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Abu Raykhan Beruni About the Quantity and Measures of Natural Being

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ABSTRACT

Beruni is a great scientist, author of numerous major works on history, geography, philology, astronomy, mathematics, geodesy, mineralogy, pharmacology, geology, etc. For the first time in the Middle East, Beruni expressed an opinion about the possibility of the Earth's movement around the Sun, determined the circumference of the Earth. Beruni can rightfully be called the triumphant of science in the medieval East. This article analyzes the issue of measure, amount and quantitative indicators in the works of Beruni.

Keywords: *Quantity, Quantitative changes, Measure, Permissible dose, Lethal dose, Overdose and reduced dose, Qualitative and quantitative indicators of the earth.*

"Nature, the Universe is a huge labyrinth, but not without a plan"

Buddha

"Nothing too much: everything is good in moderation"

Chilo

1. Introduction

Beruni (973-1048) established the exact characteristics of different planets. Comparing the measures of the Sun, Earth and Moon, he comes to such an important conclusion: "Above the sphere of the Moon is the sphere of Mercury, and then, above it, the sphere of Venus, both Mercury and Venus have a certain (maximum) distance from the Sun, beyond which they do not set, but return towards the Sun, either forward or backward movement.

Further above these two planets (is) the Sun is a beautifully radiant star. It occupies the middle in the order of (their) location and is in the position of a king among (its) dominions, for the position of all the other (luminaries) and their movement depends on the Sun, which determines their movement" [1]. Following Al-Kindi, he considers the measure of the Sun to be the criterion for the measure of the Earth.

It was Beruni who was responsible for the first study of the uneven motion of the Sun. He first determines the apogee and perigee, i.e. the limits of the measure of the Sun's motion. Beruni wrote: "The farthest distance (from the Earth) on it in Greek is (called) the apogee, and the closest is the perigee" [1.26-27].

2. Discussion

Beruni, unlike Ptolemy, believed that the apogee of the solar orbit moves at a certain speed. Thoroughly studying the uneven motion of the Sun, he was the first to study the motion of the Sun, distinguishing them as qualitatively different motions. Beruni clearly defined four interrelated measures, indicating their boundaries, nodes: «If the apogee is at the (point) of the autumnal equinox, this equality is reversed, and the qualitative and quantitative (characteristics) move from each quarter to the opposite quarter. If the (apogee) is at the (point) of the winter solstice, then this equality is preserved, and the quantitative (characteristic) goes to the

opposite quarter... Further, after that, they change in the opposite way, and the sum of both of them will be greater than the largest equation, regardless of whether the excess over it increases or decreases. This gives the limit for reducing the time interval "every quarter" [2]. Beruni determined the equinox several times - March 21, September 23, June 22, December 22.

Beruni investigated qualitatively different motions:

1. Average motion;
2. Slow motion;
3. Accelerated motions;
4. Excessive motion, etc.

Average movement, according to Beruni, was considered a yardstick. He wrote: "The fact is that the movement of a star is the average between deceleration and acceleration, it was made a measure of this kind". Therefore, if a planet becomes larger than it (in motion), it is called excessive in motion, fast, and if it is smaller than it, inadequate in motion, slow. It is necessary to distinguish in these issues (planets) redundant and increasing (in motion). The fact is that for a planet with a decrease in its motion, the following cases are possible: either it goes to a slowdown and, with its insufficiency in average (motion), will decrease in its motion. Likewise, when "increasing", "increases" and "decreases" are possible. Let it persist after. In all cases, there is a limit that does not exceed the "increase", as well as a limit of "decrease".

Based on the foregoing, it can be assumed that the essence of a measure is revealed not only by its moments, such as quality and quantity, but also by the most imperceptible (imperceptible) quantitative changes. A.F.Fayzullaev rightly notes that Beruni refers to the comparative quantitative method systematically and repeatedly [3]. Beruni showed that each planet has its own measure, a certain place in space, a measure of motion, the limits of the increase and decrease of these movements, a nodal measure with other planets: "Each planet ... has its own specific movements in longitude" that is, in the direction of the sequence south, as well as in depth (layer of the sphere) - up and down". One "hard" natural measure serves for the cognition of the second. Through this method, he determined the azimuths of Mecca.

Beruni's research led him to the fact that he was the first to introduce quantitative and qualitative data into mineralogy.

Beruni revealed how quantitative and qualitative characteristics of minerals, chemical compounds, drugs are closely related. Without quantity, quality and measure, without quantitative measurement, the scientist believed, it is impossible to create new drugs, to establish their composition. Changing the quantitative ratio of the components of a particular drug can radically change its quality.

Theoretical analysis of Beruni's works, such as "Pharmacognosy in medicine" (Kitab as-saydana fit-tibb) shows that he, using qualitative and quantitative measurements, for his time identified 750 species of plants, 107 minerals, 101 animals. Beruni introduces the concepts and existing differences between the "permissible

dose" and "lethal dose", "overdose" and "reduced dose", a simple measure from a tough (strict) measure. He advised to apply these theoretical propositions in practice: "one or two dirhams (saffron) make childbirth easier, and three dirhams kill" [4]. For Beruni, the measure of a natural object was equal to the truth. If we take the size of the Arab cubit for 493.3 mm, as defined by K. Nallino, the linear speed of the equator point, according to Beruni's definition, is 466 m / s. The actual speed is 465 m /s.

The real measure of the subject, the truth, according to Beruni, is revealed only through cognition, more precisely through measurement, weighing the smallest imperceptible, imperceptible quantitative measurements. Beruni for the first time indicates the meaning of many units, which are diverse in place and area of application, depending on time. It clearly distinguishes the measurement function of the measure. In this respect, he does not confuse the measure of natural objects and measurement. The amount of this or that substance becomes known only when it is "compared with what is commonly called the unit of measurement of the substance", wrote Beruni [5]. Thanks to the unit of measurement, a "quantitative difference" is established between the homogeneous properties of objects. The forms of the unit, he wrote: "... are different in different places at the same time and at different times in the same place" [5. 167].

When Beruni lived in the trade, gas was 0.58 m; in construction 0.75 m; with an area volume of 0, 5625 square meters.

For Beruni, the goal of cognition is to reveal a real measure, that is, truth. **Thus, Beruni identified the following natural measures:**

1. The distance of the Earth from the Sun;

2. The limits of the measure (minimum and maximum) the height of the Sun;

3. Distance of the Earth from the Moon;

4. Determined the measure of the boundary of the eclipses of the Sun and the Moon, which is used to determine the number of months;

5. Determined the measures of the Earth;

6. Determined the measures of time: Eras, small measures of the time of day, minutes, seconds, etc;

7. He established the specific gravity of a number of minerals;

8. In 995 he reflected the Earth globe in the globe.

In our opinion, there are also such relations of measure, the moments of which are inseparable and cannot be depicted in their own, distinct from each other existence. For example, the specific gravity of minerals is the ratio of weight to volume, an indicator of the ratio that expresses the certainty of one specific gravity in contrast to others (there are direct independent measures) [6]. For Beruni, the main tool for cognizing measures was finding information about accurate measurements of the most imperceptible, small quantitative increases and the most imperceptible, small quantitative decreases in continuous qualities. He strictly adhered to the measurement of imperceptible, imperceptible quantitative changes, which served him as a solid

foundation in his concept. It clearly distinguishes "the largest amount" from the "smallest amount", the maximum from the minimum, the simple amount from "the amount that is closer to the truth", the exact amount from the imprecise amount, etc. As can be seen from the above, Beruni is not limited to simply posing the problem of natural measure, but he raises the question at a sufficiently high conceptual and methodological level, giving its original and original interpretation. He writes: "As for bodily pleasures, those who experience them, they leave behind suffering and lead to illness. These pleasures are boring when they last for a long time and cause suffering when they go overboard ... And this is in contrast to the pleasure that the soul experiences when it learns something, for such pleasure, having begun, grows all the time, does not stop at any limit." This has been continued and developed by other major thinkers in Central Asia.

3. Conclusion

1. The object of Beruni's study was natural existence: the Earth, the Sun, the Moon, stars, plants, minerals, due to which he could be given such names as a star gage, drug medicine, earthmaker, etc.

2. Measure in Beruni's works is defined as "the amount that is closer to the truth", "a certain amount", "average amount"[7], "prescribed dose", as truth, as the accuracy of a real object;

3. Abu Raikhan Beruni for the first time introduces methods of quantitative and qualitative research in science;

4. Mathematical ideas about the measure, i.e., the quantitative aspect of the measure served as the starting point for al-Khorezmi, al-Fergani, al-Jauhari, al-Beruni, Omar Khayyam, al-Kashi, Ulugbek, etc.

5. Muhammad al-Khwarizmi applied the methods of quantitative study to the phenomena of social life, al-Beruni applied this method to the development of mineralogy, pharmacology, etc.

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Consent to participate

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Availability of data and material

Authors are willing to share data and material according to the relevant needs.

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