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The Significance Of The Scientific Academy Of Mirza Ulugh Beg In The Development Of Astronomy

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Abstract: This article describes the development of science in the Timurid period, in particular, the importance of the scientific academy, created by the ruler Mirza Ulugh Beg, in the development of world astronomy. The article also provides information about the scientists who worked at the Ulugh Beg Academy of Sciences and their scientific research.

Keywords: Mirza Ulugh Beg, astronomy, mathematics, scientific research, observatory, scientific school, scientific academy, "Zij-i Sultani"

INTRODUCTION

The most developed period of Central Asia, which has a three-thousand-year history of statehood, corresponds to the reign of the Timurid. Amir Timur, who liberated his homeland after 130 years of Mongol rule, created a huge empire in a short time. His great merit is that he not only liberated his homeland, but also created the conditions for the second revival in Central Asia (in Transoxiana). He paid great attention to the restoration of the cities (and villages) of the country, destroyed by the Mongol invaders, the restoration of destroyed irrigation facilities, irrigation systems, as well as the restoration of places of science and education. The desire of the people for creation and creativity became the basis of the second wave of the Eastern Renaissance under the leadership of Timur. The second wave of the Renaissance of the peoples of the East, which fell into decay as a result of the Mongol invasion, entered the field of history during the reign of Timur. During this period of spiritual growth, a scientific academy was created in Central Asia. In our article, we will describe the historical significance of research in this scientific academy.

LITERATURE REVIEW

Scientists of the 15th century wrote about the historical significance of the ruler Mirza Ulugh Beg and his scientific heritage in their writings. For example, you can specify: the works of Alisher Navoi “Majolisun-nafais” (Collection of the refined) and "Farhad and Shirin", "“Tazkirat ash-shuara" by Dawlatshah Samarqandi, "Badai al-Wakai" (Amazing events) by Zainiddin Mahmud Vasifi "Baburnama" Zahir ud-Din Muhammad Babur, Rawzat aṣ-ṣafa ("The garden of purity") Mirkhvand, Letter to the father of Jamshid al-Kashi, written from Samarkand to Kashan.

The scientific heritage of Mirza Ulugh Beg was studied by such scientists as V.V.Bartold, Kary-Niyazov, G.Jalolov, V.P.Sheglov, M.E.Masson, G.P.Matvievskaya and B.A.Rosenfeld, N.I.Nevskaya, A.Akhmedov, B.Akhmedov, O.Fayzullaev. In addition, the scientific heritage of Mirza Ulugh Beg is widely studied in the works of A.Abdurakhmanov "Academy of Ulugh Beg" and M.Mamadazimov "Ulugh Beg and his observatory". As a result of a scientific study of these sources, we came to the conclusion that the scientific school of Mirza Ulugh Beg in Samarkand was a scientific academy of the 15th century.

METHODOLOGY & EMPIRICAL ANALYSIS

The historical significance of the scientific school of Mirza Ulugh Beg in the development of astronomy was highlighted with the help of retrospective analysis, the unity of logic and historicity, comparative analysis and the method of analogy.

RESULTS

The Renaissance phenomenon is not a spontaneous process, but a number of factors and conditions are necessary for the emergence of this phenomenon. During the reign of the Timurid, all the conditions (a number of factors) were created for the emergence of the second wave of the Eastern Renaissance in Central Asia. In particular:

- creation of a strong and centralized state in Central Asia and ensuring the inviolability of borders, establishing peace and stability in the country;
- ensuring the rule of law in the management system, establishing justice as the main principle of the public administration system, guaranteeing the freedom and inviolability of citizens;
- effective implementation of reforms in the socio-economic sphere, ensuring the well-being of the people, widespread creation;
- development of foreign economic relations, creation of favorable conditions for intercultural communication;
- the transformation of the country's major cities into centers of science and culture, the establishment of Ulugh Beg's academies in Samarkand, the Boysungur Academy in Herat, the development of sciences in the natural, social and humanitarian fields.

Amir Timur gathered many scientists and intellectuals of the world in the central cities of his country. As a result, large centers of science, culture and art will be created in Maverannahr and Khorasan. Scholars and historians such as Sa'ad al-Din al-Taftazani, Ali al-Jurjani, Sharaf al-Din Ali Yazdi, hattots such as Mir Ali Tabrizi, famous artists such as Abulhai Pir Ahmad Bogishamali, music theorists such as Haja Abdul Kadir, Abdul Kadir Marogi worked in the palace of Amir Timur.

Timur himself was the founder of the Academy established in Samarkand. Under the personal patronage and care of Amir Timur, and scientific and creative activities were carried out by well-known scientists and figures, such as Kazi-zada al-Rumi, Giyas-ad-din Jamshid al-Kashi, Ali ibn Muhammad Ali Qushji, Maulana Ahmad, Shamsuddin Muhammad Khavafi, Maulana Muyniddin Kashani, poet Khoja Ismat Bukhari Samarkand carried out scientific and creative activities and left a unique scientific heritage.

Timur's favorite grandson, an enlightened ruler, owner of encyclopedic knowledge Mirza Ulugh Beg, created a research laboratory of the science center in Samarkand observatory, where he made many discoveries related to astronomy and trigonometry, geometry and mathematics, the result of the second wave of the Eastern Renaissance, the foundation of which Timur laid in Central Asia. The creation and creativity of the Timurid, who had patronage and concern for science in their "blood", also contributed to this period of spiritual development.

The researchers objectively assess the significance of the Mirza Ulugh Beg Academy and its scientific heritage in the development of world science and draw the following conclusion: "Five and a half centuries ago, from the observatory launched by Ulugh Beg and his school in the foothills of the great city of Samarkand, discovering the "unexplored treasure" of world science and culture was a big step towards the study of the Universe" [1.89]. Indeed, the fundamental research carried out at the Ulugh Beg Academy served the development of world science.

Voltaire, one of the French enlighteners, said about the Academy of Mirza Ulugh Beg, which operated in Samarkand: "The famous Ulugh Beg, who succeeded him (that is, Timur) in Maverannahr, founded the first academy in Samarkand" [2.13]. The scientific laboratory of this academy is an observatory, which is the only observatory in Central Asia and a perfect construction of its time, and the scientific significance of the results of research carried out

in it was the result of the Renaissance of the Timurid era.

Kazi-zada Rumi, a member of the Academy, was recognized as the "Plato" of his time. He is the author of "Treatise on the Science of Astronomy", "Treatise on the Sine Quadrant", "Treatise on Astronomy and Geometry", "Treatise on Arithmetic". Mirza Ulugh Beg respected him as a mentor. Kazi-zade Rumi led scientific research at the observatory.

Another prolific creator of the Academy was Jamshid al-Kashi, who wrote 19 treatises on astronomy and mathematics. He was the first to invent a method for calculating the value of one level of a sine. His well-known treatises are "The Key to Arithmetic", "Treatise on the Definition of the Sine of One Degree", "Treatise on Astronomy", "A Brief Description of the Science of Astronomy". al-Kashi was a pioneer in the construction of the observatory, the creation of its design and the creation of instruments for scientific research and astronomical observations. Another member of the Academy is Ali al-Kushchi, whom Mirza Ulugh Beg recognized as his son. His works "Treatise on the Science of Astronomy", "Questions of Geometry and Astronomy", commentaries on "Zij-i Sultani", "Steps of Heaven", "General Information on Astronomy", "Muhammed's Treatise on Arithmetic" (dedicated to the Turkish Sultan Mohammed II), mathematical works such as "Treatise on Arithmetic", "Cream of Arithmetic", "Treatise on Geometry", "Treatise on Arithmetic Rules and Instructions on Geometry" and the historical works of "Khitoynoma" made a great contribution to the development of science. Thanks to his efforts, Ulugh Beg's scientific heritage spread to European countries.

Nizam-ad-din al-Birjandi was one of the next representatives of the scientific school of Ulugh Beg, whose history of science included "Treatise on Astronomy", "Treatise on Stars and Calendar", "Treatise on Observing Instruments", also known as "Commentary on the story Almagest", "Commentary on the Zij-i Sultani", "Commentary on the memoirs of Nasiriddin", “Treatise on methods for expanding and measuring climate”.

Miram Chelebi is the last representative of Ulugh Beg’s scientific school, and his works "Commentary on the Zij-i Sultani", "Treatise on determining the azimuth of the Qibla", "General treatise on the sine of the quadrant", "Shirazi quadrant", "Treatise on teaching the use of the quadrant", "General treatise on the quadrant", "Treatise on the Zarkali quadrant" left a deep mark on the history of medieval astronomy [1.76].

In addition to the natural and exact sciences, the Samarkand Academy of Sciences also conducted research related to philosophy, logic, history, literature and art. The work of such great philosophers as Taftazani in Samarkand had a great influence on the development of the social and human sciences. Dozens of works by Mir Sayyid Sharif Jurzhoni on the theory of knowledge and logic show the development of social and philosophical knowledge at the Ulugh Beg Academy. “History of four uluses” (Tarikh-i-ulus-i-arba’a) by Mirza Ulugh Beg is a major socio-philosophical and historical work of the academy founded by him.

The breadth of research carried out at the scientific institution of Samarkand, headed by the ruler Mirza Ulugh Beg, as well as the importance of fundamental research, indicate that this is a scientific academy.

Jamshid al-Kashi describes the potential of scientists who worked at the Ulugh Beg Academy in Samarkand: "The most famous scientists are gathered in Samarkand, who teach all subjects and a lot of teachers (most of them) are engaged in mathematics" [3.278]. Al-Kashi's letter from Samarkand to Kashan to his father mentions scientists who worked at the Ulugh Beg Academy and their comments on the most famous works on mathematics and astronomy. For example, Kazi-zada al-Rumi, the most knowledgeable of them, wrote a commentary on Jaghmini and Argumented Judgments. Concluding his opinion about the scientists in Samarkand, al-Kashi concludes: "A lot of astrologers and accountants have gathered here. In a word, here (at the Ulugh Beg Academy - A.A.) a lot of specialists in all fields of science have gathered" [3.279].

Of incomparable importance are the discoveries made at the Academy of Mirza Ulugh Beg in Samarkand, which has such scientific potential. In Samarkand, Ulugh Beg, who did not limit himself to theoretical research, built by him in the university madrasah, is building a scientific and practical laboratory - an observatory. It is in this observatory that he makes discoveries of universal significance, relying on experimental studies based on his theoretical conclusions. "Zij-i Sultani", which is the result of his scientific research, has become the spiritual heritage of all mankind. Ulugh Beg's "Zij-i Sultani" served as a beacon in later astronomy both in the East and in the West. Ulugh Beg's "Zij-i Sultani" is one of the most quoted and commented works in the history of science. As the First President of the Republic of Uzbekistan noted: "The astronomical map of Mirza Ulugh Beg of the 15th century, describing the location of 1018 stars, was the first new catalog of astronomical measurements" [4].

In 1444, Mirza Ulugh Beg finished writing the "Zij-i Sultani" as a result of 30 years of scientific research and astronomical observations carried out at his scientific academy. This work, which is a fundamental scientific research, consists of four books, the first book of which contains information about the calculation of the year, days, hours, the customs of determining the beginning of the day among different peoples, the measurement of time according to astrological calculation among the ancient Turks, the issues of measuring time in China and Turkestan, and famous days, and holidays of nations. The second book "Zij" is devoted to mathematics, spherical astronomy, mathematical geography and the science of astrology. The book also contains geographic and trigonometric tables with city names and geographic coordinates. The third book of the work is devoted to the main issues of astronomy, which outlines the reasoning about the motion of planets and fixed stars. This book is the core of the work "Zij", as it contains a table of planetary movements and 30 years of continuous observations of the star cataloger Ulugh Beg at the observatory, based on precise mathematical rules. The fourth book of the work is devoted to astrology. It can be seen that this work consisted of the results and conclusions of fundamental research of great practical importance. Therefore, the scientist A.Akhmedov, a major researcher and passionate propagandist of the scientific heritage of Ulugh Beg, said: “The reference to the work "Zij-i Sultani", comments on it, translations continued from the 15th century of the 20th century” [5.27].

In the East, the first commentary on Ulugh Beg's "Zij" was definitely written by his favorite student Ali Qushji, and his work was called "Comments on Ulugh Beg's Zij". There are dozens of commentary manuscripts written on the works of Ulugh Beg. Also, the Cairo astronomer Shamsiddin Muhammad al-Sufi al-Misri uses Ulugh Beg's table at the latitude of Cairo in his work "Tashili Ziji Ulugh Beg". Ulugh Beg's "Zij" also served as a theoretical source in two of his other works - "Takwim al kavakib as-sab'a" and "Jadwal al-mahlul as-sanai 'ala usulu Ulug'bek". Ali Qushji`s student Abdul Qadir ibn Hassan Ruayni Lahiji wrote "Zizhi Mulahhasi Mirzai" based on the work of Ulugh Beg, and in the 15th century, the Syrian scholar Zayniddin al-Jawhari, as Salihi Ulugh Beg, wrote "Ad Durr an Nazil fii tashilat al-kalyan", reworking the work of Ulugh Beg.

One of the most famous commentaries on Ulugh Beg's "Zij" is "Comments on Ulugh Beg's Zij", written in 1523 by Nizamiddin al Birjandi. In addition, Miram Chelebi wrote commentaries on the Zij under the title "Dastur al amal wa tashih al tadalab". The Iranian scientist Giyasiddin Mansur al-Husayni ash Shirazi, as well as the Syrian scientist Taqi ad-Din ash-Shami, in the 16th century. Iranian Sheikh Fatullah Shirozi, another Iranian scholar Muhammad Baqir al-Yazdi, Indian scholar Farid al-Din Dehlavi, Turkish scholar Muhammad Chelebi, Egyptian scholar Rizvan ar-Razzaz al-Misri, Damaddin al-Mukhi from Dagestan, Indian scholar Sawai Jai Singh (1686-1743) wrote comments on Ulugh Beg's work "Zij" [5. 24].

The mention of Ulugh Beg's Zij in Europe begins in 1648, when the English astronomer J. Grice translated it into Latin. In 1665, another English scientist, T. Hyde,

published a catalog of stars in Zij in Persian and Latin. In 1690, the Polish astronomer Jan Hevelius published his work entitled "Bulletin of Astronomy", comparing Ulugh Beg's catalog of stars with the catalogs of Ptolemy, Brahe, Riccioli, Wilhelm IV. In 1767, the English scientist G. Sharp implemented the second edition of Ulugh Beg's catalogs, prepared by T. Hyde. The third edition was made by F.Bailey in 1843. In 1847-1853, the French orientalist L.A.Sedio translated Ulugh Beg's "Zij" into French and published it with comments. American scientists E.B.Noble in 1917 and K.Shoi in 1927 conducted research on Ulugh Beg's Zij and published their works. Interest in Ulugh Beg's "Zij" began in Russia under Peter I. The king of Georgia, the famous scientist Vakhtang VI translated Ulugh Beg's "Zij" into Georgian. [5. 26].

Ulugh Beg's work "Zij-i Sultani" served as a theoretical source of achievements and discoveries in the field of astronomy from the 15th century in the East, and from the 17th century in the West.

CONCLUSIONS

Thus, during the reign of the Timurid in Central Asia, the second wave of the Eastern Renaissance takes place. In Samarkand, Mirza Ulugh Beg founded the ideal Academy of his time. World achievements have been made in the field of natural science and medicine, as well as in socio-philosophical and Islamic theological studies. Ibn Sina's "The Canon of Medicine" and Al-Khwarizmi's " The Compendious Book on Calculation by Completion and Balancing " were of great importance in the development of Eastern and Western science, and Mirza Ulugh Beg's "Zij" was the most perfect theoretical and practical work in the development of astronomy and mathematics and trigonometry served as a source for five centuries. Scientific research, theoretical and practical conclusions and theories created at the Academy of Mirza Ulugh Beg are the scientific heritage of mankind.

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