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MIRZA ULUGH BEG – A FIGURE WHO ILLUMINATED THE PATH OF SCIENCE AND ENLIGHTENMENT

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Abstract. This article analyzes the life, scientific, and cultural heritage of Mirza Ulugh Beg, focusing on his discoveries in the field of astronomy and the activities of the observatory built in Samarkand. It also discusses the archaeological and scientific research carried out during his time. Ulugh Beg's "Zij-i Jadidi Ko'ragoniy" is highlighted as a significant contribution to the development of astronomy. The article also provides information about his architectural achievements, including the Registan complex.

Keywords: Mirza Ulugh Beg, Amir Timur, astronomy, "Zij-i Jadid-i Ko'ragoniy", Samarkand observatory, astronomical table, Registan complex.

Introduction.

Mirza Ulugh Beg is regarded as one of the most prominent representatives of the development of science and culture in the medieval East. As a leading scholar of his time, he played a significant role not only in the intellectual advancement of Mawarannahr but also in the entire Muslim world. His contributions to astronomy, mathematics, history, and education continue to attract great scholarly interest today. In particular, the observatory built in Samarkand and the observations conducted there led to the creation of the "Zij-i Jadid" star catalog, which is recognized as an important source in the history of science. This astronomical work was widely used and valued by scholars in later centuries as well.

Ulugh Beg's passion for science and his exceptional intellectual capacity are also confirmed by modern historical sources. As Islam Karimov emphasized, Mirza Ulugh Beg, "the grandson of the great Amir Temur and an outstanding scholar," demonstrated remarkable scientific courage for his time [6]. Furthermore, events recorded in historical sources—such as his ability to recall in full detail the events that occurred during a hunting trip—illustrate the strength of his memory and the depth of his intellect [4].

The main purpose of this article is to thoroughly explore Mirza Ulugh Beg's scientific legacy, particularly his contributions to the field of astronomy, and to highlight the scientific and spiritual significance of the intellectual environment he created in today's context.

The objectives of this article are as follows:

1. To analyze the life and activities of Mirza Ulugh Beg based on historical sources;
2. To reveal the content and scientific significance of the work Zij-i Jadid;
3. To demonstrate the role and importance of the Samarkand observatory as a scientific center;
4. To identify the role of Ulugh Beg's legacy in the education of modern youth and its inspirational aspects.

Methods. In order to thoroughly analyze the scientific legacy of Mirza Ulugh Beg, several research methods were employed in this study.

First of all, the historical-analytical method was used to examine the scholar's life, work, and especially his astronomical discoveries based on historical sources, and to analyze their content

and essence. Additionally, through the comparative method, Ulugh Beg's scientific works were compared with those of his contemporaries, allowing the identification of his unique contributions and the significance of his input to science.

Furthermore, the source analysis method (source criticism) was applied to study written materials related to Ulugh Beg, including modern studies and historical documents, which formed the basis for drawing scholarly conclusions. These methods enabled a scientifically grounded exploration of the research topic.

Literature Review. The sources used in this study contribute to a comprehensive understanding of Mirza Ulugh Beg's activities. Historians such as B. Akhmedov, A. Muhammadjonov, and A. Abdurahmonov have highlighted Ulugh Beg's scientific legacy and his role in state governance. Works by historians like Fasih Havafi provide a depiction of the era, ensuring the reliability of events described. The Uzbekistan National Encyclopedia and modern online sources offer general information and enrich the visual representation. Thus, written and digital sources complement each other effectively.

Discussion and Results.

In 1393, the great Amir Temur began a campaign to Iran and the Near East. During one of his usual military expeditions, he took members of the royal court—his close associates and family members—along with him. During this journey, they stayed for a while in the city of Sultaniya. It was in this city that Temur's youngest son, Shahrukh Mirza's wife, Gavhar Shad Agha, gave birth to a child. The newborn was named Muhammad Taragay [1].

Shahrukh Mirza's eldest son was born on the 19th day of Jumada al-Awwal in the year 796 AH, corresponding to Sunday, March 22, 1394 CE. This historical date coincided with another significant and tragic event. Fasih Havafi, a renowned historian of the Timur era, writes in his work: "On that very day, Amir Temur's middle son, Umarshaykh, died during the siege of the Harmatu fortress near Baghdad" [5]. The birth of Mirza Ulugh Beg and Umarshaykh's death on the same day marks an important turning point in the history of the Timurids and reflects the complex historical circumstances surrounding Ulugh Beg's early life.

In the same year, Shahrukh Mirza's second son, Ibrahim Sultan, was born to another wife. Muhammad Taragay later became known by the title "Great Prince," or "Ulugh Beg." According to the order established by Amir Temur, all his grandchildren were raised at the royal court. Therefore, Ulugh Beg was brought up under the patronage of Temur's beloved wife, Saray Mulk Khanum, whose loving care played an important role in his development [1]. Being raised under Saray Mulk Khanum's patronage at the court laid the foundation for Ulugh Beg's early worldview and interest in science, which later became one of the key factors in his emergence as a great scholar.

Ulugh Beg's early years were spent continuously under the care and patronage of his grandmother, Saray Mulk Khanum. Notably, his childhood is historically closely connected with the Karabakh region. Although this area was known as Arran before the Timurid era, starting from the late 14th century—especially during the period of Amir Temur's famous "five-year" military campaigns—it began to be called Karabakh. Amir Temur used to spend his winters resting in this very region.

After the births of Ulugh Beg and Ibrahim Sultan, Timur brought the newborns along with their mothers to Karabakh in May 1394. Later that autumn, they returned to the city of Sultaniya. During the winter season, they reached Timur's presence. Additionally, Ulugh Beg spent the winters in Karabakh with his grandmother during Timur's "seven-year" campaigns in 1399–1400, 1401–1402, and 1403–1404. Finally, in 1404, the princes and the royal court fully returned to Samarkand [2]. These historical movements indicate that during his childhood, Ulugh Beg

directly witnessed many military campaigns and political events, which played a significant role in broadening his thinking and worldview.

After Timur's death on February 18, 1405, Ulugh Beg's cousin Khalil Sultan seized the throne of Mawarannahr by force. During this period, Ulugh Beg went to Herat to join his father Shahrukh and lived there until 1409. In that year, Khalil Sultan was captured by Shahrukh's loyal amirs, and Shahrukh appointed his son Ulugh Beg as the ruler of Mawarannahr. Ulugh Beg governed this region until his death on October 25, 1449 [3]. These events marked a crucial stage in Ulugh Beg's political maturity and laid the foundation for his rule over Mawarannahr, characterized by governance based on science and culture.

During Ulugh Beg's reign, special attention was given to science, especially in fields of astronomy and mathematics. Between 1424 and 1428, he built a massive observatory by Obirahmat canal in Samarkand, collaborating with renowned scholars gathered around him. This circular building stood out with circumference of 47 meters and height of 31 meters. Babur Mirza, in his "Baburnama," emphasized that structure had three floors. Building's exterior was covered with glazed tiles and enameled pieces, and inside, a large sextant (sudsi faxriy) was installed. Structure was divided into four sections, each consisting of large and small rooms as well as halls. Through this observatory, Ulugh Beg and his scientific team achieved globally recognized significant results in astronomy [7]. Establishment of this scientific center during Ulugh Beg's era demonstrates that science became a priority in state policy, reflecting high level of astronomical progress in Eastern civilization during Middle Ages.

In 1908 and 1914, archaeological excavations were conducted in the Samarkand region under the leadership of Russian and local scholar V.L. Vyatkin, which identified the location of Ulugh Beg's observatory and some of its main instruments. However, the initial excavations did not yield complete results as expected, revealing only the remains of the outer walls of the three-story massive structure. These works were continued in 1941 by academician M.E. Masson and in 1948 by V.A. Shishkin, this time achieving significant results [10]. The archaeological research allowed for a deeper study of the structure and significance of Ulugh Beg's observatory and played an important role in restoring its scientific legacy.

The main scientific instrument of the observatory was a large angular measuring device — a vertical circle with a radius of 40.212 meters and an arc length of 63 meters. Researcher V.L. Vyatkin noted that this device was "part of a large quadrant," with one half positioned below the horizon line and the other half extending upward. However, in later years, academician Qori Niyoziy and astronomer G'iyos Jalolov assessed this instrument not as a quadrant but as a sextant. They based this opinion on the fact that it was installed along a precise meridian direction from south to north. Their viewpoint was also confirmed by the scientific studies of V.N. Kastelskiy and V.P. Shcheglov. The preserved part of this instrument is placed in a deep groove carved into a rock beneath a hill, with the base lined with baked bricks and two parallel arcs constructed. A gypsum mortar was poured onto these arcs, and they were covered with marble slabs 10–20 cm thick. On the western arc, markings in Arabic script are embossed in a convex form. On the marble surface, a copper strip divided into minutes and seconds was installed, allowing the device to precisely measure the time when celestial bodies crossed the meridian [1]. The vertical circle-shaped sextant of Ulugh Beg's observatory was the most advanced astronomical instrument of its time, playing an important role in precise timekeeping and angular measurements.

As a result of observations conducted at the Samarkand observatory, significant scientific achievements were made in astronomy. In particular, the work "Ziji jadidi Ko'ragoni," prepared under Ulugh Beg's leadership, summarized the theoretical and practical achievements of Eastern astronomy, enriching them with new scientific foundations. Although this major scientific source was completed in 1437, Ulugh Beg continued to make corrections and add scientific notes to it

until the end of his life. The work identified the positions and coordinates of 1,018 fixed stars, based on which astronomical tables were compiled. The "Ziji" consists of two main parts: the first part covers theoretical issues of astronomy, calendar calculation methods among Eastern peoples, planetary movements, and other important topics, while the second part includes tables based on astronomical observations.

The second section of the work "Ziji jadidi Ko'ragoni" covers practical problems related to astronomy and trigonometry. In this part, cubic algebraic equations were successfully solved using a novel approach. Based on these solutions, a nine-digit trigonometric table with an accuracy of one part in a billion was compiled [7]. This table is recognized in the history of astronomy as the most accurate result after the times of Hipparchus and Ptolemy. Among the zijes created before the invention of optical instruments, it is considered the most advanced. This zij was used by Eastern and European scholars until the 17th century for determining time, calculating geographic coordinates, and solving other astronomical problems.

The work also contains several other important tables, one of which includes geographic coordinates for 683 locations. This table was compiled based on various historical sources. The tables of sine and tangent values were prepared using new calculation methods developed by Samarkand scholars [8]. In summary, the geographic coordinates and trigonometric tables in the work demonstrate the advanced scientific approach and developed computational methods of scholars of that time.

When discussing this topic, a conversation held in 1996 in Paris with UNESCO's then Secretary-General Federico Mayor comes to mind. Mr. Mayor mentioned that when Mirza Ulugh Beg's calculations of the movement of stars were rechecked using a computer, the difference was only a few minutes. At that moment, Islam Karimov humorously said: "No, Mr. Federico Mayor, Ulugh Beg cannot have made a mistake; rather, the computers might have made a mistake" [6]. Although this remark was made in jest, it contains a great truth.

Today, more than 150 manuscript copies of "Ziji jadidi Ko'ragoni" are known. Some sources report about 120 copies in Persian and more than 15 copies in Arabic. Mirza Ulugh Beg preferred to focus more on science, and his works such as "Treatise on Determining the Sine of an Angle," "Risola Ulugh Beg," "History of the Four Nations," "Ziji jadidi Ko'ragoni," and "New Tables of Ko'ragoni" continue to be studied by scholars worldwide [11].

The architectural complex of Registan, built by Ulugh Beg, includes the Ulugh Beg, Tillaqori, and Sherdor madrasahs. This complex is one of the most unique examples of architectural art in Central Asia and was included in the UNESCO World Heritage List in 2001. The oldest building in the complex, the Ulugh Beg Madrasah, was constructed between 1417 and 1420 and became one of the most prestigious scientific centers in the 15th century. Many scholars and thinkers were educated here [9].

Mirza Ulugh Beg lived for 57 years. During his father's lifetime, he ruled Samarkand for 40 years, and after his father's death, he governed Khorasan for 8 months[4].

Conclusion and Recommendations.

Ulugh Beg's contributions to science, his invaluable works, and the scientific institutions he established continue to hold significant importance today. His activities clearly reflect the high level of intellectual development, dedication, and reverence for knowledge characteristic of the medieval Eastern world. Studying Ulugh Beg's legacy inspires modern youth to appreciate science and value historical heritage. The scientific environment he created and the rich legacy he left behind serve as a model school even in the present day.

To deepen the study and promotion of Ulugh Beg's scientific and cultural heritage, it is necessary to expand archaeological research, restore his observatory using modern technologies, and

increase scientific activities at the international level. Additionally, it is recommended to develop more textbooks and educational materials about Ulugh Beg's scientific work for schools and universities.

References:

1. Abdurahmonov, A. Ulug'bek akademiyasi. – Toshkent: Qomuslar bosh tahririyati, 1994. – B. 4–8.
2. Ahmedov, A. Ulug'bek (hayoti va faoliyati). – Toshkent: O'zbekiston SSJ Fan nashriyoti, 1991. – B. 17.
3. Ahmedov, B. O'zbekiston tarixi manbalari (qadimgi zamon va o'rta asrlar). – Toshkent: O'qituvchi, 2001. – B. 177–178.
4. Ahmedov, B., Uvatov, U., Karimov, G. va boshq. Amir Temur va Ulug'bek zamondoshlari xotirasiga. – Toshkent: O'qituvchi, 1996. – B. 11.
5. Fasih Havafi. Mujmali Fasihi. – 1980. – B. 116–117.
6. Karimov, I. Yuksak ma'naviyat – engilmas kuch. – Toshkent: Ma'naviyat, 2008. – B. 28–29.
7. Muhammadjonov, A. Temur va Temuriylar saltanati (Tarixiy ocherk). – Toshkent: Qomuslar bosh tahririyati, 1994. – B. 117–123.
8. O'zbekiston Milliy Ensiklopediyasi. – Toshkent, 2000–2005. – B. 96.
9. Qadim Samarqand shahrining rasmiy markazi – Registon maydoni. – URL: https://www.trtavaz.com.tr/haber/uzb/avrasyadan/qadim-samarqand-shahrining-rasmiy-markazi-registon-maydoni/60969aae01a30a1f1ceec356
10. Qiyinchiliklar orqali yulduzlarga: Ulug'bek rasadxonasi. – URL: https://uzbekistan.travel/uz/o/qiyinchiliklar-orqali-yulduzlarga-Ulugh Beg/rasadxonasi/
11. Ziji jadidi Ko'ragoniy. – URL: https://uz.m.wikipedia.org/wiki/Ziji_jadidi_Ko%CA%BBragoniy