ABU RAYHAN BERUNI'S CONTRIBUTION TO THE DEVELOPMENT OF THE SCIENCE OF GEOGRAPHY

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Annotation: This article reflects the contribution of Abu Raykhan Beruni to the science of geography, as well as a review of his works. This justifies the fact that the formation of the science of geography goes back to ancient times.

Key words: thinker, Nandi, India, Mahmoud Ghaznavi, Ptolemy, China, Tibet

ВКЛАД АБУ РАЙХАНА БЕРУНИ В РАЗВИТИЕ НАУКИ ГЕОГРАФИИ

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Аннотация: В данной статье отражен вклад Абу Райхана Беруни в географическую науку, а также сделан обзор его работ. Это обосновывает тот факт, что формирование науки географии восходит к глубокой древности.

Ключевые слова: мыслитель, Нанди, Индия, Махмуд Газневи, Птолемей, Китай, Тибет

Just as the roots of the currently existing sciences go back to the distant past, the origin of the science of geography dates back to ancient antiquity, that is, to the 5th century BC, while some advancements in science date back to the Middle Ages. Just as the geography of antiquity cannot be imagined without Aristotle and Claudius Ptolemy, it is difficult to study the geography of the Middle Ages without Abu Rayhan Beruni. Beruni worked tirelessly for science, and as a result of his work, he is considered the author of more than 150 works. Among these works, the number of works on geography is 12. In the rest of his works, concepts and information related to geography are scattered. In particular, in the field of geography, Beruni summarizes the information available in the scientific literature and further enriches it with the information collected by his contemporaries, tourists and merchants. Most of the geographical information left by the scientist is the first source in the literature of the East to cover the issues of this or that science. The thinker's information

about the northern countries, the Baltic and the White Sea, which were not well known at that time, and the information about places in Siberia "where it is winter when we have summer" are especially interesting. Beruni also described the countries adjacent to China and Tibet more fully and accurately than his predecessors. His hypothesis, which contradicted Ptolemy's, justified the fact that the southern side of the Atlantic and Indian oceans were connected to each other. The thinker assumed that there was a strait between the continents of Asia and Africa, and that the southern side of the globe was land.

For example, Beruni is considered to be the first globe discoverer in the East, but also in the whole world. In addition, the scientist clearly stated several times in his works that he firmly believed in the sphericity of the earth and provided evidence proving the sphericity of the earth. Beruni - "the main reason why the sun is not visible at night is not because it moves away from the earth, but because of its roundness, it is not visible to us. When some nations see the sun rise, other nations see the sun above them at the same time. If the earth were not round, it would not be surrounded by areas of different latitudes, day and night would not be different in summer and winter, they would not change as they do now. - put forward the ideas.

When the scientist was living in India, an incident happened when he was climbing a high mountain near the city of Nandi. When he first decided to climb the mountain and went to the foot of the mountain, he had no intention in his heart. For some reason only one thing, a lonely tree standing on the far horizon, attracted his attention. After climbing 200 steps up the mountain, he stopped to catch his breath, stopped and involuntarily looked at the tree. The tree standing on the horizon had reached the foot of the mountain, and the horizon had receded into the distance. This event was not new for Beruni. When he was brought to Ghazna by the order of Mahmud Ghaznavi, he built an observatory in Ghazni and practiced astrology there. Even when he observed the celestial movements and compiled a star chart, the idea of the shape of the globe did not

leave his mind. p times had passed. But, while watching the opening of new horizons as you climb higher and higher, it turns out that this land, which is bounded by the sky of the circle of gyre, is not as flat as everyone thinks. Beruni was engaged in various measurements here for up to a week. First, he climbs the horizon visible at the foot of the mountain, then slowly climbs the mountain, while climbing, he measures the range of horizons opened at every hundred steps, and then multiply the obtained numbers by the height of the mountain to get determines the angle l. The most important discovery was the determination of the straight line joining the center to any point on the globe, which enabled him to solve the problem that most troubled him, namely, to prove numerically that the globe is round and not flat.

Also, the thinker - "The earth is generally round, but some of its places are rough, because the mountains are protruding, the depressions are deep; however, its shape is spherical, and the height of the mountains is very small compared to the whole earth. Have you ever seen a round object, a cubit or two cubits in diameter, with little indented marks on its surface, and the mountains and depressions are equally insignificant compared to the whole earth. If the earth did not have such undulations, everything would be covered with water, and nothing would be visible. However, water has weight like the earth" - put forward the hypothesis.

The scientist tried not only to clearly imagine the earth, but also to make its shape. In this regard, he consults with his first disciple, Abu Nasr ibn Iraq. When Ibn Iraq asked Abu Rayhan Beruni what books he had read that would help him to make a picture of the globe, he replied that the scholar Ptolemy's book "Geography" and Jaykhani's "Book of Roads". I learned the names of cities and the distance between them by asking people who visited and saw these places. I checked what they said by comparing each other, and Beruni gave the teacher several notebooks, each page full of tables, numbers and notes. The teacher carefully flipped through the notebook and said: - "It is enough to make

half a ball." This specific information can be reflected in it. "If the size of the half-sphere to be made is larger, it will be easier to mark the places on it," he said.

According to the scientist's biography, between 994 and 995, he made a globe of the Northern Hemisphere in Khorezm. It is a relief globe, estimated to be 5 meters in diameter (scale 1:2,500,000). Abu Rayhan Beruni wrote about the globe he made in "Geodesia". It was found that Beruni was 22 years old when he made the globe. The scientist calculated the gravity of the earth thousands of years ago with great accuracy. One of the most popular American magazines "Science" reported about this. Article "Did Central Asians Discover America in the Middle Ages?" published under the title "Beruni discovered 1023 different ways of determining the radius of the globe. His calculations showed that the coast of the Indian Ocean is 6339.6 km. This was slightly different from the distance of 6378.1 kilometers at the true equator. Until the 15th century, such accurate measurements were not yet implemented in Europe. He determined more than 600 geographical coordinates based on his observations. The scientist measures the width of the city of Bukhara as 390201. The current latitude of Bukhara is 390201. Information about other objects and points also varies with the same error.

Beruni calculated the size of the earth's surface and measured the length of the Meridian arc to be 10-111.6 kilometers (currently 111.1). Beruni performs these measurements with the Farsang unit. Beruni's methods were later forgotten. Only in Europe, in the 15th century, his measuring works were rediscovered.

In his work entitled "Projection of constellations and countries", the scientist also gave a number of scientific and practical recommendations about cartographic projections. Modern scientists note that some of his projections have not lost their practical significance to this day. The scientist is also known as the inventor of the Pinkometer, which determines the density of liquids.

Using the apparatus, Beruni determined the density of 18 elements and substances. In his manuscripts, he included scientific and practical ideas about the difference between the speed of sound and the speed of light.

Beruni wrote the work "Relics of Ancient Peoples" in his chronicle in 1000 when he lived in Gurgon. In this work, first of all, the reader has a clear idea about night and day. In addition, the addresses of the Moon, a lot of mineralogical, phrenological and historical information, names of tribes and places are written. In one of the Eastern sources, the work is given a high rating, and it is said that the author of this work "gathered and commented on elegant issues similar to scattered durs from the books of previous scholars."

Beruni was always in conversation with the scientists of his time, or else he communicated through Makrub. Beruni corresponded with Ibn Sina during his stay in Urganch. Abu Rayhan's correspondence with Bukhara scholar Ibn Sina has reached us in the form of a book. Their conversation was in the form of questions and answers, in which the two scientists debated such issues as space, heat distribution, expansion of objects in heat and freezing in water, reflection and refraction of light. From the content of the question and answer, it is stated that Beruni opposed the conclusions made by Aristotle through observation and experience, and Ibn Sina defended Aristotle. The work is about the answers of Abu Ali ibn Sina to 18 questions written by Beruni, all of them are related to Aristotle's books "On the Sky" (ten questions) and "Physics" (eight questions).

Reducing water salinity. If a few pieces of well-dried wax are thrown into salt-water wells, the salinity of the water can be reduced. Even the experimenters said: "If you make a thin vessel out of wax and throw it into the sea water, if it does not come out into your mouth, the water that seeps into it will definitely be sweet."

In his work on mineralogy, the scientist described the geographical distribution of mineral deposits, the properties of minerals, and their names. Fanda was the first to try to determine the specific gravity of minerals, and he

used pure gold as a standard for its determination. Academician H.Abdullayev described, “Beruni is the theoretician and founder of the sciences of geology and mineralogy”.

Beruni is the scientist who first tried to study the geological features of some regions of Central Asia, including the Amudarya valley, from scientific and theoretical aspects. His conclusions about the geological past of the Amudarya valley and the formation of the Aral Sea are considered one of the most successful geological analyzes of that time. The scientist relies on the theory that "Seas turn into land, and lands turn into seas." Conclusions about the formation of outer mineral deposits, the importance of rock erosion, weathering of rocks, etc., are of great scientific importance. He put forward a theory explaining that the appearance and disappearance of mountains is based on natural factors.

In conclusion, Abu Rayhan Beruni shows the precise coordinates of countries, seas and islands located in seven climates in his geographical studies. At the same time, it develops the most perfect map of the world. He examines the earth into seven climates in his work "Tahdid al-Amokin li tas'ih dasht al masokin" and gives a lot of valuable information about distant regions. The scientist explains that one year is 365 days, 6 hours, 10 minutes, and 8 seconds. Today, one year is 365 days 6 hours 9 minutes 6 seconds. This proves that the scientific-theoretical and practical research conducted and researched by the scientist has been proven.

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