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Issue Article

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ABU RAYHAN BIRUNI A GREAT SCHOLAR WHO CONTRIBUTED TO THE FIRST RENAISSANCE OF CENTRAL ASIA AND HIS CONTRIBUTIONS TO THE DEVELOPMENT OF GEOLOGY AND MINERALOGY

Abstract: *This article briefly discusses the great polymath Islamic Scholar Abu Rayhan Biruni's works on mineralogy and geology and his achievements in these fields. Here the role of the scholar's heritage in today's era also discussed. Article finds that his great mind helped to establish scientific disciplines such as geodesy and helped to shape science of geology.*

Key words: *Al Biruni, Polymath scholars, Geology, Mineralogy, Khwarazm.*

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Introduction

Al-Biruni, Abu Ar-Rayhan Mohammad Bin Ahmad (440AH/1048CE) is in the authors view the leading mineralogist throughout Islamic history. His monograph "Treatises on how to recognize gems" (*Al-Jamhir fi Ma'rifatil Al-Jawahir*) is most probably the best contribution on mineralogy in the Muslim civilization. Throughout this manuscript, Al-Biruni did not translate or copy the science of other civilizations but Instead, he recorded his own experience. Abu Rayhan Mohammed ibn Ahmad al-Biruni, a prominent polymath scholar from Khwarazm, city of Kyat great representative of Mamun Academy in Khwarazm, he has written about 150 works in astronomy, mathematics, mining, geography, history, pharmacology and others, 31 of which have reached us. Among them are the following fundamental works of the scholar.

There is information that Biruni wrote 154 works of different sizes, correspondence, but 30 of them have come down to us. In his works, on the one hand, he creatively developed the advanced traditions of Central Asian, ancient Greek and Indian thinkers, and on the other hand, his maturity testifies to the breadth of his scope of thinking. It is noteworthy that Biruni raised the question of the "cause of causes" - the emergence of man and human society. In this regard, he writes, "it is the oldest and most famous of all ancient histories, the beginning of humanity." Hence, the Scholar was in a position of rationalism on this issue, acknowledging the differences between people, thinking only of external differences, and concluding that the internal structure and organization of people are common to all. Biruni's great works such as "India", "Monuments of Ancient Peoples", "Mineralogy", "Geodesy" brought him worldwide fame [2, p. 12].

Main part

Biruni defined the concepts of arithmetic, algebra, geometry and number theory in a certain order, raised trigonometry to the level of an independent science. In his studies on geography, he showed the exact coordinates of countries, seas and

islands located in seven climates, developed the most perfect map of the world. With the help of the astronomical instruments he created, he discovered the unique shape of the Earth - a globe, which was one of the greatest inventions in the history of mankind. Unlike the Greek scientists [5, p.68], he proved in an original way that the Indian and Atlantic oceans are connected, and discovered the unknown continent unknown assembly behind the ocean five hundred years before Christopher Columbus. did Biruni is one of the encyclopedic scholars who left a rich legacy in the fields of history, ethnography, language, literature and medicine.

Mineralogy. In mineralogy, Beruni first measured the specific gravity of solids and liquids using his own instrument and proposed the classification of minerals. He developed the theory of origins of minerals and cited paragenetic data. When he was already eighty years old, Biruni devoted a book entitled Ketāb al-jamāher fī maʿrefat al-jawāher (The sum of knowledge about precious stones) to mineralogy. It is the most comprehensive book on this subject in medieval Arabic literature. In it Biruni describes the minerals and metals of Europe, Asia, and Africa, drawing upon earlier sources and his own vast experience.

The work consists of three parts, beginning with an introduction composed of a dībāja (preamble) devoted to praise of the wisdom possessed by created beings and fifteen tarwīḥa (sections) describing the situation of man in nature and how he came to use gold and silver and to make use of jewels for his adornment (32 pages of the printed text).

The second part (200 pages) is devoted to precious stones (al-jawāher), as well as to other minerals. The principal stones described are the following: yāqūt (hyacinth, sapphire), yāqūt aḥmar (ruby), yāqūt aḵžar (green corundum), yāqūt jamrī (carbuncle), laʿl (spinel), bījādī (garnet), almās (diamond), sanbāḏej (emery), loʾloʾ (pearl), zomorrod (emerald), fayrūzaj (turquoise), ʿaqīq (agate), jaẓʿ (onyx), ballūr (rock crystal), jamast (amethyst), lazaward (lapis lazuli), dahanj (malachite), yašm (jade), yašb (jasper), sabaj (obsidian), bādzahr (bezoar), kahrobā (amber), maḡnaṭīs (magnetite), šaḏenj (hematite), zojāj (glass), mīnā (enamel), qīsaʿ ṣīnīya (porcelain). Metals (felezzāt) include zeʾbaq (mercury), ḏahab (gold), feżża (silver), noḥās (copper), ḥadīd (iron), asrob (lead), and ḵār ṣīnī (Chinese iron, i.e., zinc).

Biruni makes use of numerous ancient Greek and Arab authors and cites many verses from Arab or Persian poets. He carefully analyzes the names of minerals from the philological point of view, citing authors like Ḵalīl b. Aḥmad, Aṣmaʿī, Farrāʾ, Abū Ḥanīfa, and Dīnavarī.

Biruni accepts the vapor theory, more specifically Jāber b. Ḥayyān's sulphur-mercury theory, of the origins of the minerals and metals. He rejects the notion of transmutation, though he admits the growth and gradual transformation of metals into gold in nature.

Finally, thanks to an apparatus he constructed himself, he succeeded in determining the specific gravity of a certain number of metals and minerals with remarkable precision [6, p.561].

Geology. Biruni's results in determining the geographical width and distance of different places amaze even modern scientists. The great scientist notes that each part of the Earth's surface has its own long historical development. Biruni was the first to seriously study the geological development of some regions of Central Asia, including the Amudarya Valley. His conclusions about the geological past of the Amudarya valley and the formation of the Aral Sea are considered to be 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." Biruni's conclusions about the formation of mineral deposits, the importance of rock erosion, and weathering of rocks are of great scientific importance. He puts forward a theory that interprets the appearance and disappearance of mountains based on natural factors.

He criticized the theory of the transmutation of simple metals into precious metals - a utopian idea that was firmly established in the chemistry of that time. In geography, he suggests the theory of the seas and the idea to create the world's first spherical globe of the Earth and the continent's existence behind the Pacific and Atlantic oceans.

Biruni also made great discoveries in the field of geology. They took a scientific approach to the study of the earth. He writes that each part of the earth's surface has its own long historical development. Biruni was the first to seriously study the geological development of some parts of Turkestan, including the Amudarya valley. His conclusions about the geological past of the Amudarya valley [4, p.883] and the formation [9, p. 206] of the Aral Sea are considered to be one of the most successful geological analyzes of that time. The scientist [10, p.128] relies on the theory that "Seas turn into land, and lands turn into seas." Biruni's conclusions about the formation of layers of minerals, erosion of rocks, etc. are of great importance. Assumptions about the location of terrestrial bodies for the balance of gravity in the earth's crust are also very important.

In his work "Geodesy" for the first time, he introduced a method of finding the distance between cities by triangulation (measuring distance through the solution of triangles) and using it to determine the distance between the Ghazna and Mecca through Khorezm [3, p.4541]. In this work [1, p.1052], he proved [7, p.524: 8, p.4] that the African continent was washed by the ocean waters from the south using the original logical way.

Conclusion

This article briefly discusses the great polymath Islamic Scholar Abu Rayhan Biruni's works on mineralogy and geology and his achievements in these fields. Here the role of the scholar's heritage in today's era also discussed. Article finds that his great mind helped to establish scientific disciplines such as geodesy and helped to shape science of geology.

Nowadays, his great heritage can be widely used to promote tourism and his scientific discoveries such as measurements of earth circumference and devices used to measure it can be showed as a expositions in the museums.

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