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PHILOSOPHER-ENCYCLOPEDIST ABU RAYKHAN BERUNIY

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Abstract:
The article shows that the first half of the 11th century and the two centuries preceding it were characterized by the rapid development of the culture of the peoples of the Middle East and Central Asia. The works of Central Asian astronomers and mathematicians of this period are widely known. Among them, a place of honor is occupied by Abu Raykhan Beruniy, who is to this day a scientist all over the world.

Keywords: scientist, scientific works, science, culture, mathematics, geology, philosophy.

Introduction

The first half of the 11th century and the two centuries preceding it were characterized by the rapid development of the culture of the peoples of the Near East and Central Asia. The creation and development of large cities, flourishing oases, irrigation systems, the formation of international trade routes, the construction of palaces and temples stimulated research in mathematics, geodesy, and astronomy. This is the time of the first Renaissance in this region.
The works of Central Asian astronomers and mathematicians of the 11th-16th centuries are widely known. Among them, one of the places of honor belongs to the famous scientist Abu Rayhan Muhammad ibn Ahmad al-Beruni. This man combined the best traits of a scientist - devotion to science, unquenchable passion for knowledge, purposefulness and dedication.
Abu Raykhan Beruni was born on September 4, 973 in Uzbekistan on the outskirts of the city of Kyat (now this city, located in the lower reaches of the Amu Darya, is called Biruni - this is the Arabic version of the name of the scientist). He spent the first years of his life in the family of Khorezm Shah Mamun. There, the famous scientist Abu Nasr Mansur ibn Ali ibn Iraqi drew attention to his outstanding abilities, who instilled in young Beruni an interest in the natural sciences, and especially in mathematics and astronomy.

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Having received an excellent education in his homeland, Beruni made independent observations already in his youth and around 995 he was the first in Central Asia to build a globe that made it possible to determine the geographical coordinates of settlements with sufficient accuracy for that time, was engaged in the design of astronomical instruments and determined the geographical coordinates of various places in Khorezm. His inquisitive mind, constant desire to acquire knowledge could not be satisfied with the education received in the Iraqi family, and Beruni devotes a lot of time to the study of philosophy, mathematics, astronomy and other sciences. For the same purpose, Beruniy, dissatisfied with his education, traveled to such large scientific centers as Baghdad and Bukhara and to various cities of Khorasan and Afghanistan.

In 1004, having returned to Khorezm, to its new capital - Gurganj, Beruni held the position of adviser to the shah and directed the academy created by that time. Brilliant scientists, invited by the Khorezm Shah from different countries, are grouped around Beruni. The decoration of the academy was the famous Abu Ali ibn Sina (Avicenna), a great naturalist, physician and philosopher. After the capture of Khorezm by Sultan Mahmud of Ghazivid in 1017, Beruni, along with other scientists, was forced to move to Ghazna (Afghanistan), where he lived until the end of his life. Here he is engaged in astronomy, mathematics and geodesy. During the same period, Beruni twice visited India; there he not only carried out work to determine the size of the globe, but also collected extensive material on the history, geography, ethnography and philosophy of this country. Peru Beruni owns about 150 scientific works related to various fields of science: astronomy, mathematics, mineralogy, geography, geodesy, history, linguistics and others. To the heights of some of the ideas of this man, the Western scientific world was able to grow only after more than 500 years. His first major work "Monuments Remaining from Past Generations" (circa 1001) includes a description of the calendar systems of various peoples (Greeks, Romans, Khorezmians, Arids, Jews, Persians, etc.), the history of the development of science, culture, customs. The book tells about the astronomical types of months (lunar, solar and leap years), about the origin of the names of months among different peoples. This book, as a source of ethnographic information about the peoples of the ancient East, has not lost its significance even today.

In 1025, Beruni finishes his treatise "Determining the boundaries of places to clarify the distances between points", in which - the first of the Muslim astronomers - gives a detailed development of a method for determining the

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geographical longitude of a point by simultaneously observing a lunar eclipse from two points with a known longitude of one of them. This is followed by a unique fundamental work "The Book Containing Explanations of the Teachings Belonging to the Indians, Acceptable by Reason or Rejected", briefly called "India" (c. 1031).

"The book of admonishment in the rudiments of the art of astronomy", containing a presentation of the issues of geometry, arithmetic, geography and astronomy, for many years served as a textbook in madrasas (the so-called religious Muslim schools) throughout the Middle East. This book contains 511 questions and answers, of which 119 relate to mathematics (planimetry, relational theory, stereometry, number theory, arithmetic, algebra, letter numbering), and the rest - to astronomy, geodesy and astrology.

Around 1037, Beruni completed "Ma'sud's Canon on Astronomy to the Stars" - this is the main work, its main content is questions of astronomy and mathematical geography. It seems to sum up Beruni's activities in the field of astronomy, which at that time was considered one of the branches of the tree of mathematical sciences.

For the first time in history, Beruni, using a special device designed by himself, accurately determined the specific gravity of 50 substances, including metals, liquids, minerals, providing science with a reliable method of diagnosing. Based on his measurements, he calculated the geographical latitude of many cities, including the capital of medieval Khorezm - Gurganch.

Beruni's explanations of some questions of geology were very progressive for their time. His idea of mobilism, that is, the drift of the continents, attracts attention. This hypothesis in science is associated with the name of the German geophysicist A. Wegener. But the earliest herald of this idea was Beruni. He outlined his hypothesis about the process of horizontal movement of parts of the land in the fundamental work on this science - Geodesy. Beruni contributed a lot of original thoughts, a rich imagination, which was based on a large stock of knowledge and experience of a scientist in this science.

For example, Beruni developed a completely new method for measuring the length of the earth's arc, qualitatively different from all previous methods. The path proposed by Beruni is an expression of the amazing ability of its author to scientific generalization, to solving complex problems of scientific research.

By his method of measuring the parameters of the Earth, Beruni anticipated the later development of science not only in terms of the accuracy of the results, but

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also in terms of the very method of solving this problem by measuring the angle of lowering the horizon, which was previously considered the merit of the Englishman Wright (1560-1616). those. Beruni was ahead of all his "competitors" by more than 500 years.

Some remarkable results achieved by Beruni in the field of geology are widely known. For example, according to Beruni, the Amu Darya once flowed towards the Caspian Sea, and then turned and went along its modern channel, which flows into the Aral Sea. This conclusion of Beruni is brilliantly confirmed by modern science.

Beruni should be considered one of the founders of another, very relevant science at that time, namely, mineralogy. One of the most important achievements of Beruni in this area was the systematic determination of the specific gravity of minerals as one of the necessary characteristics of the latter, which he introduced into practice for the first time.

Beruni made another big step in mineralogy - he tried to base the classification of minerals on the "principles of natural classification", in particular, according to the principle of specific gravity. Beruni also contributed to other branches of science, but based on what has already been said, the following conclusions can be drawn. Beruni is characterized by the desire not to be limited to the science and culture of any one country, one people, but to embrace the scientific and cultural achievements of many peoples. He was not embarrassed by any barriers: neither racial, nor religious, nor territorial.

The breadth of his interests in this sense was unparalleled in the entire medieval East and West. Dealing with any branch of science, Beruni set himself the task of enriching it both in terms of factual material and in terms of developing its theory, discovering new laws and research methods.

Beruni created about 150 scientific papers, including: “Al-asar al-bakiya min al-kurun al-khaliya” (“Monuments of past generations” (“Chronology”) (written in Arabic)) is an essay dedicated to the chronology of ancient and early medieval states and peoples, in which descriptions are given their religious and national customs, holidays; “Kitab fi-tahrir ma lil-Hind min maqala maqbula fi-l-akl av marzula” (“The Book Containing the Explanations of Indian Teachings, Acceptable by Reason or Rejected” (“India”) (written in Arabic)) - work , which is an encyclopedia of India, in which the author described the customs, religion, festivals and sciences of the Indians; "Al-qanun al-Mas 'udi" ("Masud's Canon" (written in Arabic)) - an astronomical work dedicated to Sultan Masud of Ghazni,

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is an encyclopedia of mathematics and astronomy of the Middle Ages; "Kitab at-tafkhim li-avail sina't at-tandjim" ("The book of admonishment to the beginnings of the science of the stars" ("Tafkhim") (written in Arabic)) is a medieval elementary textbook on mathematics, astronomy, astrology, geography, construction of measuring instruments. It was also translated into Persian; “Makala fi istikhraj al-avtar fi-d-daira bi-hawas al-khatt al-munhani fiha” (“Determining the boundaries of places to clarify the distances between settlements” (“Geodesy”) (written in Arabic)) - essay , in which the author determines the distances between settlements by triangulation; “Kitab tahdid nihayat al-amakin li-tashikh masafat al-masakin” (“Collection of information for the knowledge of jewelry” (“Mineralogy”) (written in Arabic)) - a work in which the specific gravity of minerals, jewelry and metals is determined.

In astronomy, he asserted the same fiery nature of the Sun and stars, in contrast to dark bodies - planets, the mobility of stars and their huge size compared to the Earth, the idea of gravitation. He established the angle of inclination of the ecliptic (the annual path of the sun) to the equator, calculated the radius of the Earth, described the change in the color of the Moon during lunar eclipses and the solar corona during solar eclipses. In the essay "India", he first discovered this country, mysterious to the Western world, in all its diversity in linguistic, ethno-cultural and historical terms.

In the field of mineralogy, Beruni was the first to measure the specific gravity of solids and liquids using his own device, and on the basis of this he proposed a classification of minerals; developed a theory of the origin of minerals and paragenetic information. In the field of geology, he put forward several scientific theories, including geotectonic, i.e. the idea of mobilism; theory of the geological evolution of the Amu Darya and the Arabian Desert.

To date, out of 31 works by Beruni that have come down to us, they have been translated into German, English, Russian and Uzbek, 24 works have been studied and 3 works have been published in the Arabic original. Beruni is recognized in the history of science as the founder of a new branch of science - geodesy (the science of measuring the terrain and the surface of the earth using tools designed for this). His name is immortalized in the name of a crater on the moon. One of the minor planets of the solar system, discovered in 1986. and registered at the Harvard Center under number 9936, named after him.

Beruni felt that many of the conclusions and data of the science of his time needed to be re-verified empirically, since they were not always established

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through experience and observation. Beruni is one of those who made a great contribution to the development of experimentation, a remarkably sharp-sighted and thoughtful observer of nature. He conducted many different experiments, which contributed to Beruni's appeal to the art of creating various tools and devices.

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