Cultural heritage of the thinkers of the Eastern Renaissance as a fundamental stage in the development of world civilisation

El patrimonio cultural de los pensadores del Renacimiento oriental como etapa fundamental en el desarrollo de la civilización mundial

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Abstract

This article examined the Eastern Renaissance scholars and thinkers of Central Asia of the 9th-13th centuries and their impact on world culture and science. To attain this purpose, Eastern Renaissance intellectuals' scientific achievements were analysed and compared to ancient and mediaeval European philosophical and scientific perspectives. General conclusions were formed about their impact on global science, culture, and philosophy. The research found that Central Asia and the Middle East experienced a cultural phenomenon similar to European cultural processes in the 14th-16th centuries during the 9th-13th centuries. This is the Eastern Renaissance. Eastern Renaissance intellectuals shared a humanistic ideology that valued individuality with European Renaissance thinkers. Like the European Renaissance, Eastern

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Renaissance thinkers were influenced by ancient philosophers and scholars. Many ancient thinkers' works were translated into Arabic and Persian. In the East, the old legacy was researched and expanded, while in Europe it was ignored. The Eastern Renaissance intellectuals helped Europe rediscover antiquity, a European Renaissance preoccupation. Eastern Renaissance centres were Great Silk Road cities. Eastern Renaissance intellectuals had access to both East's and the West's achievements thanks to this channel.

Key words

Scientific achievements, philosophical views, Great Silk Road, cultural exchange, polymaths, humanistic philosophy.

Resumen

Este artículo examinó a los eruditos y pensadores del Renacimiento Oriental de Asia Central entre los siglos 9 y 13 y su impacto en la cultura y la ciencia mundiales. Para lograr este propósito, se analizaron los logros científicos de los intelectuales del Renacimiento Oriental y se compararon con las perspectivas filosóficas y científicas europeas antiguas y medievales. Se formularon conclusiones generales sobre su impacto en la ciencia, la cultura y la filosofía globales. La investigación encontró que Asia Central y Oriente Medio experimentaron un fenómeno cultural similar a los procesos culturales europeos de los siglos 14 al 16 durante los siglos 9 y 13. Este es el Renacimiento Oriental. Los intelectuales del Renacimiento Oriental compartieron una ideología humanista que valoraba la individualidad con los pensadores renacentistas europeos. Al igual que el Renacimiento europeo, los pensadores del Renacimiento Oriental fueron influenciados por filósofos y eruditos antiguos. Muchas obras de pensadores antiguos fueron traducidas al árabe y al persa. En Oriente, el legado antiguo fue investigado y expandido, mientras que en Europa fue ignorado. Los intelectuales del Renacimiento Oriental ayudaron a Europa a redescubrir la antigüedad, una preocupación del Renacimiento europeo. Los centros del Renacimiento Oriental fueron las ciudades de la Gran Ruta de la Seda. Los intelectuales del Renacimiento oriental tuvieron acceso a los logros de Oriente y Occidente gracias an este canal.

Palabras clave:

Logros científicos, visiones filosóficas, Gran Ruta de la Seda, intercambio cultural, polímatas, filosofía humanística.

1. Introduction

From the 9th to the 13th century, Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan, Afghanistan, Iran, Kazakhstan, Pakistan, and China prospered in science and culture (Darling, 2007). Ibn Sina, Al-Farabi, Al-Biruni, Nasir al-Din Tusi, Abu al-Abbas al-Farghani, Muhammad ibn Musa al-Khwarizmi, Mahmud al-Kashgari, and others participated. Scientific institutes employed several Central Asian scholars (Aliyev, 2016). Rulers supported scholars and research institutions to improve science and culture. Ibn Sina and Al-Biruni attended Khwarazmshah Mamun Academy in the 11th century. Emir

Mahmud of Ghazni, who supported Al-Biruni, and Ilkhan Hulagu, who founded Maragheh Observatory under Nasir al-Din Tusi, promoted science (Ma, 2023). Polymath scientists contributed to numerous fields. Al-Biruni wrote about astronomy, history, and ethnology, while Ibn Sina, an Aristotelian physician and philosopher, became famous. This 9th-13th-century Central Asian cultural phenomenon describes the Eastern Renaissance in science, culture, and philosophy (Usmonova & Kamariddinzoda, 2024). With modern science, technology, and the information revolution, previous scientific achievements are gaining popularity. Globalisation has proven the importance of historical cultural exchange and the contributions of various peoples and civilisations. Thus, examining Eastern Renaissance thinkers' legacies is crucial (Mullajanova et al., 2024).

de Souza and de Souza (2018) discuss the mathematical accomplishments of Al-Biruni, considering him one of the most outstanding mathematicians in world science. Straeten and Obertreis (2022) review the development of science and technology in Central Asia during the Eastern Renaissance, asserting that the region became a hub where a significant shift in human civilisation's scientific and technological advancement took place. Ramadani (2022) examines the epistemological views of Ibn Sina, portraying him as a follower of Aristotle who significantly expanded upon the dominant concepts of ancient philosophy. Usmonova and Kamariddinzoda (2024) discuss the phenomenon of the Eastern Renaissance itself, focusing on the overall cultural development of the East in the 9th-13th centuries.

Marozzi (2023) examines the architectural, scientific, and cultural accomplishments of Central Asian cities in Afghanistan during the Ghaznavid kingdom, particularly under Mahmud of Ghazni. In his doctoral dissertation, Kyrgyz scholar Aliyev (2016) studies the Eastern Renaissance in modern Kyrgyzstan. He concentrates on Karakhanid culture, from which Mahmud al-Kashgari came. The author considers Turkic culture essential to the Eastern Renaissance. In 2023, Isakov et al. examine Eastern Renaissance religious contacts in Kyrgyzstan. They claim that the Eastern Renaissance was influenced by Great Silk Road exchanges between religious and cultural groups in Central Asia, which promoted religious tolerance. Sadyrov (2024) views the Great Silk Road as a cultural bridge between East Asia and the Muslim East, contributing to the Eastern Renaissance.

Having conducted research on this topic, it is worth noting that certain aspects still require further in-depth study. For instance, the possible connections between Eastern Renaissance thinkers and those of the Western world, as well as the direct influence of the Eastern Renaissance on the European Renaissance, remain insufficiently explored.

The aim of this article was to assess the extent to which the legacy of thinkers from Central Asia during the 9th-13th centuries influenced the overall development of world civilisation. Accordingly, the following objectives were set:

- Identify the most prominent thinkers of the Eastern Renaissance and determine the main characteristics and causes of this cultural phenomenon.
- Evaluate the extent to which Eastern Renaissance thinkers influenced global science and culture and trace their connections with European thinkers.

2. Materials and Methods

The subject was investigated using several scientific methodologies. The historical-critical technique analysed historical sources. The historical-critical method revealed Central Asia's scientific growth from the 9th to the 13th centuries. This method helped analyse the historical background of the age and explain why science, culture, and philosophy developed so much in that time and place. The historical-critical method applied the epoch's context to data interpretation, assessing its dependability.

The comparative method showed Eastern Renaissance and European Renaissance commonalities and differences. This approach allows academics to investigate cultural renaissance events and their connections to ancient European, Eastern Renaissance, and European Renaissance thinkers. Comparing Asian and European cultural occurrences across time helps discover their similarities and differences. This research also showed how closely the 14th-16th century European Renaissance was tied to the 9th-13th century Eastern Renaissance and 7th-9th century Chinese Renaissance. Cultural centres, philanthropists, philosophy, science, art, and literature were compared.

The generalisation method allowed for the acquisition of specific data on cultural phenomena in Central Asia during the 9th-13th centuries. Thanks to the generalisation method, it was possible to identify key trends defining the phenomenon of the Eastern Renaissance and to characterise the overall contribution to science and culture made by various scholars working during this period.

Dialectical analysis was utilised to determine Renaissance-era science, culture, and philosophy patterns. The dialectical method allowed us to analyse the Eastern Renaissance in terms of world history and identify how its intellectuals shaped global civilisation. The dialectical method revealed the relationship between global processes in world science and culture and specific processes, such as individual researchers' activity at a given time and location. This strategy helped explain how the Renaissance emerged and developed in diverse cultures worldwide.

The historical-typological method was used for the analysis of historical data, which made it possible to identify specific features and key characteristics of the studied era of the Eastern Renaissance in Central Asia during the 9th-13th centuries. With the help of the historical-typological method, it was possible to determine the extent to which the cultural processes that took place in the East in the preceding era influenced the development of culture and science in the 9th-13th centuries. Thanks to the historical-typological method, the key characteristics of the studied period were identified, distinguishing it from both the previous and subsequent epochs.

Al-Biruni's history, ethnology, and astronomy works, such as "Alberuni's India," "Chronology of the Ancient Nations," and "Kitab al-Qanun al-Masudi," were among the research materials. Al-Biruni, Ibn Iraq, Muhammad ibn Musa al-Khwarizmi, Abu al-Abbas al-Farghani, Al-Farabi, Ibn Sina, Mahmud al-Kashgari, and Tusi were studied because their works shaped global science and culture (Sa'adi et al., 2024). As an encyclopaedist, Al-Biruni influenced history, astronomy, and ethnology. Muhammad ibn Musa al-Khwarizmi's arithmetic and astronomy works shaped European math. Mahmud al-Kashgari and Nasir al-Din Tusi inspired philology and astronomy, while Al-Farabi and Ibn Sina impacted philosophy and medicine. Al-Biruni, Ibn Sina, and others were chosen for their contributions to mathematics, astronomy, medicine, and philosophy during the Eastern Renaissance. These scholars preserved, translated, and expanded old knowledge,

affecting modern science and culture. Their writings reveal the intellectual and cultural climate of the time, helping us comprehend how the Eastern Renaissance affected global civilisation.

3. Results

Certain periods in human history have seen rapid advances in science, culture, and philosophy. Such upsurges normally occur in a given location and spread to surrounding countries, shaping global culture. In this historical and cultural phenomenon, philosophers are increasingly interested in the human individual and developing philosophical notions that promote individualism and human power to improve the world. Science and technology expand, revealing new phenomena and creating new instruments. Scientific advances drive cultural development: new structures are built utilising innovative technologies, visual arts trends arise, and history and literature methods evolve. All achievements in philosophy, science, and culture are linked to great scientists and artists who collaborated and shared knowledge. Many great philosophers, engineers, inventors, artists, and architects of the time contributed to multiple fields. They worked in scientific and cultural institutions with political support from authorities who valued research and culture.

The 14th-16th century Renaissance was one such period in European history. The Renaissance began in Italy and extended across Europe. Many Renaissance people excelled in multiple professions. Leonardo da Vinci was an artist, engineer, and inventor. Michelangelo Buonarroti, his contemporaries, was a great sculptor and architect. The Medici dynasty funded Renaissance individuals in Florence, a distinctive Renaissance centre. Popes and French kings contributed to the Renaissance. Renaissance ideologists claimed to be resurrecting ancient European culture and civilisation, particularly Greece and Rome. Renaissance figures discovered new things and innovated, which shaped world civilisation (Ma, 2023; Usmonova & Kamariddinzoda, 2024).

The European Renaissance revived Ancient Greek and Roman philosophy, culture, and science, but other cultures also experienced similar cultural upheavals. Like the European Renaissance, they had humanistic philosophy, unfettered thinking about the world, cultural and scientific flourishing, and a classical revival model (Haliv & Ilnytskyi, 2024). Different regions experience successive "Renaissances"

cyclically. The Tang Dynasty saw a similar cultural boom in China, known as the "Chinese Renaissance" (Ma, 2023). The 9th-13th century Eastern Renaissance was a cultural upheaval throughout Central Asia and the Middle East. The 14th-century Timurid Renaissance is sometimes called the "second Renaissance" of Central Asia and the Middle East (Mullajanova et al., 2024). As mentioned, a comparable cultural dynamic arose in Europe after the Eastern Renaissance. This article discusses the 9th-13th century Eastern Renaissance and its intellectuals' impact on global culture. Table 1 compares the main traits of the Eastern Renaissance and the European Renaissance.

Table 1. Comparison of the Eastern Renaissance with the Chinese Renaissance and the Renaissance in Europe

-	Eastern Renaissance	Chinese Renaissance	Renaissance in Europe
Chronological framework	9th-13th centuries	7th-9th centuries	14th-16th centuries
Centres	Central Asia (Gurganj, Ghazni, Samarkand, Bukhara, Fergana, Kashgar, Merv), Middle East (Hamadan, Gorgan, Maragheh, Nishapur)	Cities of the Yangtze and Yellow River valleys (Chang'an, Luoyang, Hangzhou)	Italy (Florence, Rome, Milan, Venice), France (Paris, Amboise)
Patrons	Khwarazmshahs Mamunids, Ghaznavid emirs, Karakhanid khagans, Ilkhanids	Emperors of the Tang dynasty	Influential families: Medici, Sforza; Popes, Kings of France
Philosophy	Rationalist philosophy focused on individuality	Humanist philosophy asserting the independence of human nature	Humanist philosophy: man at the centre of the universe
Science	Development of mathematics, astronomy, compilation of astronomical tables and the system of geographical coordinates	Development of engineering, invention, and dissemination of technical innovations	Great geographical discoveries, heliocentric system of the world, invention of the critical method of text analysis
Art	Development of monumental architecture, construction of palaces, mosques	Development of fine arts, architecture, calligraphy	Intensive development of fine arts, discovery of perspective
Literature	Development of literature in classical Arabic and Persian	Development of poetry, prose, historical literature	Emergence of national literatures, formation of national literary languages
Classical model	Partially Antiquity	Confucian Era	Antiquity

Source: compiled by the authors.

Global civilisation expansion, regional and religious factors, and historical context shaped these features. The Eastern Renaissance and European Renaissance share growth factors. Humanist philosophy shaped science and culture as a whole; Renaissance centres, which were specific cities (in Europe, Italian cities at the crossroads of important maritime trade routes; in the East, Silk Road cities); and patrons, influential families and individuals managing the Renaissance centres. Regional, religious, and historical considerations shaped traits. The European Renaissance saw the advent of many great artists and rapid artistic advancement. It wasn't shown in the Eastern Renaissance since Islam forbids showing living people. European Renaissance literature used national languages, while Eastern Renaissance literature used classical languages. The Eastern Renaissance grew in enormous Eastern empires, while the European Renaissance blossomed in Italian city-states.

Eastern Renaissance scholars discovered science first, benefiting European Renaissance researchers. Eastern Renaissance thinkers tackled scientific difficulties, while the European Renaissance was a scientific breakthrough. Chinese Renaissance and Antiquity scholars influenced Eastern Renaissance thinkers. The Eastern Renaissance linked Chinese, European, and Antiquity in science. Eastern Renaissance taught Europeans Chinese Renaissance science and technology. Through Central Asia and the Middle East, Europeans acquired the Chinese compass for navigation. Gunpowder spread East-West. Paper and printing spread knowledge, starting the information revolution. The Eastern Renaissance delivered this technology to Europe (Aliyev, 2016; Horbatiuk, 2023; Ma, 2023).

The epicentre of the Eastern Renaissance from the 9th-13th centuries was Central Asia and the Middle East, with its centres located directly along the Silk Road: Samarkand, Bukhara, Gurganj (modern Köneürgench), Ghazni, Merv, Nishapur, Fergana, Kashgar (Usmonova and Kamariddinzoda, 2024). The centres of the Eastern Renaissance in Central Asia are shown in Figure 1.

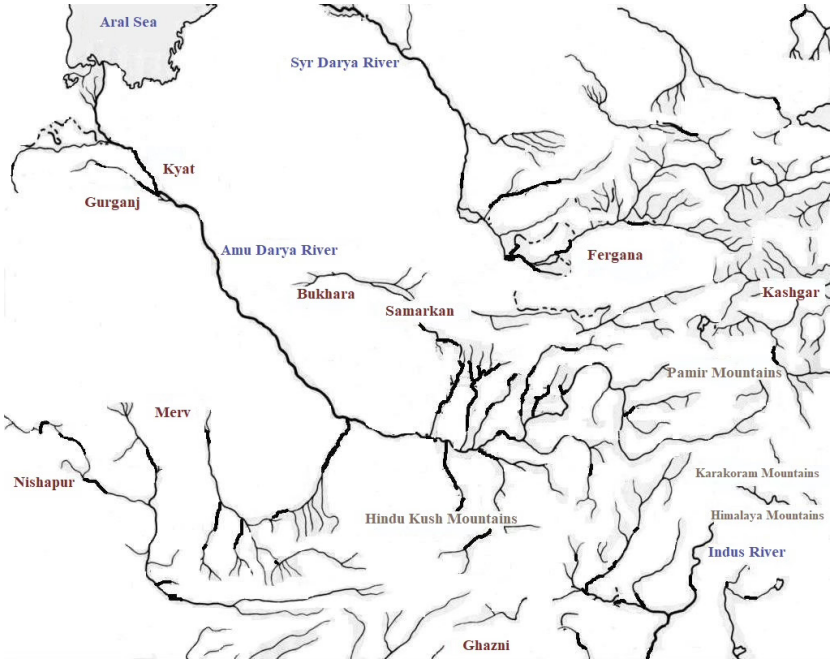

Figure 1. Cities – Centres of the Eastern Renaissance in Central Asia

Source: compiled by the authors.

Like the 14th-16th century European Renaissance, the Eastern Renaissance was influenced by European classical thought and culture. Eastern Renaissance thinkers revered European ideas. They systematised earlier knowledge and translated ancient Greek and Roman intellectuals' texts into Eastern Renaissance scientific languages Arabic and Persian. Western Europe rapidly disregarded ancient thinkers' legacy with the fall of the Western Roman Empire, whereas the East retained and systematised it with new knowledge and Far Eastern scientific accomplishments. Eastern Renaissance scholars knew about Eratosthenes' Earth's sphericity and Aristarchus of Samos' heliocentric system, which were proven in the Early Modern period. These cosmological theories were developed by Eastern Renaissance leader Al-Biruni (Auanasova et al., 2025; Mullajanova, 2024).

Abu Ali Ibn Sina, another Eastern Renaissance scientist and thinker, was a medical genius, philosopher, and Aristotle's leading follower.

Ancient philosophers and natural scientists were rediscovered in Europe before the Renaissance through Eastern Renaissance intellectuals. This applies to Aristotle's philosophy and Claudius Ptolemy's astronomical and geographical writings, which were given the Arabized title "Almagest" in European tradition. European late mediaeval philosophers and scholars rediscovered Antiquity's cultural and scientific heritage by studying Eastern Renaissance thinkers and their translations of ancient philosophers, paving the way for the European Renaissance (Table 2).

Table 2. Systematic comparison between the Eastern and European Renaissances

Dimension	Eastern Renaissance	European Renaissance
Philosophy	Focused on rationalist philosophy with an emphasis on individuality and the synthesis of ancient Greek thought with Islamic theology.	Cantered on humanist philosophy, emphasizing human potential and achievements, often drawing directly from ancient Greek and Roman texts.
Science	Significant advancements in mathematics, astronomy, and medicine. Development of algebraic concepts and precise astronomical observations.	Breakthroughs in anatomy, physics, and astronomy. Development of the scientific method and heliocentric theory.
Art	Development of monumental architecture, including mosques and palaces. Emphasis on geometric patterns and calligraphy due to religious constraints on figurative art.	Flourishing of fine arts, including painting, sculpture, and architecture. Rediscovery of perspective and realism in art.
Institutions	Centres of learning such as the House of Wisdom in Baghdad and the Academy of Khwarezmshah Mamun. Libraries and observatories were key features.	Universities and academies such as the Platonic Academy in Florence. Growth of private studios and workshops for artists.
Patronage	Supported by various rulers and dynasties such as the Abbasids, Ghaznavids, and Ilkhanids. Patronage often tied to political and religious objectives.	Supported by wealthy families like the Medici, as well as the Church and various monarchs. Patronage driven by both political and personal interests.
Transmission Mechanisms	Knowledge dissemination through translation movements, trade routes like the Silk Road, and scholarly migrations.	Spread of ideas through the printing press, travel and correspondence of scholars, and the movement of artists and thinkers across Europe.

Source: compiled by the authors.

Thus, the Eastern Renaissance served as a bridge between Antiquity and the European Renaissance. Moreover, the ideas and scientific developments of the representatives of the Eastern Renaissance became a certain foundation for the scientific views of European scholars of the Late Middle Ages and Early Modern Period. This applies in particular to mathematics as well as chemistry. For example, the very name of the science "chemistry" has an Arabic root. Similarly, the word "algebra" also comes from Arabic and refers to a branch of mathematics. The father of algebra is one of the most outstanding representatives of the Eastern Renaissance, Muhammad ibn Musa al-Khwarizmi, who not only coined the term "algebra" but also introduced the term "algorithm" (da Silva & Morey, 2021).

The Eastern Renaissance was influenced by intellectuals, philosophers, and politicians who supported thinkers, founded scientific centres, and offered material assistance for science and culture. Khwarezm, ruled by the Khwarezmshahs, was a scientific centre of the Eastern Renaissance. From 995 to 1017, the Mamunid dynasty ruled mediaeval Khwarezm briefly but impressively. Due to the collapse of the Abbasid Caliphate, the Mamunids became independent. They overthrew the ancient Afrighid dynasty in Khwarezm and transferred the capital from Kat to Gurganj (Urgench, modern Köneürgenç), a cultural and scientific centre. Khwarezmshah Mamun II founded the Academy of Khwarezmshah Mamun in Gurganj around 1000 as "Dar Elhokmeh" ("House of Wisdom"). Famous intellectuals were invited to Urgench by the Khwarezmshah for studies. Ibn Sina and Al-Biruni worked together in Khwarezmshah Mamun Academy. Scholars shared ideas and scientific achievements through such interactions (Usmonova and Kamariddinzoda, 2024).

The Academy of Khwarezmshah Mamun had a large library, housing over a hundred thousand manuscripts in Arabic, Persian, Hindi, Sanskrit, Syriac, Turkic, Ancient Greek, and Chinese. The Academy also had an astronomical observatory for studying celestial bodies, translators, and researchers working on improving medieval musical instruments (de Blois, 2024). By the decision of Khwarezmshah himself, the head of the Academy became Al-Biruni, a native of Khwarezm from the former capital city of Kat. Before the Academy was established, Al-Biruni worked in Iran, in the city of Gorgan, but returned to Khwarezm to lead the Academy. In total, about a hundred scholars from various cities of Central Asia and different scientific disciplines worked under

his leadership. Additionally, scholars from the Middle East, particularly Syria and Egypt, came to the Academy (Ketners, 2025).

One of the leading Khwarezmian scholars of that time was Abu Nasr Ibn Iraq, who belonged to the first dynasty of Khwarezmshahs – the Afrighids – and was a cousin of the last representative of this dynasty, Abu Abdullah Muhammad. As a member of the ruling family, Ibn Iraq had broad opportunities for organizing his scientific activities. After the Afrighids were overthrown, the scholar fell out of favour with the new rulers for a time. However, later, the Mamunid Khwarezmshahs regained favour with Ibn Iraq and entrusted him with helping to organize the Academy of Khwarezmshah Mamun. In the history of science, Ibn Iraq is primarily known as the mentor and patron of Al-Biruni, under whose guidance Al-Biruni began his scientific career. Ibn Iraq played a crucial role in bringing Al-Biruni back to Khwarezm (Rokhman et al., 2024; Iudova-Romanova, 2025).

After Khwarezm was conquered by Emir Mahmud of Ghazni in 1017, the centre of scientific activity in Central Asia shifted from Khwarezm to Ghazni, the capital of the Ghaznavid state (Figure 2). An ambitious politician and military leader, Emir Mahmud of Ghazni sought to transform his capital into a center of science and culture. Like other great rulers of his time, he provided significant support to scholars and thinkers. The poet Ferdowsi lived and worked at Mahmud's court, presenting his classic work “Shahnameh” to the emir. Mahmud of Ghazni also relocated Ibn Iraq and Al-Biruni from Khwarezm to his capital (Allegranzi, 2021).

Al-Biruni is a leading Eastern Renaissance figure. A true encyclopedist, whose interests included many scientific fields. Al-Biruni was one of the first to study Indian culture, history, and traditions. His works are essential for studying ancient Khwarezm, his country. He created one of the most complete astronomical tables, known as “zij,” for Europe and Asia. One of the scientists who proposed a heliocentric world model before Copernicus. Al-Biruni knew ancient philosophy and Indian wisdom. His encyclopaedic knowledge of Eastern and old European philosophy and science typifies Eastern Renaissance intellectuals. Al-Biruni worked with and competed with Abu Ali ibn Sina, another Eastern Renaissance figure. Al-Biruni opposed Aristotle, unlike Ibn Sina. Their partnership and rivalry were good and bad. Their correspondence advanced philosophy, but their competitiveness

distracted them from scientific study and discoveries (Kaluzhynska & Miroshnichenko, 2024; Ramadani, 2022; Ghorbani, 2024).

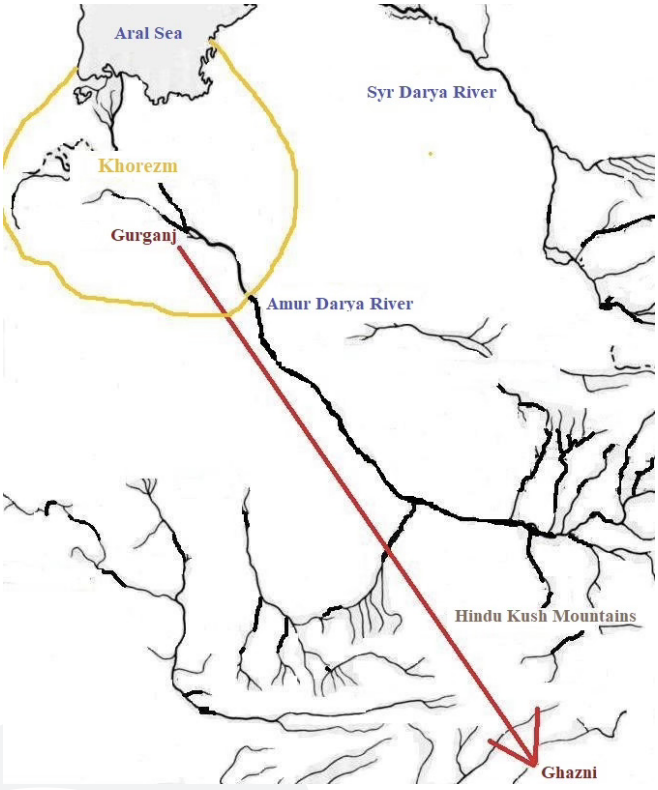

Figure 2. The relocation of the center of scientific activity in Central Asia from Khwarezm to Ghazni

Source: compiled by the authors.

Al-Biruni (2013) wrote "Alberuni's India," his most famous work in Europe, about India's geography, history, ethnography, and religion, with Mahmud of Ghazni's help. Al-Biruni, the emir's personal astrologer, spent a lot of time in India due to Mahmud of Ghazni's repeated military excursions. His dissertation on India was the most complete study of Indian traditions and religion at the time. The treatise by Al-Biruni became a key source on India (Starr, 2023). "Alberuni's India" is also one of the earliest to describe chess in length. The treatise continues Al-Biruni's studies on national histories and customs. In 1000, he authored "Chronology of the Ancient Nations" in Gorgan,

discussing India and chess. Al-Biruni tells the story of Brahman Sissa, who invented chess and proposed the grain problem on a chessboard (dos Santos, 2024).

While in Ghazni, Al-Biruni (1954) wrote his main treatise on astronomy, "Kitab al-Qanun al-Masudi", dedicated to Emir Masud, the son of Mahmud of Ghazni. Al-Biruni advocates a heliocentric model of the world, asserting, based on his calculations, that the Earth rotates around its axis and the Sun (Starr, 2023).

Al-Biruni was an encyclopedist who contributed to global science. It wasn't unusual at the time. Many scientists succeeded in different, sometimes unrelated domains before professional distinction. However, many Eastern Renaissance intellectuals excelled in one or more domains. Ibn Iraq, Al-Biruni's tutor, was a brilliant mathematician. His accomplishments include solving cubic equations using conic sections and improving trigonometry (Borroni and Boselli, 2021). The mathematician and astronomer Muhammad ibn Musa al-Khwarizmi created Zij, a system of astronomical tables (Novozhenov et al., 2020). Abu al-Abbas al-Farghani, a contemporary of Muhammad ibn Musa al-Khwarizmi, was an astronomer and Ptolemy interpreter. Abu al-Abbas al-Farghani proved Earth's sphericity mathematically (Novozhenov, 2023). Mahmud al-Kashgari, the first Turkic philologist and lexicographer, wrote "Divan Lugat at-Turk," a dictionary of Turkic languages.

Al-Biruni, an encyclopedist who wrote over 150 scholarly works, excelled in several fields (Auanasova et al., 2019). In addition to ethnography and geography, Al-Biruni was a renowned Eastern Renaissance historian. His chronicles covered Khwarezm's early history. Al-Biruni's works illuminate the Khwarezmshahs' first dynasty, the Afrighids. Al-Biruni lists all Khwarezmshahs from this dynasty (Grechkosii, 2025; Deuraseh, 2016). Al-Biruni was a multilingual encyclopedist. He could write scientific treatises in Khwarezmian, Persian, Arabic, and the military elite's Turkic tongue. He also spoke Greek, Sanskrit, and Hebrew, allowing him to examine several cultures' scientific heritage. Al-Biruni translated Euclid's "Elements" and Claudius Ptolemy's "Almagest" from Greek to Sanskrit.

Among the sciences in which Al-Biruni made significant contributions were geology and pharmacology. In 1038, he wrote "Mineralogy, or

the Book of Summaries for the Knowledge of Gems", in which he provided data on the characteristics of various minerals, ores, and metals. Furthermore, Al-Biruni described the phenomenon of meteor showers. He measured the densities of gaseous, liquid, and solid substances using a physicochemical instrument he invented – the pycnometer. His most significant medical work, "Pharmacognosy in Medicine", is a detailed reference on 880 medicinal plants and their properties (Kieliszek, 2023).

One of the last prominent figures of the 9th-13th-century Eastern Renaissance was Nasir al-Din Tusi. Like Al-Biruni, he was known as an encyclopedist, excelling as a philosopher, mathematician, and astronomer. Nasir al-Din Tusi worked in the 13th century during the Mongol conquests, which significantly impacted the history of Asian nations. His patron was the Mongol conqueror and founder of the Ilkhanate, Hulagu Khan. Initially indifferent to science, Hulagu, under Tusi's influence, approved the establishment of an observatory in Maragha, in present-day Iranian Azerbaijan. Under Tusi's direction, the Maragha Observatory became a significant scientific center in the Muslim East in the 13th century. One of Tusi's major achievements was compiling more precise Zij tables, known as "The Ilkhanic Tables", which included lunar-solar and planetary tables as well as a more comprehensive star catalog. He also contributed to trigonometry with his work "Treatise on the Quadrilateral", significantly advancing the field (Lameer, 2020).

Knowledge transfer during the Eastern Renaissance went beyond Silk Road travel. It entailed complicated interactions between cultural and intellectual centres in Central Asia, the Middle East, and Europe, each contributing to and profiting from the exchange. Jewish, Christian, and Muslim interpreters helped bridge linguistic and cultural boundaries and assist this complex knowledge network. These translators translated scientific and philosophical literature and adapted and incorporated knowledge into diverse cultures, often encountering linguistic limitations, political instability, and regional receptivity. The approach also involved feedback loops, where ideas were developed and reinterpreted amongst learning centres. Western scholars built on, criticised, and expanded Eastern scientific and philosophical advances, enriching both Eastern and Western intellectual traditions. This dynamic interaction highlights the collaborative and interrelated nature of worldwide intellectual advancement throughout this time.

Scientific and philosophical ideas flourished throughout the Eastern Renaissance due to socio-political factors. Political stability, religious tolerance, and strong patronage structures kept intellectual pursuits alive. The Abbasid Caliphate's House of Wisdom in Baghdad shows institutional support for scholarship. Due to the caliphate's emphasis on knowledge and religious tolerance, intellectuals from many backgrounds worked on translation, research, and instruction at this intellectual powerhouse. The House of Wisdom preserved historic books and promoted innovation in astronomy, mathematics, and medicine.

Similarly, the Maragheh Observatory, founded in the 13th century under the patronage of the Ilkhanid ruler Hulagu Khan, illustrates how political support could catalyse scientific advancement. Nasir al-Din Tusi, a prominent scholar, played a pivotal role in establishing the observatory, which became a leading centre for astronomical research. The observatory's success was largely due to the stable political environment and the ruler's recognition of the value of scientific inquiry. These institutions exemplify how patronage systems enabled scholars to pursue their intellectual curiosities, often leading to ground-breaking discoveries.

The Eastern Renaissance intellectuals retained the tradition of Antiquity. The Eastern Renaissance intellectuals preserved and supplemented the writings of Euclid, Claudius Ptolemy, Plato, and Aristotle, allowing European scholars to rediscover them in the Late Middle Ages. Eastern Renaissance intellectuals also introduced Europe to China and India's scientific and cultural achievements. Central Asian and Middle Eastern cities, where many Eastern Renaissance individuals worked, connected East and West due to their location on the Great Silk Road. The Eastern Renaissance facilitated cultural and knowledge interchange, which advanced science and technology and elevated global civilisation. Scientific discoveries were achieved by Eastern Renaissance scientists. Their contributions to mathematics, chemistry, medicine, and astronomy shaped global science. Eastern Renaissance scientists produced early discoveries. Based on Eastern intellectuals' work, Early Modern European scientists developed natural science discoveries that started a scientific worldview.

4. Discussion

Starr (2023) compares the biographies and scientific achievements of Eastern Renaissance scholars Ibn Sina and Al-Biruni, calling them “geniuses of the era”. Starr examines Ibn Sina and Al-Biruni's communications and scientific and philosophical discourse. The author believes that two geniuses living and working together advanced philosophy and science. Starr notes that Ibn Sina and Al-Biruni regularly disagreed, making them distinct scholars. Starr calls the Ibn Sina and Al-Biruni era the “Lost Enlightenment”. While I agree with the author's evaluation of Ibn Sina and Al-Biruni's impact on global civilisation, the Eastern Renaissance's claim as a "Lost Enlightenment" is unwarranted. Despite European researchers' neglect of the Eastern Renaissance, it is not “forgotten”.

The paper by dos Santos (2024) highlights Al-Biruni's mathematical contributions and chess description. A chess problem from Al-Biruni's "Chronology of the Ancient Nations" is given. Al-Biruni's work is one of the most important sources on previous chess features, according to dos Santos. “Chronology of the Ancient Nations” by Al-Biruni is significant for exact, humanities, and scientific sciences, according to the author. Dos Santos also illustrates Al-Biruni's manuscript "Chronology of the Ancient Nations," showing that it is also a valuable Eastern Renaissance work. While supporting the author's claims, Al-Biruni also introduced readers to different cultures, particularly India, in addition to chess issues.

Wu (2024), Lameer (2020), and Kushenova wt al. (2025) discuss the philosophical and scientific views of various representatives of the Eastern Renaissance. These authors dedicated their studies to figures such as al-Farabi, Nasir al-Din Tusi, and Abu al-Abbas al-Farghani. Scholars agree that each of these representatives of the Eastern Renaissance made a significant contribution to global civilization, enriching human knowledge in philosophy, mathematics, astronomy, and other sciences. Additionally, the authors emphasize that most scholars of the Eastern Renaissance and the Middle Ages, in general, were characterized by encyclopedism. In general, the conclusions of these authors align with the results of this research, and they are fully valid.

Whether the Islamic Golden Age or Central Asian intellectual flowering is a "Renaissance" reflects broader debates concerning Eurocentric historical frames and non-European contexts. Scholars like Benigni (2021) urge for context-sensitive language that recognises these periods' particular socio-cultural and historical contexts rather than seeing them as European Renaissance counterparts. Yuldashev et al. (2021) emphasise Central Asian scholars' unique contributions and say that their impact on socio-spiritual thinking and cultural development deserves attention. Historians can better reflect the diversity of intellectual revivals across places and periods by using such terms, expanding the global story of cultural and scientific growth. This approach challenges the European Renaissance as a single model and promotes a more holistic understanding of how societies have experienced and contributed to intellectual development.

The Eastern Renaissance's influence on the European Renaissance is debated by scholars from many angles. Some scholars believe that the Eastern Renaissance sparked the European Renaissance by preserving and transmitting ancient knowledge through translations and intellectual exchanges, paving the way for European scientific, philosophical, and cultural advances. Translation movements, like as those in Baghdad and Toledo, made Greek, Persian, and Indian scientific and philosophical literature available to European students, enabling the Renaissance's resurgence of classical learning. Others argue that cultural and intellectual exchanges are nuanced and multifaceted, avoiding a simplified narrative of direct causation (Ramadani, 2022; Saidbek, 2024). They argue that while the Eastern Renaissance provided valuable knowledge and methods, the European Renaissance was also shaped by local European developments, socio-political changes, and interactions with non-Islamic cultures. This discussion highlights the significance of recognising the Eastern Renaissance as a critical and revolutionary period while also understanding the complex influences that shaped the European Renaissance's intellectual blossoming.

Thus, most experts agree that cultural resurgence and vigorous scientific growth have occurred in different regions of the world throughout the history of universal civilisation. Call such events a “renaissance”. Additionally, these events may be linked. Most experts agree that the Great Silk Road helped spread the Chinese Renaissance to Europe. The 9th-13th century Eastern Renaissance was centred on Great Silk Road towns. The Eastern Renaissance bridged the Chinese Renaissance with

the European Renaissance, absorbing Chinese and classical European achievements. While drawing on other cultures' achievements, Eastern Renaissance thinkers achieved scientific breakthroughs, advancing world civilisation. Supporting the above theses, it is not acceptable to call the Eastern Renaissance a "forgotten" or "lost" era. Despite Eurocentrism among modern researchers, Eastern culture and science have long been studied. Eastern Renaissance intellectuals' scientific concepts and creations paved the way for future advances.

5. Conclusions

Eastern Renaissance intellectuals built essential intellectual foundations, scientific methodologies, and institutions that shaped world civilisation. These intellectuals created the framework for Ibn Sina's medical and philosophical contributions, which were integral to European academic curricula. Al-Biruni and Al-Khwarizmi pioneered modern science with systematic algebraic solutions and exact astronomical measurements. The House of Wisdom and the Academy of Khwarazmshah Mamun preserved and translated ancient works, influencing European intellectual progress. This period's Silk Road cultural and intellectual interaction spread ideas and technologies, influencing the European Renaissance and modern science. Many later scientific, philosophical, and cultural advances would have been impossible or delayed without these contributions, highlighting the Eastern Renaissance's importance in global civilisation.

The Eastern Renaissance of the 9th-13th centuries resembled the 14th-16th century European Renaissance. These events were marked by cultural rebirth, rapid scientific progress, and humanism philosophy, which valued human individuality. Renaissance also entails reviving a classical cultural model. European Renaissance model: Antiquity. The Eastern Renaissance also embraced classical culture. Eastern Renaissance thinkers translated old philosophers and scholars' writings into Arabic and Persian and used their knowledge to create new ideas. The European and Eastern Renaissances saw a transition from dogmas to autonomous thinking in philosophy and science. East and West developed diverse visual arts and literature, distinguishing the European and Eastern Renaissances. Religious and regional differences drove this variance. The European Renaissance developed in small republics in Italy, while the Eastern Renaissance developed inside Islam and was ruled by huge states.

Eastern Renaissance intellectuals shaped global civilisation. In mathematics, chemistry, and astronomy, they made major advances. The Eastern Renaissance brought Chinese Renaissance inventions like the compass, paper, and gunpowder to Europe. This, together with Eastern Renaissance scholars' contributions, powered scientific progress during the European Renaissance, the Age of Great Geographical Discoveries. Eastern Renaissance thinkers helped Europe rediscover ancient philosophers, which sparked renewed interest in classical philosophy throughout the European Renaissance.

This study is limited to the general impact of the legacy of Eastern Renaissance thinkers on world culture. The study of this issue still needs further in-depth research, in particular, it concerns the study of the influence of each particular thinker on a particular field of science and culture.

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