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PHILOSOPHICAL ANALYSIS OF AL-KHWARIZMI'S GEOGRAPHICAL VIEWS

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Annotation: This scientific article is devoted to the philosophical analysis of Al-Khwarizmi's geographical views.

Keywords: Science and culture, Arab Caliphate, deterministic geographical imagination, Caliphs.

The era in which Al-Khwarizmi lived was the 8th-9th centuries, a period of the Arab Caliphate's rise, the development of science and culture. Development, along with all branches of science of that time, also affected geography. Because during the time of the first Abbasid caliphs, the Arab Caliphate was still a single state, covering a vast territory from the Principian Peninsula to Western India and from the Aral Sea to the Arabian Sea. As a result, with the growth of economic needs in the Caliphate, the demand for geographical knowledge and discoveries also increased. As Academician I.Yu. Krachkovsky said, in search of knowledge they went "from Andalusia to Bukhara, from Baghdad to Qurtaba."[1]

In the Caliphate, trade caravans would travel from cities such as Egypt, Damascus, Merv, and Kot to China and India. Such trips to near and far countries, trade, and financial needs, required geographical knowledge to know not only the Caliphate countries, but also the distant unknown countries, and to know their large and small rivers, springs, wells, lakes, deserts, and mountains. There would even be people in the caravanserais in the cities who would write down the stories of travelers. The information collected from these stories and travel writers later became the basis for writing geographical works. It should be noted that no complete geographical work was written in the Caliphate until the time of Al-Khwarizmi. The first geographical works began to be written during the reign of Caliph al-Ma'mun (813-833).

Before analyzing the geographical and ontological views of Al-Khwarizmi, we think it is necessary to dwell on the history of geographical ideas in antiquity before Khorezmi.

The geographical knowledge of many ancient peoples spread mainly to their own country, which was considered the center of the Earth inhabited by people, and to their immediate neighbors. In particular, the Phoenicians are one of the ancient peoples with extensive geographical knowledge. Their ships sailed along the Mediterranean Sea and even to the Atlantic Ocean.

The geographical information of the ancient Greeks and many countries of Europe, Asia and Africa is given in Aristotle's work "Meteorology"[2]. In the work, the thinker puts forward his deterministic views, including his own unique considerations about atmospheric

[1] Крачковский И.Ю., Арабская географическая литература, Избр. Произведения. Т. IV, М.-Л., 1957, с.18.
[2] Булгаков П.Г., Розенфельд Б.А., Ахмедов А., Мухаммад ал-Хорезми. Москва «Наука», 1983, с. 162.

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precipitation, the formation of rivers, the seas and currents in them, winds and their formation, earthquakes, and volcanoes.

The geography of the ancient era can be considered, without exaggeration, the geography of the Greeks. The Greeks were naturally diligent and meticulous, and they began to be interested in the structure of the world, natural phenomena, and geography very early. Geographical information in the epics and epics of Homer (9th century BC) and Hesiod (9th century BC), which are the oldest monuments of the Greeks, shows that ontological problems were also reflected in the works of these thinkers.

Homer believed that the arable part of the Earth was surrounded by the Ocean on all sides and that the Sun rises from the Ocean and sets in it. In the Iliad, he says:

Чиқиб мавжли тинч оқар Океан сувидан,
Янги нурларила аста водийларни ёритди Қуёш.
(Iliad, VII, 421)[3].

However, at this time, Homer's empirical research had not yet been formalized into a systematic theory.

One of the most prominent representatives of such geographers was Herodotus (5th century BC). His most famous work that has come down to us is the "History",[4] which, although on a historical subject, skillfully describes the world structure and geographical views of the Greeks of the 5th century BC. Herodotus tries to describe the world known to him as accurately as possible.

Eratosthenes of Cyrene (275-195 BC) played an important role in the formation of the deterministic geographical concept of antiquity. Eratosthenes, in addition to being a geographer, was also an astronomer and mathematician. He was the first in the history of science to prove the connection between geography and geodesy, thereby laying the foundation for mathematical geography. He was the first to mathematically prove the spherical shape of the Earth and measure the length of one degree of the Earth's meridian.

After Eratosthenes, the great geographer of antiquity, Strabo, continued the tradition he began. He considered geography as a theory with a deep scientific basis and tried to show its place in social life. According to him, he says, "So much of geography, as we say, is related to marriage and the needs of rulers,"[5] and elsewhere he says: "The study of geography includes important theory - the theory of the arts, mathematics, and natural sciences, as well as the theory underlying history and legends."[6]

Strabo's connection with geography and the complementarity of these sciences can be seen in his following thoughts: "I think that the science of geography, which I have now decided to study, falls within the scope of the philosopher's occupation, like any other science... The benefit of geography is multifaceted: it can be applied not only to the activities of statesmen and rulers, but also to the science of celestial phenomena, to phenomena on land and sea, to animals, plants, fruits, and all other things that can be found in different countries. The usefulness of geography requires that the geographer be a philosopher - a person who devotes himself to the study of the art of living, that is, happiness."[7]

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[3] Муҳаммад ибн Мусо ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 226 бет.
[4] Геродот. История. В девяти книгах. Перевод и примеч. Г.А.Стратановского, под общей ред. С.Л.Утченко, Редактор перевода Н.А.Мецерский. Ленинград, 1972.
[5] Страбон. География. С.16.....
[6] Страбон. География. С. 17
[7] Страбон. География. С. 7

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Strabo's geometric description of the most important lines and points on the globe clearly reflects the influence of Aristotle's (4th century BC) Meteorology. In this work, Aristotle gave a scientific explanation of the equator, the northern and southern tropics, the northern and southern polar circles, and the north and south poles on the globe[8]. It is clear from this that Strabo shared Aristotle's views. He divides the Earth into four quarters, and says that only one of them is inhabited by humans. Later, we can see that these views had a strong influence on the geography and thought of al-Khwarizmi and the Middle East.

Khorezmi's ontological views are presented in the work "Kitab Surat-l-Arz" (Book of the Picture of the Earth), where we can see that information about the shape of the Earth and its territories is not only geographical, but also ontological. In this work, Khorezmi also used the word "surat" in the sense of a map.

The full Arabic title of Al-Khwarizmi's work is "Kitabu Surati-l-Arz min al-Mudun wal-Jibal wal-Bihar wal-Jazair wal-Anhar istakhrjah Abu Ja'far Muhammad ibn Musa al-Khwarizmi min kitabu Jugrofiyo allazi allafahu Baytlimiyus al-Qalawzi." The phrase "surati-l-Arz" is a translation of the first word in the Greek title of the work of Ptolemy (2nd century), Γεωγραφιχη υφηγησις, meaning "description of the earth." This indicates its close connection with Ptolemy's geographical work.

"Ptolemy's Geography" is an important work in the history of cartography, providing a complete atlas of the world known in the 2nd century BC. This book presents an expertly edited and annotated version of the original text, complete with detailed maps, notes, and illustrations. We believe that this book, with its thorough research and historical significance, is a must-read for anyone interested in geography, cartography, or the history of ancient cultures.

Although the year of writing of Kitab Surat-i-Arz is not stated, it is one of the three works of the scholar in Arabic that have survived to this day. According to the orientalist scholar V.V. Barthold, it should have been written after 836 or before 847[9]. It has been proven by prominent orientalists that the title of Al-Khwarizmi's work is not a translation of Ptolemy's "Geography", and it is also stated that the first copy of the work was titled "Rasm ar-rub' al-ma'mur"[10]. That is, historical sources state that Ptolemy's Geography was translated into Arabic only after Khorezm. In particular, during the reign of Caliph Al-Ma'mun, the first translations of Ptolemy's "Geography" from revised versions in Syriac into Arabic were made[11]. The fact that the information in the Syriac copies of Ptolemy's Geography differs from each other requires a re-examination of that information.

Al-Khwarizmi approached geography not only as a descriptive science, but also as a mathematical science based on accuracy. He used trigonometry and precise calculation methods in map making and determining location.

Al-Khwarizmi is a vivid example of an attempt to understand the truth that humans can know through mathematical methods and logical analysis. He formed geography by combining experimental and theoretical knowledge. This approach is important from the point of view of ontology and epistemology, because he considered human experience and

[8] Аристотель. Метеорологика. В.кн.: Аристотель. Сочинения в четырех томах. Т.III, М., 1981, 441-558, 493-497.

[9] Муҳаммад ибн Мусо Ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 242 бет.

[10] Крачковский И.Ю. Арабская географическая литература. Избр. Произведения. Т. IV, М.-Л., 1957, с.94-95.

[11] Юшкевич А.П. История математики в средние века. М., 1961, с. 170-172.

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rational analysis to be the highest method of knowledge. We can see this from the following information.

For example, by order of Caliph al-Ma'mun, in 827, the length of the 1st meridian passing through the cities of al-Raqqa and Tadmur in Syria was calculated and found to be equal to 56,3/2 Arabic miles. According to Bessel's calculations made in the 19th century, the length of the 1st meridian of the Earth is 110,938 meters. The measurements made by Al-Khwarizmi and scientists were quite accurate for their time. As a result, a large map called the "Map of Ma'mun" was created with the cooperation of many scientists, and at the same time the "Zij of Ma'mun" was also created[12]. It can be seen that Al-Khwarizmi's geographical views, in accordance with his approach to all science, are based on a clear system and laws. Through his information about the shape and territories of the Earth, he helps to explain the responsibility of man to the Earth. His ideas can be considered as the first steps towards modern awareness and global approaches to the shape of the Earth. In his time, Al-Khwarizmi's work "Kitab Surat-l-Arz" was highly appreciated by the historian and geographer Al-Mas'udi of the 10th century: "... I have seen these climates depicted in different colors in several books. This is the best of its kind that I have seen." The 12th-century geographer Al-Zuhri says that the "Map of Al-Ma'mun" is divided into seven climates[13].

Al-Khwarizmi's work "Kitab Surat-l-Arz" contains scientific information about the main concepts of world geography. In this work, he presented important information about the shape of the Earth, its territories and the relationship of human life with nature. When analyzed from an ontological point of view, the work reflects not only information about the shape and territories of the Earth, but also the role of man in understanding the world. We can see this in the following examples.

Al-Khwarizmi organized his work in the form of a table - a zij, and this feature of the work led to its being considered a geographical part or continuation of the "Zij".

The work "Kitab Surat-l-Arz" consists of six sections, and in the first section the names of cities in the administrative part of the Earth inhabited by people are given in a table along seven climates, with their longitudes and latitudes. The cities are listed in the direction from west to east and from south to north, according to Greek tradition.

In the second section, Khorezmii also provides a table with the coordinates of the beginning and end of each mountain, as well as the colors and directions of the mountains.

The third section of the book is devoted to the description of the seas on Earth. The most important aspect of this chapter is that Khorezmii gives several names for the Caspian Sea, one of which is the Khorezm Sea. This name is used for the first time in science by Khorezmii in relation to the Caspian Sea. However, this does not mean that Khorezmii imagined that the Caspian Sea was connected to the Aral Sea. Because he called the Aral Sea by a separate name “Khorezm Lake” (“Bukhairatu Khorezm”). On the contrary, this indicates that the area of Khorezm in the Middle Ages was large, and its borders even reached the Caspian Sea. There is information about this in historical sources. According to the Khorezm king Farazman, during the reign of Alexander the Great, we can see that even the lands between the Caspian and Black Seas were subordinate to Khorezm[14]. Or, if we take into

[12] Крачковский И.Ю. Арабская географическая литература. Избр. Произведения. Т. IV, М.-Л., 1957, с.86-88.
[13] Крачковский И.Ю. Арабская географическая литература. Избр. Произведения. Т. IV, М.-Л., 1957, с.87.
[14] Арриан. Поход Александра. Перевод с древнегреческого М.Е.Сергеенко, М-Л., 1962, с. 146-147.

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account that the area of Khorezm, as reported by the early medieval geographer al-Maqdisi, is 6,400 farsakhs, or more than 230,000 km2, we see that there is reason for the Khorezmians to call the Caspian Sea the Sea of Khorezm[15].

The fourth section of the book is devoted to describing the islands in the seas. The fifth section provides information about countries, states and territories.

The final, sixth section of the book describes the rivers and springs in the inhabited part of the Earth. Al-Khwarizmi gives the geographical coordinates of a total of 2402 geographical points. Al-Khwarizmi's achievements in geography were not only based on theoretical knowledge, but were also widely used in practical applications such as precise cartography and navigation. This means that in his philosophical views there is a harmony between science and practice.

The work provides information about various regions, their natural resources and populations. This information helps to understand the relationship between man and nature at an ontological level. Descriptions of territories show the dependence of man on nature. Various natural resources and climatic conditions are considered as the main elements of human life. Another important aspect of the work is that it analyzes the issue of climates.

The problem of climates was an important issue in Eastern geography throughout the Middle Ages. There was no single opinion on this issue, and Al-Khwarizmi's views on climates were the first attempts in medieval geography to do so.

He described the shape of the earth, cities, rivers, mountains, and other geographical features on the basis of mathematical models. This approach is consistent with the philosophical idea that the material world is based on strict laws.

According to experts, it is likely that Khorezmii's choice of seven climates was due to the fact that he was a pagan by origin, and that the number seven was considered a mysterious number by the pagans, and that the peoples of Iran and Central Asia believed that the fertile part of the earth was divided into seven regions.

We can find more extensive information on the study of the problem of climates in Abu Rayhan Beruni's work "Tafhim". According to the ancient geographical ideas of the Iranian peoples, the inhabited part of the earth was divided along the longitude and consisted of three parts: the eastern part consisted of the lands inhabited by the Turkic peoples and China, the western part consisted of Rome, that is, the western countries around the Mediterranean Sea, and the middle consisted of Iran and the lands inhabited by the Iranian peoples. According to the Iranian peoples, the inhabited part of the earth is divided into seven regions: the first region is India, the second region is the land of the Arabs, the third region is the Maghreb, the fourth region is Iran, the fifth region is the lands of the Romans and Slavs, the sixth region is the lands of the Khazars and Turkic peoples, and the seventh region is China and Tibet[16].

In Article V of "Qanuni Masudi", Al-Biruni calculates the coordinates of 602 cities in seven climates[17]. It is clear from this that Beruni significantly expanded the knowledge of geographers who preceded him and Khorezmii. He measured the radius of the Earth at the Nandna fort in India and presented the method of measurement in a number of his works.

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[15] Муҳаммад ибн Мусо Ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 415 бет.

[16] Муҳаммад ибн Мусо Ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 240 бет.

[17] Абу Райҳон Беруний. Қонуни Масъудий. V Т. II китоб, Тошкент “Фан”, 1976, 400-428 бетлар.

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Beruni discusses the geographical views of the ancient Indians about the Earth in chapter 29 of his work "India" entitled "Determination of the inhabited part of the Earth according to the imagination of the Indians", also paying attention to the Indian theory of climates and cites the following. The Indians called the inhabited part of the Earth Navakhanda-prathama, that is, "the first nine parts"[18]. Biruni took this information from the work of the Indian astronomer Varahamihira, who lived in the 6th century, called "Brihat-samhita"[19]. In general, it is a tradition of Indians to include geographical sections in astronomical works, and this was also present in the Sindhanta. It is known in science that one of these Sindhantas was translated into Arabic during the time of Caliph al-Mansur, and by order of Caliph al-Ma'mun, Khorezmī compiled the Zij, known as the Lesser Sindhind. Indian traditions had a very strong influence on astronomy and geography in the Caliphate. Caliphate astronomers, like Indian astronomers, included geographical sections in their astronomical works, the Zij. This tradition began during the time of Khorezmī and continued until Ulugbek. The ninth chapter of Khorezmī's astronomical work, Kitāb fi usul ilm an-nujum (Book on the Fundamentals of Astronomy), was entitled "On the Names of Certain Countries and Cities on Earth and Their Climates." According to the Greek tradition, Ferghani places countries and cities in seven climates, while according to the Indian tradition, he shows them in the direction from east to west.[20].

Thus, by the first half of the 9th century, the ideas that combined ancient Eastern and Western scientific traditions and new geographical views in the Caliphate were implemented by Al-Khwarizmi.

Thanks to Khwarezmi's theory, the study of the inhabited part of the Earth by regions became easier, and the desire to identify unknown lands in the regions and study continents increased.

Khwarezmi mentions the cities of Central Asia in the fifth and sixth climates. These are Sarakhs, Merv, Marwarrud, Bukhara, Balkh, Samarkand, Usrushana, Khujand, Banokat, Akhsikat, Torband, Isfijab, Taraz, Khorezm, Khazar, Shosh and other cities. The information about Tashkent in the work is significant, it is mentioned under the name Burji Hijara, that is, Tash Kala,[21] and lists its geographical points as mountains.

According to information provided by Abu Rayhan Beruni, the phrase "Burji Hijara" is a translation of the name Lithinas purgos in Ptolemy - that is, "Stone Fortress", which is also a translation of the name "Tashkent" in the Turkic language[22].

The "Burji Hijara" or Stone Fortress in Khorezm should be understood as Tashkent and its oasis, and Beruni testifies in his work "India" as follows: "Tashkent means a stony village. In Ptolemy's book "Geography" it is called Burj al-Hijara (Stone Fortress)."[23].

The description of the rivers of Central Asia in Khorezmii's work is also noteworthy. The thinker had a clear idea of the Aral Sea. Khorezmii calls it a "lake" and gives its dimensions. In his imagination, the Aral Sea stretched from west to east from 86º30' to 90º, that is, 3º30'. This is about 390 km. Today, the level of the Aral Sea has decreased significantly, but it is important that Khorezmii had a surprisingly accurate idea of

[18] Абу Райҳон Беруний. Ҳиндистон. Тошкент “Ўзбекистон”, 2022, 214 бет.
[19] Абу Райҳон Беруний. Ҳиндистон. Тошкент “Ўзбекистон”, 2022, 216 бет.
[20] Муҳаммад ибн Мусо Ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 241 бет.
[21] Муҳаммад ибн Мусо Ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 313 бет.
[22] Абу Райҳон Беруний. Қонуни Масъудий. V Т. I китоб, Тошкент “Фан”, 1973, 426 бет.
[23] Абу Райҳон Беруний. Ҳиндистон. Тошкент “Ўзбекистон”, 2022, 217 бет.

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the dimensions of the Aral Sea. Khorezmii also accurately described the flow of the Amu Darya (Balkhi River) and the Syr Darya (Uzun Darya) into the Aral Sea[24].

Khorezmii describes the Aral Sea using specific numbers, which shows his mathematical approach. He tried to systematize information about the real world, relying on the methods of geography and cartography. This reflects his approach to science, in particular, to the exact sciences.

The names of rivers such as the Amu Darya and the Syr Darya and their discharge into the Aral Sea are one of the important elements of natural geographical ontology.

Khorezmii calls the Aral Sea a “lake”, which shows his approach to the classification of water bodies. In his time, the concepts of “sea” and “lake” may not have been as clearly distinguished as they are today. However, it seems that the Aral Sea was indeed classified here as a large saltwater lake.

Today, the level of the Aral Sea has decreased significantly. This means that the state of the Aral Sea described by Khorezmii has changed over time. However, his information reflected the reality of that time, and this shows the accuracy of his geographical knowledge. Khorezmii describes the Caspian Sea on pages 80-81 of his work “Kitab Surat-i-Arz”. In ancient and medieval times, this sea was called by many names. Ptolemy mentions it as the Hyrcania and Caspian Seas. In the East, it was also more often called Gurgan or, in Arabic, the Jurjan Sea. Khorezmii, in addition to calling it the Jurjan, Tabaristan and Daylam Seas, also sometimes calls it the Khorezm Sea in the history of science, and this information of the scientist is of great historical importance.

Study of the work

Khorezmii's "Book of the Image of the Earth" is a single manuscript kept in the library of the University of Strasbourg (France) under the number 4247. The manuscript is indicated to have been copied in the month of Ramadan 428, that is, in 1937[25]. The manuscript was discovered in 1878 by W. Spitta, director of the Hadith Library in Cairo. After his death, the manuscript was brought to Strasbourg in 1883 and has been kept there to this day. The first scientific articles about the work in Europe were published by W. Spitta in 1879 and 1892[26]. Later, the Italian mathematician and Arab scholar C. Nallino made a deep scientific analysis of the work and published his major article in 1895. This article was included in the fifth volume of C. Nallino's selected works[27]. He localized a number of names in the work for the first time, that is, he restored them and indicated the point on Ptolemy's maps or in which geographical region they were located, and he restored a number of names in Europe and Asia.

The Austrian Arabist H. Mjik analyzed the work of Khorezmii in a number of articles. In his monograph published in 1915, he compared the data of eastern geographers, including Khorezmii, with the maps of Ptolemy[28]. H. Mjik published the Arabic text of the work in

[24] Муҳаммад ибн Мусо Ал-Хоразмий. Танланган асарлар. Тошкент “Фан”, 1983, 145-147 бетлар.

[25] Крачковский И.Ю. Арабская географическая литература. Избр. Произведения. Т. IV, М.-Л., 1957,с.93. Шу ерда рус тилидаги китоблардан сноскани қўйиш керак.

[26] Крачковский И.Ю. Арабская географическая литература. Избр. Произведения. Т. IV, М.-Л., 1957,с.93.

[27] Nallino Carlo Alfonso. Al-Khuwarizmi e in suo rifasimento della Geographia di Tolomeo, in Carlo Alfonso Nallino Raccolta di scritti editi e inedita, vol. V, Astrologia-Astronomia-Geographia, Roma, 1944, pp. 458-532.

[28] Mžik H. v. Ptolemaeus und die Karten arabishen Geographen Vortrag gehalten in der Fachsitzung der k-k. geographichen Gesellschaft am. 4. Mai 191. Mitt. der K.K.Geogr. Ges. in Wien. LVIII, 1915, ss. 153-176.

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1926[29]. He uses the works of the 10th-century geographer Sukhrob and the works of the 14th-century geographer Abu'l Fido to restore the names in Khorezm's work. In this edition, Mzhik uses Greek names from the works of Ptolemy or the works of Greek scholars of the Alexandrian school, as well as Syriac reprints. According to him, during the preparation of the manuscript for publication, many names were difficult to find due to the absence of diacritical marks in the Arabic script and the omission of words.

Later, the great Uzbek orientalist and Khorezmist scholar A. Akhmedov, who translated Khorezm's work from Arabic into Uzbek and prepared it for publication, managed to restore geographical names and coordinates that H. Mzhik and other scholars did not restore and did not attach importance to[30]. It is worth noting that research has also been conducted in Uzbekistan to study the scientific heritage of Al-Khwarizmi. In particular, P.G. Bulgakov,[31], H.H. Hasanov,[32], O. Buriev[33] and other scientists have reflected Khorezmi's contribution to mathematics and geography in scientific articles or monographs. Professor O. Faizullaev conducted scientific research devoted to the study of al-Khwarizmi not only as a mathematician but also as a philosophical thinker, while Professor B. Turaev[34] shed light on some aspects of Khorezmi's scientific and organizational activities and scientific heritage.

Al-Khwarizmi's geographical works also reached Europe during the Middle Ages. In the 11th century, the astronomer al-Zarqaly (c. 1029-1087), who lived in Spain, compiled an astronomical work called "The Toledo Tables" that took the geographical coordinates of cities from Al-Khwarizmi's work. This work was translated into Latin in the 12th century and became widely distributed in Europe[35].

Al-Khwarizmi's geographical views are aimed not only at describing the earth's surface, but also at understanding and systematizing it. His philosophical approach is aimed at understanding the universe through rational and mathematical analysis, which is closely connected with the thinker's general scientific philosophy. Therefore, his geographical views are of great importance not only from the point of view of cartography, but also from the point of view of ontology, epistemology, and scientific methodology.

Analysis of ontological views in Al-Khwarizmi's "Kitab Surat al-Arz"

Al-Khwarizmi lived in the 8th-9th centuries during the Arab Caliphate, during a period of rapid scientific and cultural development. Interest in geography increased in connection with the expansion of the Caliphate's territory and economic needs. Information collected through trade caravans and travelers paved the way for the creation of geographical works.

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In antiquity, Greek and Roman scholars shaped geographical knowledge. Scholars such as Aristotle, Herodotus, Eratosthenes, and Strabo discussed natural phenomena and the shape of the Earth. Al-Khwarizmi's views were also influenced by these scientific traditions.

Al-Khwarizmi's "Kitab Surat al-Arz" was written under the influence of Ptolemy's "Geography", which presented information about the shape and territories of the Earth using a descriptive and mathematical approach. He tried to explain the Earth through maps and contributed to the formation of geography as an exact science.

When the work is analyzed from an ontological point of view, it becomes clear that the shape of the earth and its territories are considered as truths that can be known by man. Al-Khwarizmi's geographical data help not only to determine the shape of the earth, but also to understand the relationship between human society and nature.

Al-Khwarizmi's works and scientific achievements had a great influence on the development of geography and cartography in the Islamic world. His work served as a main source for scholars in subsequent centuries and made a great contribution to the formation of world geography.

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