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Abu Abdallah Muhammad Ibn Musa Al-Khwarizmi: Heritage and Achievements

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Abstract: The article examines the life and scientific achievements of Abu Abdallah Muhammad ibn Musa al-Khwarizmi, an outstanding scientist and mathematician of the 9th century. His homeland of Khwarazm, a vast region of Central Asia, and the cultural traditions of this region are described. The article also notes the difficult time of the conquest of Khwarazm by Arab troops and the destruction of writing and cultural monuments. However, despite this, the article emphasizes that the cultural traditions of Khwarazm were not completely destroyed, and the people began to experience a new upsurge of spiritual life in the 9th century. During this period, Muhammad ibn Musa al-Khwarizmi made a significant contribution to the development of the exact sciences. The article also mentions other scientific and cultural institutions that existed in Central Asia during the Middle Ages, and emphasizes the importance of the scientific heritage of Khwarizmi and its influence on the development of mathematics and science.

Keywords: *Musa al-Khwarizmi, Khwarazm, Avesta, islam, science, academies of sciences*.

1. INTRODUCTION

Abu Abdallah Muhammad ibn Musa al-Khwarizmi was born at the end of the eighth century and died in the second half of the ninth. Now it is conventionally accepted to consider the year of his birth to be 783 (Khiva), and the year of death to be 850 (Baghdad). The scientist's homeland was Khwarazm, a vast region of Central Asia, which corresponds to the modern Khwarazm region of Uzbekistan (the centre is the city of Urgench), part of the Republic of Karakalpakstan and the Tashauz region of Turkmenistan. In the Middle Ages, artisans worked in the cities of Khwarazm and created wonderful examples of applied art. During archaeological excavations, magnificent works of ancient artists and sculptors of that time were also found. Khwarazm merchants conducted brisk trade with India and China, the Middle East, the Caucasus and Eastern Europe. They exported furs, livestock, dried fruits, fish, etc. Historical chronicles more than once noted their enterprise and curiosity, which forced them to travel long distances. Already in very distant times, the Khwarazmians owned writing. The book Avesta testifies to this. Monuments of this writing were discovered during archaeological excavations and deciphered by many scientists around the world. In 2001, the world community, together with the people of Uzbekistan, celebrated the 2700th anniversary of the Avesta, which is not only a collection of religious books of Zoroastrianism, but also the strongest unique historical and scientific monument - the creation of the peoples of Central Asia and the Middle East. The Avesta pays great attention to the power of science and enlightenment; the twenty best qualities of morality, including the desire to master knowledge, are explained in a unique form. Such best virtues include, for example, a person's acquisition of holiness with the help of knowledge and wisdom, his constant quest in the name of

understanding the world around him, his creation of a certain teaching, the ability to be a teacher and become a student of a highly educated person, and his support for justice.

2. LITERATURE REVIEW

Abu Rayhan Beruni in his book “Monuments of Past Generations” spoke about this difficult time in the history of his homeland - Khwarazm. He wrote that the Arab governor in Central Asia, Qutayba ibn Muslim, destroyed “the people who knew the Khwarazmian written language well, knew their traditions and taught them the sciences that existed among the Khwarazmians, and subjected them to all sorts of torments.” According to Beruni, the conqueror Qutayba “destroyed the Khwarazmian scribes, killed the clergy and burned their books and scrolls,” after which “the Khwarazmians remained illiterate and relied on memory for what they needed.” That is why so few written monuments of ancient Khwarazm have reached us. However, the cultural traditions that developed in Khwarazm many centuries ago were not destroyed. The wounds inflicted by the wars gradually healed. Conditions began to emerge for a new upsurge in the spiritual life of the people. It began in Central Asia in the 9th century. This period was marked by great achievements in the field of exact sciences.

3. METHODOLOGY & EMPIRICAL ANALYSIS

Among those Khwarazmians who glorified their homeland with their labours, Muhammad ibn Musa Khwarizmi should be named first. The decisive role in the formation of him as a scientist was undoubtedly played by the ancient traditions of Khwarazm science, which found a remarkable continuation in his work. In the east in the Middle Ages, there were dozens of scientific and cultural institutions (Institutes or Academies of Sciences) under the names “Bayt al-Hikma” (Baghdad, IX century), “Sivan al-Hikmah” (Bukhara, X century), “Dar al-khikma" (Cairo, XI-XII centuries), "Al-Mamun Academy (Khwarazm, X-XI centuries), Ulugbek Academy (Samarkand, XV century) If during the Hellenistic period the city of Alexandria (Egypt) was considered the centre of science, then in the IX-XI centuries. Central Asia (Khorasan and Transoxiana) was rightfully considered the centre of science and culture. During this period, such scientists as Al-Khwarizmi (783-850), Ahmed Ferghani (798-865), Muhammad ibn Ismail Bukhari (810-870), Muhammad Termizi (824-870) lived and worked in Central Asia. 892), Abu Nasr Farabi (873–950), Abu Rayhan Beruni (973–1048), Abu Ali ibn Sina (Avicenna, 980–1037), Mahmud Zamakhshari (1075–1114) etc. Baghdad was founded in the 60s. VIII century Caliph al-Mansur. Within four years (762–766) it became the “Capital of the Muslim World.” The new capital of the state, which at that time occupied a vast territory, quickly became an important centre of trade, science and culture. This city differed from others in its layout. It had the shape of a circle with a diameter of approximately 2 km. It was surrounded by a double fortress wall with four gates facing north, south, east and west. The city, where people came from various regions of the caliphate, was crowded and lively, famous for its bazaars. A large scientific school arose in Baghdad, which attracted outstanding scientists from different countries. Most of the scientists working at the Mamun-Baitul-Hikma Academy in Baghdad came from Central Asia, including Merv and Khwarazm. Such famous scientists as Ahmad al Ferghani, Muhammad Khwarizmi, his brother Ahmad Khwarizmi (sons of Musa ibn Shakir), Husayn ibn Ishok, Hamid ibn Abdumalik Marwazi and many others worked there. These scientists translated and commented from ancient Indian and ancient Greek into Surenium, Arabic and Latin a number of works on astronomy, geography, geodesy, geometry, medicine and biology, philosophy and other sciences. Thanks to the scientific heroism of these scientists, the Arabic-speaking world learned about the works of Hippocrates and Galen, Plato and Aristotle, Euclid and Ptolemy. Particular attention at this time was paid to the achievements of ancient Greek and Hellenistic science. Special expeditions were sent to purchase manuscripts. Of particular interest were the exact sciences - mathematics, astronomy, geodesy, mathematical geography. Euclid's Elements, Ptolemy's Almagest, Menelaus Spherita, etc. were translated. Indian astronomical works were also studied. However, Baghdad scientists of the VIII - IX

centuries. They also engaged in independent research and achieved remarkable results in various fields of knowledge.

4. RESULTS

Science in Baghdad reached its greatest flourishing under the caliph al-Mamun, who ruled from 813 to 833. Under him, the “House of Wisdom” (Bayt al- Hikma) was founded, an institution that performed the functions of the Academy of Sciences. A rich library was created at the “House of Wisdom,” which contained more than 400 thousand volumes of ancient manuscripts and two astronomical observatories. Al-Khwarizmi worked for many years in the Baghdad House of Wisdom, along with other scientists of this academy. Al-Khwarizmi is best known for his “Book of Complementation and Opposition” (“Al-kitab al-mukhtasar fi hisab al-jabr wa-al-mukabala”), from the name of which the word “algebra” is derived. The treatise on algebra also includes a "chapter on transactions" (which discusses a rule for finding an unknown term of a proportion from three known terms) and a "chapter on measurement" (which deals with rules for calculating the area of various polygons, an approximate formula for the area of a circle, and a formula for volume truncated pyramid). It is also accompanied by the “Book of Wills,” dedicated to mathematical problems arising during the division of inheritance in accordance with Muslim canon law. 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 (Ibn Turk, Abu Kamil, al-Karaji, etc.). This book was translated twice into Latin in the 12th century and played an extremely important role in the development of mathematics in Europe. Such an outstanding European mathematician of the 13th century as Leonardo of Pisa was directly influenced by this work.

5. CONCLUSIONS

Al-Khwarizmi wrote a book “On Indian Counting,” which contributed to the popularization of the decimal positional system for recording numbers throughout the Caliphate, right up to Spain. In the 12th century, this book was translated into Latin and played a very important role in the development of European arithmetic and the introduction of Indo-Arabic numerals. The name of the author, in Latinized form (Algorismus, Algorithmus), began to designate the entire system of decimal arithmetic in medieval Europe; This is where the modern term algorithm, first used by Leibniz, originates.

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