

MIRZO ULUGBEK AND HIS CONTRIBUTION TO SCIENTIFIC RENAISSANCE IN THE ISLAMIC WORLD

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ABSTRACT: Mirzo Ulugbek (1394–1449) was a pioneering scholar and ruler during the Timurid Empire who contributed to an era of scientific flourishing. Establishing one of the world’s most advanced observatories in Samarkand, he helped usher in a renaissance of knowledge in astronomy, mathematics, and philosophy. This article explores Ulugbek’s scientific legacy, his observatory’s pivotal role in global knowledge, and the broader impact of his achievements on the Islamic Golden Age. Ulugbek’s work reflects the intellectual richness of this era, inspiring future generations in both the Islamic world and beyond.

KEY WORDS: *Mirzo Ulugbek, Islamic Golden Age, Ulugbek Observatory, scientific renaissance, astronomy, mathematics, Timurid Empire, Samarkand*

АННОТАЦИЯ: Мирзо Улугбек (1394–1449) был выдающимся ученым и правителем эпохи Тимуридов, который способствовал эпохе расцвета науки и знаний. Создав одну из самых передовых обсерваторий в Самарканде, он способствовал возрождению знаний в астрономии, математике и философии. Эта статья исследует научное наследие Улугбека, ключевую роль его обсерватории в мировых знаниях и более широкий вклад его достижений в Золотой век ислама. Работы Улугбека отражают интеллектуальное богатство этой эпохи, вдохновляя будущие поколения как в исламском мире, так и за его пределами.

КЛЮЧЕВЫЕ СЛОВА: Мирзо Улугбек, Золотой век ислама, Улугбекская обсерватория, научное возрождение, астрономия, математика, эпоха Тимуридов, Самарканд

ANNOTATSIYA: Mirzo Ulug‘bek (1394–1449) Timuridlar davrida ilm-fan va ma‘rifatning yuksalishiga katta hissa qo‘shgan olim va hukmdor edi. Samarqandda dunyoning eng ilg‘or observatoriyalaridan birini tashkil etgan Ulug‘bek astronomiya, matematika va falsafa sohalarida bilimlar uyg‘onishini boshladi. Ushbu maqola

Ulug‘bekning ilmiy merosini, uning observatoriyasining jahon ilmidagi o‘rmini va islom olamining oltin davrida erishgan yutuqlarining keng ta‘sirini o‘rganadi. Ulug‘bekning ishlari bu davrning intellektual boyligini aks ettiradi va kelgusi avlodlarga, ham islom olamida, ham undan tashqarida ilhom manbai bo‘lib xizmat qiladi.

KALIT SO‘ZLAR: Mirzo Ulug‘bek, Islomning oltin davri, Ulug‘bek observatoriyasi, ilmiy uyg‘onish, astronomiya, matematika, Timuridlar davri, Samarqand

INTRODUCTION

The Islamic Golden Age saw unparalleled advancements in the fields of science, mathematics, and philosophy. Central to this intellectual movement was Mirzo Ulugbek, the Timurid prince whose observatory in Samarkand became a symbol of scientific progress. This article examines Ulugbek’s life and contributions to science within the context of the broader Islamic scientific renaissance, emphasizing how his achievements reflect the era’s pursuit of knowledge.

MAIN PART

The Islamic Golden Age (8th to 15th centuries) was a period of intellectual and scientific growth, where scholars from across the empire contributed to advancements in numerous fields. Centers like Baghdad, Cairo, and Samarkand were hubs of scientific inquiry, translating Greek, Persian, and Indian texts and expanding on these ideas. This environment laid the groundwork for Ulugbek’s contributions.

As a prince in the Timurid Empire, Ulugbek was exposed to a world that valued knowledge. Under the influence of scholars and family members who emphasized learning, Ulugbek developed an early interest in the sciences. His court in Samarkand became a melting pot of intellectual exchange, drawing inspiration from the achievements of earlier Islamic scholars such as Al-Biruni and Al-Khwarizmi.

Raised in the royal court of Timur, Ulugbek was well-educated, studying a wide range of subjects from mathematics to philosophy. His grandfather Timur’s support of cultural achievements greatly influenced Ulugbek’s worldview, shaping his desire to expand knowledge and invest in scholarly pursuits.

Ulugbek’s intellectual pursuits were encouraged by his father, Shahrukh, who allowed him to govern Samarkand and supported his scientific interests. However, Ulugbek’s relationship with his son Abd al-Latif, who opposed his scholarly ambitions, ultimately led to tragic conflicts, reflecting the challenges he faced within his own family as he pursued knowledge over power.

The Ulugbek Observatory, established in 1428, represented a culmination of Ulugbek's vision to create a center for advanced astronomical research. This observatory was equipped with an enormous sextant and other instruments that allowed for precise observations of the stars and planets. Its design demonstrated the innovative spirit of the Islamic Golden Age.

Ulugbek's most famous work, the *Zij-i-Sultani*, cataloged over a thousand stars with unprecedented accuracy. The star catalog was based on years of meticulous observation and became a foundational text in both the Islamic world and Europe. It contained calculations of planetary movements, eclipses, and the solar year, highlighting the advanced level of scientific understanding achieved under Ulugbek's guidance.

The observatory's findings had a profound impact on the scientific world. European astronomers in the Renaissance used the *Zij-i-Sultani* as a reference, and the observatory's accurate measurements were regarded as milestones in the transition to modern astronomy.

Ulugbek's work included developing highly accurate trigonometric tables, which were essential for astronomical calculations. These tables bridged theoretical mathematics with practical applications in astronomy and navigation, demonstrating his contributions to both fields.

Under Ulugbek's patronage, scholars at the observatory explored algebra and geometry, disciplines vital to accurately charting the cosmos. Ulugbek's focus on mathematical rigor demonstrated the interconnectedness of these fields and underscored his contributions to mathematics beyond mere calculations.

Ulugbek's observatory became a symbol of the Islamic Golden Age's commitment to scientific inquiry. It inspired future observatories in Persia, the Ottoman Empire, and beyond, reflecting the influence of his achievements on subsequent generations of Islamic scholars.

The translations and studies of Ulugbek's work in Europe provided critical knowledge that contributed to the Renaissance. Scholars such as Copernicus and Tycho Brahe referenced his findings, showing how his work transcended cultural boundaries and influenced global scientific development.

Ulugbek's life serves as a model for leaders who valued knowledge as a means to improve society. His commitment to scientific inquiry and intellectual pursuits highlights a unique governance approach where scholarly achievement and leadership were intertwined.

Despite his scientific achievements, Ulugbek faced opposition from conservative religious leaders who questioned his focus on astronomy and mathematics. This

tension between scientific progress and tradition posed significant challenges to his work.

The rediscovery of the Ulugbek Observatory in the 20th century reignited interest in his contributions. Today, his observatory and star catalog are celebrated worldwide, symbolizing the global legacy of Islamic scientific achievement. Institutions and academies named after Ulugbek commemorate his dedication to knowledge and his role in advancing humanity's understanding of the universe.

Mirzo Ulugbek's legacy extended well beyond his life, inspiring a dedicated group of scholars and astronomers who continued his work and upheld his contributions to science. These followers and disciples carried forward his vision, adding their own insights and advancements.

Qazizadeh Rumi (1364–1436) was born in Bursa (present-day Turkey), Qazizadeh was a mathematician and astronomer renowned for his skills in calculating complex astronomical data. Contribution to Ulugbek's Observatory: Qazizadeh was a senior scholar in Ulugbek's circle and played an integral role in the establishment of the Samarkand observatory. As a trusted advisor, he contributed significantly to the development of the observatory's main project, the star catalog known as the Zij-i Sultani. His mathematical insights, especially in spherical trigonometry, provided crucial theoretical support for Ulugbek's astronomical studies. Qazizadeh's works remained influential in Central Asia and were studied by later mathematicians.

Ali Qushji (1403–1474) was born in Samarkand, was one of the most brilliant students under Ulugbek's guidance. His keen interest in mathematics and astronomy made him a key figure in the observatory's projects. Qushji's contributions include his own treatises on astronomy, where he refined theories on celestial motion. He also made notable advancements in geometry and algebra, furthering the foundations laid by Ulugbek. After Ulugbek's death, Qushji moved to the Ottoman Empire, where he continued his work and shared Ulugbek's teachings. In Istanbul, he joined the court of Sultan Mehmed II, contributing to scientific discourse and influencing scholars in the Islamic and Ottoman worlds.

Ghiyath al-Din al-Kashi (1380–1429). Although al-Kashi's collaboration with Ulugbek was short-lived, he was one of the most influential mathematicians and astronomers of his time. Originally from Kashan in Persia, he became an advisor to Ulugbek in Samarkand. Al-Kashi is best known for calculating π to an unprecedented degree of accuracy and for developing highly accurate trigonometric tables. His work provided essential data for the observatory's projects. Al-Kashi's influence on Ulugbek's observatory was profound, especially through his book *The Key to*

Arithmetic, which served as a major resource for mathematical education in Central Asia.

Continuing Ulugbek's Scientific Legacy: The Samarkand observatory trained a generation of scholars and laid the groundwork for scientific study that extended beyond Ulugbek's lifetime. Though the observatory was later destroyed, manuscripts and knowledge from this period circulated widely, spreading Ulugbek's methods and findings.

Influence on Later Islamic Astronomy: These scholars preserved Ulugbek's contributions through manuscripts, with his *Zij-i Sultani* copied and referenced by astronomers across the Islamic world. This led to Ulugbek's scientific achievements influencing later observatories, like those in the Ottoman and Persian empires.

Impact on European Renaissance Astronomy: While not direct followers, European scientists like Tycho Brahe and later Johannes Kepler benefited from the legacy of Ulugbek's precise astronomical measurements. The data from *Zij-i Sultani* reached Europe through translations and sparked interest in empirical observation.

Cross-Cultural Influence: Ulugbek's emphasis on accurate measurements and empirical observation foreshadowed the methods of the scientific revolution in Europe, showing the indirect but powerful impact of his work on Western science.

Ulugbek's followers preserved and expanded upon his scientific advancements, ensuring his contributions to mathematics and astronomy remained influential for centuries. Figures like Qazizadeh Rumi, Ali Qushji, and al-Kashi were not only collaborators but also innovators, each leaving an indelible mark on the fields of mathematics and astronomy. Together, they embody the spirit of the Islamic Golden Age and its pursuit of knowledge, carrying forward Ulugbek's vision and influencing both Islamic and global scientific communities.

CONCLUSION

Mirzo Ulugbek was more than a ruler; he was a visionary who bridged the worlds of science and governance. His life and achievements illustrate the spirit of the Islamic Golden Age, where knowledge was pursued for the betterment of society. Ulugbek's commitment to astronomy, mathematics, and intellectual openness serves as a lasting inspiration. His legacy reminds us of the potential of scientific inquiry to connect cultures and propel humanity forward.

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