLY FOUND LETTER

The newly found letter (in the same Majlis MS 5138/142) had some overlaps with the already known one, but it also contained new information about Ulugh Beg's scientific school in Samarkand. I published the Persian text of the newly found letter in Iran (Bagheri, 1996), and its English translation with comments in the international journal *Historia Mathematica* (Bagheri, 1997). I still wait for the publication of its Russian, Turkish and Uzbek translations, like the already known letter.

An important novelty in the newly found letter is Kashani's strict reference to the construction of a sextant (not quadrant) in Samarkand. This piece of information put an end to the old debate about whether it was a sextant or quadrant.

In his letter, Kashani mentions that Ulugh Beg knew several languages: Arabic, Persian, Turkish, Mongolian and also some Chinese. He adds that Ulugh Beg was interested in the poems of the Iranian poet Anvari (twelfth century AD) and composed poems in his style. 'Alishir Nawa'i (ninth century AD) in his *Majalis al-nafa'is* quotes a Persian couplet from Ulugh Beg as follows:

هر چند ملک حسن به زیر نگین توست شوخی
مکن که چشم بدان در کمین توست

Translation:
Although you are the ruler of the territory of beauty,
Avoid wittiness because bad peoples' eyes are ambushing you.

We also know that Ulugh Beg wrote a commentary on the collection of the poems of Anvari. Anvari's interest in mathematics, astronomy and astrology is reflected in his poems. This may have attracted Ulugh Beg to Anvari's poems. Ulugh Beg's commentary is not extant. But it was mentioned in a codex composed around four centuries ago, in Deccan (India) for

a minister of Qutb-Shahi rulers; so it may be searched for in the manuscript collections of India. Kashani adds that Ulugh Beg has a good command of poetry and knows all of the poems of Anvari by heart.

Kashani admired Ulugh Beg's capacity in mental calculations and his fairness towards everyone, even students whom he allowed to discuss with him on scientific subjects and disagree with him if they are not yet persuaded.

Kashani says that Ulugh Beg was familiar with theoretical music. He adds that Ulugh Beg knew the major part of the Holy Koran and its commentaries by heart, and had a good command of Arabic grammar. According to Kashani, Ulugh Beg had an extraordinary memory, for which Kashani provides some examples.

An appendix to the already known letter (MS Sepahsalar 2914/24) titled "The Curiosities Which I Observed Here" mentions the following items. "Upon Ulugh Beg's order, a huge Koran is being written." This must be the Koran written in Baysunqur's hand. It is said to be a masterpiece of calligraphy and ornaments and its folios were unbounded and scattered in the course of wars. It was taken to Samarkand, and kept in Amir Timur's mausoleum. Most of the extant folios of the Koran is now in Iran (in Mashhad and Tehran). The remainder are kept in museums and art galleries in different countries. Baysunqur was Ulugh Beg's brother and lived in Herat, the capital city of the Timurid Dynasty.

Another item is the palace with stone ornaments constructed for Ulugh Beg. Other items include the school (*madrasa*) and monastery (*khaneqah*) built face-to-face using stones brought from some place 12 *parasang*s (~70 km) away. These buildings are now situated in Registan square in Samarkand, and the monastery is now called the school with lion painting (*madrasa* Shirdar).

Kashani also mentions the huge mill for oil extraction. The last and most interesting item is his detailed description of the paper mill that is similar to rice-grinding mills. Knowledge of the production of paper was brought to Samarkand from China, and traditional paper mills are still one of the tourist attractions in the village Kani-Gil near Samarkand.

Ulugh Beg was born in Sultaniya (near Zanjan) in Iran, where there is a marvelous construction called Gonbad-e Sultaniya (Sultaniya dome), a masterpiece of architecture and ceramic decoration with a huge dome. The people in that region mostly speak Turkish and there is a modern university for advanced education in basic sciences including astronomy in Zanjan.

3 OTHER RECENTLY DISCOVERED DOCUMENTS

Thanks to the recent celebrations of Ulugh Beg in Samarkand, new traces of scientific treatises and literary quotations from him have been found. Apart from the *New Gurkani Zij*, Ulugh Beg's Arabic treatise on parallax was recently found in the Majlis Library (Tehran) and will be published soon with an English translation by Sajjad Nik-Fahm (Montreal University, Canada). E.S. Kennedy, a pioneering figure in surveying the history of Islamic astronomy says that Ulugh Beg's *Zij* provides the most accurate parallax values, when compared to Greek, Indian and other Islamic period values.

Another Arabic treatise from Ulugh Beg titled *Resalay-ye Malekiya* (literally *The Royal Treatise*) regarding the 'altitude circle' was found by another Iranian colleague, Mohammad-Reza Arshi from Kashan. He also found another treatise which is a commentary on *Resalay-ye Malekiya* composed by a certain Sa'id al-Din ibn Javani that starts as follows: "When I entered Samarkand …" He was a disciple of Qazizadeh Rumi, and possibly one of the 500 junior students whom Kashani mentions as mathematics students. In the newly found letter, Kashani mentions that 10,000 students were studying in Ulugh Beg's school, and the same number of students from high-ranking families were studying at home. This sounds too high a number, and maybe is a result of a scribal mistake, an exaggeration, or a metaphor to imply a very large number. Just before this, Kashani says that Ulugh Beg allocated more than 10,000 dinars for distribution among the students. This may have caused the confusion that led to this scribal error.

There is a stylistic Persian sentence from Ulugh Beg in a manuscript (MS 473) kept in the Majlis [Parliament] library (Tehran). We read there:

> A writing from Ulugh Beg in the *Madrasa* of Marv (present Mary in Turkmenistan):
> علیما عالما علّاما علم علم علماء عالم دار ا علی الدوام عالی د

Here Ulugh Beg plays with consonance of letters in the words and the brief meaning is: "O, the supreme omniscient (referring to the God)! Keep the flag of the science of the scientists of the world ever raised."

A Persian alphanumerical enigma from Ulugh Beg is found in an anthology of interesting short writings in history, literature and science collected by Farhad Mirza, a knowledgable prince from the Qajar Dynasty (1785–1925 AD). An alphanumerical system is one in which alphabet letters stand for numbers. In

Islamic civilization such a system called *abjad* was widely used. In the *abjad* numeration system, the 28 letters of Arabic alphabet stand for the numbers 1, 2, up to 9; 10, 20, up to 90; 100, 200, up to 900; and 1000.

'Abd ar-Razzq Samarqandi admired Ulugh Beg in the following line of this poem:

چون الغ بیگ میرزا در هندسه یافت نتوان در هزاران مدرسه

Translation:
[Anyone] like Ulugh Beg in [the field of] geometry,
Cannot be found [even] in thousands schools.

4 CONCLUDING REMARKS

Ulugh Beg was murdered upon the order of his son 'Abd al-Latif in the year 853 AH. The following Persian quatrain implies the year in which he died:

سلطان فلک قدر الغ بیگ سعید در هشتم ماه رمضان گشت شهید
آن شب که شهید شد قیامت برخاست تاریخ همی "شب قیامت" گردید

Translation:
The high rank king, the fortunate Ulugh Beg
Was martyred on the eighth of the month of Ramadan

His date of his death can be found by the *abjad* value of *shab-e qiyamat* (شب قیامت = 300+2+100+10+1+40+1+400).

5 NOTES

For biographical data on Jamshid Kashani and other astronomers mentioned in this paper see Gillispie (1972–1976) and Qurbani (1989).

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After several years of work as an electrical engineer, he was appointed Director of the History of Science Department at the Encyclopedia Islamica Foundation (Tehran). After receiving his PhD degree he became an adjunct member of the Scientific Board of the Institute for the History of Science, University of Tehran. In this Institute he functioned as the Chief Editor of the *Iranian Journal for the History of Science* from 2008 to 2012. Since 2012 he has been the Chief Editor of the Persian semiannual journal *Miras-e Elmi* (*Scientific Heritage*) published by the Written Heritage Research Institute (Tehran).

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