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ABU ABDULLAKH MUKHAMMAD IBN MUSA AL-KHOREZMI AS AN OUTSTANDING ASTRONOMER AND MATHEMATICIAN

Shukhrat Rustamovich Tokhtiev
PhD., Senior Lecturer, "IRCICA Chair for Islamic History and Source Studies"
International Islamic Academy of Uzbekistan

ABSTRACT

The article is devoted to the life and work of the prominent thinker and mathematician of the East, Muhammad ibn Musa al-Khorezmi, based on the principles of objectivity, historicity, and scientific character. Because on our planet there lived great teachers, people of outstanding minds and extensive research work, whose achievements transformed science and revealed to our eyes huge unexplored mysteries. Nowadays, raising a harmonious and comprehensively developed generation is one of the most important tasks that presuppose real progress in the development of society in the near future.

KEY WORDS: *al-Mamun, Khiva, algorithm, algebra, zij, Renaissance, Sri Lanka island, era of Alexander, Book about Indian counting, Book about sundial.*

INTRODUCTION

The future of society depends on the degree of creative power, mental and physical perfection, political consciousness, practical activity and spiritual and moral development of every citizen of the country.

Education of young people based on national pedagogical traditions in the context of the implementation of the National Program for Personnel Training acquires special importance.

In the past, progressive teachers and prominent thinkers put forward many progressive educational ideas; the study of their scientific heritage helps to improve the pedagogical culture of the teacher and warns against a prescription approach to issues of scientific and educational theory and practice.

Islamic civilization turned Muslim lands into the most advanced part of the civilized world and created a high example of culture that was created over many centuries. This period, both in terms of the degree of stability in society and the rationality of moral principles, and in terms of the high standard of living, the degree of tolerance and the relative absence of fanaticism, as well as the level of development of science and literature, is undoubtedly one of the brightest periods in the history of world civilization. The contribution of Islamic civilization to the world is no less than Hellenic. The only difference is that Islamic civilization still has a significant influence on the modern world, and its spiritual foundations continue to be attractive

As a result of the restoration of our national values and the study of the heritage of our ancestors, the names of our great chapters were restored. Great work has been done to study their life and invaluable heritage, improve and preserve their heritage. Our people, who lived with such noble goals and thoughts, made a great contribution to world development. Science and culture have long been developed in the territory of our country, which connects the East and the West, where great civilizations meet. Especially in the Middle Ages, thousands of scientists, poets and great thinkers came from Central Asia. Their works on many fields such as mathematics, physics, chemistry, astronomy, ethnography, medicine, religion, history, literature, ethics, philosophy, ancient monuments in Samarkand, Bukhara, Khiva, Termiz, Tashkent, Shahrisabz, Margilan and other cities. is the spiritual property of all mankind.

During the period of the highest flowering of science (9th-11th centuries), Muslim philosophers and scientists proceeded in their research like the Greeks; from the principle of the unity of nature and the integrity of the character of science. Philosophers enjoyed special authority among Muslims.

Eastern scientists continued to develop physical and mathematical sciences, relying on the results achieved in Greece, India and China. The works of the Central Asian scientist Muhammad ibn Musa al-Khwarizmi (783-c. 850) were of particular importance.

Abu Abdullah Muhammad ibn Musa al-Khorezmi - one of the largest medieval scientists of the 9th century, mathematician, astronomer, geographer and historian, born around 783 in Khiva (Khorezm) [10, p. 38; 6, p. 3-4].

The life and work of al-Khorezmi coincided with an era of great cultural and scientific upsurge. He received his primary education from outstanding scientists of Transoxiana and Khorezm.

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During the period of scientific research at the Mamun Academy, commissioned by Caliph al-Mamun, he worked on the creation of instruments for measuring the volume and circumference of the earth. In 827, in the Sinjar desert, al-Khwarizmi took part in measuring the length of the degree of arc of the earth's meridian in order to clarify the circumference of the Earth. The measurements taken here remained unsurpassed in accuracy for 700 years[10, p. 40; 12, p. 7-8; 13, p. 15].

Around 830, the scientist created the first known Arabic treatise on algebra, al-Kitab al-mukhtasar fi hisab al-jabr wal-muqabala (A Brief Book of Algebra). Thus, he was the first to introduce algebra as an independent science of general methods for solving linear and quadratic equations, and gave a classification to these equations.

Al-Khorezmi is known primarily for this work on algebra, which played a vital role in the history of mathematics. The word “algebra” comes from the title of this book. Particularly noteworthy is the fact that the term “algorithm” arose from his name (Latin “Algorithms”) [10, p. 41-42; 7, p. 242].

Algebra by al-Khwarizmi, which laid the foundation for the development of a new independent scientific discipline, was later commented on and improved by many eastern mathematicians. This book was translated twice into Latin in the 12th century and played an extremely important role in the development of mathematics in Europe. [11, p. 12; 2, p. 15].

Historians of science highly appreciate both the scientific and popularization activities of al-Khorezmi. Renowned historians call him "the greatest mathematician of his time and, all things considered, one of the greatest mathematicians of all time".

His works were translated from Arabic into Latin, and then into other European languages. Based on them, various mathematics textbooks were created. They played an important role in the development of science, the Renaissance, and had a fruitful influence on the development of medieval scientific thought in the countries of the East and West.

The scientist developed detailed trigonometric tables containing sine functions. In the 12th and 13th centuries, based on his books, the works Carmen de Algorismo and Algorismus vulgaris were written in Latin, which remained relevant for many centuries. Until the 16th century, translations of his works on arithmetic were used in European universities as the main textbooks on mathematics[5, p. 10-15; 8, p. 6-8].

Astronomy occupied a leading place among the exact sciences in the medieval East. It was impossible to do without it either in irrigated agriculture or in sea and land trade. By the 9th century, the first independent works on astronomy appeared in Arabic, among which collections of astronomical and trigonometric tables (ziji) occupied a special place. They served to measure time, and with their help, the positions of luminaries in the celestial sphere, solar and lunar eclipses were calculated.

Al-Khorezmi is the author of serious works on astronomy. In them he talks about calendars, calculations of the true position of the planets, parallax and eclipses, compilation of astronomical tables (zij), determination of the visibility of the moon, etc. His work in this area was based on the works of Indian scientists. He made detailed calculations of the positions of the sun, moon and planets, and solar eclipses. His astronomical tables were translated into European and later Chinese languages [10, p. 41-42; 13, p. 25].

Among the first zijs is “Zij al-Khwarizmi,” which served as the basis for medieval research in this area, both in the East and Western Europe.

The book began with a section on chronology and the calendar, which was very important for practical astronomy, since due to the difference in calendars, it was difficult to determine the exact dating. The existing lunar, solar and lunisolar calendars and different beginnings of chronology led to many different eras and for different peoples the same event was dated differently. Al-Khwarizmi described the Julian calendar (the calendar of “rums”). He also compared different eras, among them the ancient era of India (began in 3101 BC) and the “age of Alexander” (begun 1 October 312 BC). According to his calculations, the beginning of the Islamic era of chronology corresponds to July 16, 622. The scientist took the meridian passing through a place called Arin (the island of Sri Lanka) as the prime meridian from which time was measured[4, p. 55-56].

Along with this, al-Khwarizmi wrote “The Book of Indian Accounting,” which contributed to the popularization of Arabic numerals and the decimal positional system for recording numbers. The Arabic text has been lost, but a 12th-century Latin translation, Algoritmi de numero Indorum, survives. The book had a huge scientific influence not only in the East, but also in the West. It describes how to find a decimal number consisting of nine Arabic digits and a zero. It is possible that al-Khwarizmi became the first mathematician to use zero in notation of numbers.
Two hundred years after the writing of On Indian Accounting, the Indian system spread throughout the Islamic world. In Europe, “Arabic” numerals were first mentioned around 1200. Initially they were used only in universities. In 1299, a law was passed in Florence, Italy, prohibiting their use. Having first become widespread among Italian merchants, by the 16th century all of Europe had switched to Arabic numerals. Until the beginning of the 18th century, Russia used the Cyrillic number system, after which it was replaced by a number system based on Arabic numerals[5, p. 22-24; 9, p. 66].

al-Khwarizmi was the author of 9 works:

1. Book on Indian calculation (Arithmetic treatise, Book on addition and subtraction);

2. A short book on algebra (“al-Kitab al-mukhtasar fi hisab al-jabr wal-mukabala”);

3. A book about actions with the help of an astrolabe (“Kitab al-amal bi-l-asturlabat”) - in incomplete form, included in the work of al-Fargani, in sections 41-42 of this book, a special compass was described for determining the time of prayer;

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4. Book about the sundial ("Kitab al-ruhama");

5. Book of pictures of the Earth (Book of Geography, "Kitab surat al-ard");

6. Treatise on the definition of the era of the Jews and their holidays ("Risala fi istihraj tarikh al-yahud va ayadihim");

7. The book about the construction of the astrolabe - has not survived and is known only from mentions in other sources;

8. Astronomical tables ("Zij");

9. A history book containing horoscopes of famous people.

Of these 9 books, only 7 have reached us. They have been preserved in the form of texts either by al-Khwarizmi himself, or in translations into Latin, or in the works of his Arab commentators [12, p. 25-27; 1, p. 7].

Thus, in contrast to medieval Europe, where the Christian form of worldview mainly dominated, where natural scientists were persecuted and the fires of the Inquisition burned, in the Arab-Muslim East Islam encouraged the development of science, technology, culture and therefore, the Muslim East was 300 years ahead of Europe. 400 years according to all scientific and technical achievements of that period. The need to preserve this unique heritage of Eastern thinkers for subsequent generations requires constant study.

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