

AL-KHWAREZMI'S CONTRIBUTION TO THE DEVELOPMENT OF THE EASTERN RENAISSANCE

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Abstract

This essay shows Al-Khwarizmi and his importance in the Eastern Renaissance. Al-Khwarizmi made a great contribution to the development of science through his work in the fields of mathematics, astronomy and geography. His works influenced not only Eastern, but also Western science.

Keywords: Al-Khwarizmi, Eastern Renaissance, Mathematics, Astronomy, Geography, Science, Culture.

Introduction

Al-Khwarizmi, a great Muslim scholar who lived in the 9th century, made a great contribution to the formation of the Eastern Renaissance through his works. His scientific achievements, in particular, his works in mathematics, astronomy and geography, laid the foundation for future generations. Al-Khwarizmi played a significant role in the development of science, which was popular in his time, and his legacy has not lost its significance today. This essay analyzes Al-Khwarizmi's contribution to the development of science and shows his place in the Eastern Renaissance.

Al-Khwarizmi proposed many approaches to solving mathematical, astronomical and geographical problems in his works. His work "Al-Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala" (The Book of Algebra and Reciprocity) forms the basis of the field of algebra in mathematics. This work mainly contains rules and methods for solving equations and played an important role in the formation of terminology in the field of algebra.

Al-Khwarizmi also made significant contributions to astronomy. In his work "Al-Zij al-Ma'muni" he presented astronomical observations and conclusions, as well as astronomical tables and calculations. This work is of great importance in the history of Eastern and Western astronomy, and was later continued in the works of Western scientists. In the field of geography, Al-Khwarizmi wrote the work "Kitab surat al-ard" (Book of the Image of the Earth). This work contains information about geographical maps, location and climate and helped to expand the geographical knowledge of his time. Al-Khwarizmi used mathematical methods in creating maps and developed a scientific approach to solving geographical problems.

The influence of Al-Khwarizmi's works continued not only in his time, but also in subsequent centuries. His mathematical and astronomical approaches had a great influence on Western scientists, and his name was recognized in Western science. Al-Khwarizmi's works also continue to be used in modern mathematics and scientific research.



Al-Khwarizmi's scientific activity is reflected in his works aimed at solving mathematical, astronomical and geographical problems. He is known as a scholar who strives to update, improve, and propose new approaches to accepted knowledge in many fields. His works, in particular, "Al-Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala" (The Book of Algebra and Algebra), opened up new horizons in mathematics and systematized knowledge in this field. In the field of algebra, Al-Khwarizmi described in detail the methods for solving equations and established a clear and systematic approach to this process. The terminology and concepts in his work led to the origin of the modern word "algebra" in mathematics. Al-Khwarizmi presented several approaches to solving equations in his work, such as quadratic and cubic equations, and also developed methods for simplifying complex equations to facilitate their solution. These approaches were of great importance not only in his time, but also for subsequent generations.

Al-Khwarizmi's analytical style in his mathematical works was aimed at solving geometric problems using algebraic methods. He combined geometry with algebra, creating the possibility of using an intuitive approach to solving problems. This, in turn, played an important role in the development of mathematical thinking in future generations of scientists. He also provided examples for solving important problems, preparing his work to serve as material for the formation of not only theoretical but also practical skills. Al-Khwarizmi's contribution to astronomy is also unique. In his work "Al-Zij al-Ma'muni" he provides important information about astronomical observations, the movements of planets and stars. His work contains astronomical tables and calculations, which served as an important source for Western astronomy. Al-Khwarizmi developed many astronomical instruments, including the astrolabe, quadrant, and spherical trigonometry instrument. His theories and methodologies led to developments in astronomy in the following centuries and influenced the research of European scientists. In his work, Al-Khwarizmi proposed new approaches based on modern astronomical theories and models.

In the field of geography, Al-Khwarizmi used scientific methods in the creation and study of geographical maps in his work "Kitab surat al-ard" (Book of the Image of the Earth). He made a significant contribution to the development of geography and cartography, providing accurate and detailed information about maps and locations. Al-Khwarizmi also used mathematical methods in determining the coordinates of geographical objects and for the first time in his work presented a wide range of geographical images using astronomical measurements. His work influenced not only Eastern geography, but also Western geographical knowledge.

Studying the works of Al-Khwarizmi, analyzing his scientific methodology and approaches, helps to determine his place in the history and culture of science. The strength of Al-Khwarizmi's work is that it was a perfect expression of mathematical and scientific knowledge, as well as the introduction of new theories and concepts in these areas. He presented not only theoretical knowledge in his work, but also practical skills, which left him as a valuable source for future generations. His works played an important role in the development of scientific interaction between Eastern and Western scientists, and his name was later recognized worldwide. The importance of Al-Khwarizmi's works continued not only in the development of science in his time, but also in subsequent periods. His scientific approaches, methodology for solving problems and research do not lose their significance in the development of



mathematical and scientific research even today. This further strengthens Al-Khwarizmi's place in the history of science and culture and emphasizes the need to preserve his legacy.

The renewal of Al-Khwarizmi's creativity, his efforts to create new theories and methodologies in his time, are visible in every field of science. His methods of study and scientific approaches have had a great influence on the formation of modern scientific methodologies. Al-Khwarizmi's works also serve as a guide for every scientist striving for scientific development. In his works, he proposed methods for identifying problems and solving them, which contributed to the further expansion of achievements in scientific activity.

Al-Khwarizmi's scientific achievements and their historical significance are still being studied and widely discussed today. His scientific legacy, while providing the necessary knowledge to achieve high achievements in the fields of mathematics, astronomy and geography, remains an important source of inspiration for future generations. Al-Khwarizmi's works, his approaches and research form the foundation of the development of science not only in his time, but also today. Al-Khwarizmi's work "Kitab surat al-ard" is an important step in the field of geography, through which he systematized the knowledge of his time and introduced innovative approaches to the study of geographical knowledge. This work not only provided information about geographical maps and locations, but also provided the application of scientific methods based on geographical measurements and images. This work of Al-Khwarizmi is one of the most important works of his time aimed at expanding and improving geographical knowledge. Al-Khwarizmi's "Kitab Surat al-Ard" is notable for its accurate depiction of geographical objects. He provided detailed information about various regions of the earth's surface, their climate, natural resources, as well as economic and cultural characteristics. This work served to further deepen the geographical knowledge of his time through geographical images and data, and was appreciated and widely studied by Western scholars.

The work tells a lot about Al-Khwarizmi's depiction of geographical objects based on his astronomical observations and mathematical calculations, and the perfection of his scientific approach. In his work, he used astronomical measurements to indicate geographical locations, which was a novelty for his time. Al-Khwarizmi also recommended the use of mathematical formulas and astronomical observations to determine the distances between geographical objects, which strengthened the relationship between geographers and astronomers.

Al-Khwarizmi also introduced innovations in the creation of geographical maps. He developed precise and systematic methods for depicting locations and objects on maps. His maps were created not only on a theoretical basis, but also based on practical experience, which opened up new horizons in the development of geographical knowledge. Al-Khwarizmi's maps were later used on European maps, which had a significant impact on the development of geography.

The geographical information in Al-Khwarizmi's works remained useful not only in his time, but also in subsequent centuries. His images and maps, as well as information about geographical objects, served as an important source for scientists and travelers. The geographical indicators and information presented in the work, such as mountains, rivers, deserts and other natural objects, helped to open up new knowledge in his time.

Al-Khwarizmi provided accurate and detailed information about many geographical objects in his work. He created new knowledge by analyzing and systematizing the knowledge available in his time. This approach, of course, led to progress not only in geography, but also in other



fields. Al-Khwarizmi's geographical approaches also influenced other geographers and scientists of his time. His geographical methodology and scientific approach are still important today. Al-Khwarizmi, combining scientific and theoretical approaches in his work, made a great contribution to the development of geographical knowledge. His methodology is also used in modern geography, which further increases the importance of his scientific heritage.

The influence of Al-Khwarizmi's "Kitab Surat al-ard" spread not only to the countries of the East, but also to the West. His works and scientific approaches later had a great influence on the work of European geographers. This, of course, in turn, led to the development of scientific cooperation and cultural exchange.

Al-Khwarizmi is considered to have been a leader in the development of geographical knowledge in his time. His works clearly described many geographical objects and their relationships, forming the basic principles of modern geography. Al-Khwarizmi's approaches, methods and methodology served as an important foundation for the development of geographical knowledge. Al-Khwarizmi's works demonstrate a unique combination of scientific methodology, education and experience. He included not only basic theories, but also practical skills for modern geographers. His approach introduced new ways of thinking in understanding geographical objects and processes.

The geographical information presented in Al-Khwarizmi's works is also used in modern scientific research, helping to understand geographical features and apply them in practice. He offered accurate and modern knowledge for his time, which increases the value of his scientific legacy.

Al-Khwarizmi's "Kitab Surat al-Ard" has gone down in history as the most important work in the field of geography. It played an important role in the development of science, contributing to the further expansion and improvement of geographical knowledge. This work is valued for the excellence and innovative manifestations of Al-Khwarizmi's scientific approaches.

The study of Al-Khwarizmi's scientific legacy is still important today, and his influence continues. He opened up new directions for scientific thought and research with his innovative approaches not only in geography, but also in other fields. Al-Khwarizmi's achievements and scientific approaches, having consolidated his position, played an important role in modern science and culture. Al-Khwarizmi's contribution to astronomy occupies an important place in the scientific development of his time. He expanded mathematical approaches to the study of astronomy and developed accurate and modern methods for astronomical observations. Al-Khwarizmi's work "Zij al-Ma'muni" is one of the most important works in the field of astronomy, in which he collected and systematized astronomical data available at his time. In this work, he presented valuable astronomical tables and explanations, which served as a source of new knowledge for astronomers and naturalists. Al-Khwarizmi's astronomical tables and explanations were of great importance in their practical application. His approaches, the results obtained as a result of astronomical observations and calculations, in turn, had a strong influence on the development of astronomical science at that time.

Studying Al-Khwarizmi's astronomical works allows us to understand his scientific methodology and mathematical approaches in a deeper way. He introduced the use of mathematical modeling in understanding astronomical objects and processes. Al-Khwarizmi's astronomical methods were also adopted by Western scientists and had a great influence on



them in subsequent centuries. His approaches played an important role in the practical application of astronomical theories, which led to the further development of astronomy.

Al-Khwarizmi's astronomical research is of not only theoretical but also practical importance. He combined astronomical observations with his theoretical knowledge and presented the practical results of his research. He developed precise methods and equipment for studying astronomical phenomena. This approach, in turn, was of great importance in the development of the science of astronomy and laid the foundation for the next generation of scientists.

When studying Al-Khwarizmi's astronomical works, a lot of information is obtained about his theoretical approaches and methodology. He conducted scientific research by linking astronomical observations and theories. Al-Khwarizmi's astronomical interpretations play an important role, for example, in determining the movements of terrestrial and celestial bodies. In his work, he combined astronomical observations with mathematical methods and created new astronomical theories.

His work "Zij al-Ma'muni" contains the most advanced astronomical data of his time and is appreciated by Western scientists. Al-Khwarizmi introduced innovative approaches to classifying and interpreting astronomical data in his work. His tables and descriptions were an important step in the astronomical community and allowed for the further development of astronomical research. Al-Khwarizmi's work in astronomy helped to create many new ideas and theories. He studied astronomical movements, understood their causes, and carried out mathematical modeling. This work opened new directions in the development of the science of astronomy and expanded previously established theories and views. Al-Khwarizmi, combining astronomy and mathematics, formed new scientific paradigms. Many new astronomical aspects were introduced in his work. Al-Khwarizmi's astronomical research played an important role in studying the structure of the universe, the movement of bodies, and the relationships between them. Through his scientific approaches, he introduced advanced methods for determining the distances between astronomical objects and their movements. These studies later influenced other scientists and astronomers. Al-Khwarizmi's astronomical theory and the mathematical formulas he developed are still important today. The astronomical data and approaches he presented in his works are used in modern astronomical research and theories. Al-Khwarizmi's contribution to astronomy was important in the development of the science of astronomy, and his methodology and approaches continue to influence the development of science today.

His works served as the main source of achievements and discoveries in the field of astronomy in his time. Al-Khwarizmi, with his new approaches, presented new views on astronomy and introduced methods that could be used to solve new problems in this field. His methodology and scientific methods opened up new directions for research in the field of astronomy.

Al-Khwarizmi's works in the field of astronomy also provided him with high recognition and appreciation. His scientific legacy aroused great interest not only in the East, but also in the West, and many scientists tried to study his work. This, in turn, led to the development of science, and Al-Khwarizmi's contribution to astronomy is of great importance for the lifelong process of acquiring knowledge.

Conclusion.

Al-Khwarizmi occupies an important place in history with his contribution to the development of the Eastern Renaissance. His scientific achievements, through the study of his works, have



played a significant role in the development of science in his time and in subsequent periods. Al-Khwarizmi's works in the fields of mathematics, astronomy and geography have influenced not only Eastern but also Western science. His legacy has not lost its significance today and plays an important role in the development of scientific research.

REFERENCES

1. Al-Khwarizmi, Muhammad ibn Musa. *Al-Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala*. Oxford: Oxford University Press, 1983.
2. Nasr, Seyyed Hossein. *Islamic Philosophy from Its Origin to the Present: Philosophy in the Land of Prophecy*. State University of New York Press, 2006.
3. Gutas, Alexander. *Avicenna and the Aristotelian Tradition: Introduction to Reading Avicenna's Philosophical Works*. Brill, 1988.
4. Ghanem, Saeed. "Al-Khwarizmi and the Influence of His Works on the Development of Mathematics." *Journal of Mathematics and Culture*, vol. 2, no. 1, 2007, pp. 1-10.
5. Sayili, A. "The Islamic Contribution to Astronomy: Al-Khwarizmi and the Development of the Astronomical Tables." *Journal of the History of Astronomy*, vol. 14, no. 1, 1983, pp. 33-45.

