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TIME AND SPACE IN THE PHILOSOPHY OF IBN SINA: OBJECTIVITY AND CONNECTION WITH MATTER

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A B S T R A C T

This scientific article explores the philosophical understanding of time and space in the teachings of Ibn Sina. Linking time with the concepts of space and movement, Ibn Sina argues that time does not exist without movement. He presents arguments that support the objective nature of time. His view of space is also discussed, where he rejects the idea of emptiness and argues that space is the boundary of the surrounding body, filled with a moving body. The article emphasizes the philosophical significance of time and space in the teachings of Ibn Sina and their correspondence to modern physical concepts.

K E Y W O R D S

Ibn Sina, philosophy, time, space, movement, objective nature of time, extension.

Introduction

Ibn Sina (980-1037), the great encyclopaedist, has been the subject of many studies [2]. However, despite the abundance of works by “Avicenologists”, his legacy in physics is not sufficiently covered. In the “Physics” section of his “Book of Knowledge,” Ibn Sina defines physics as follows: “Physics is a science that studies such states, ideas about which are inseparable from matter” [3,168].

Ibn Sina's ideas about time, space and movement are reflected in the “Book of Healing”, “Book of Salvation”, “Book of Knowledge”, “Book of Directions and Instructions”, “Sawdust of Nature”, as well as in his scientific correspondence with Abu Rayhan Beruni.

LITERATURE REVIEW

Time. Time in Ibn Sina’s philosophical worldview exists in close connection with the concepts of space and movement. In the "Book of Salvation" he argues that time cannot be imagined, that is, does not exist without movement. “When we don’t feel movement, we don’t feel time” [4,116]. Ibn Sina gives the following arguments to explain that time is an objective category.

1. “Two moving bodies, which simultaneously begin and complete movement, have the ability for one of them to travel a greater and the other a shorter distance, that is, for one to move faster, the other slower. But if you take half of this distance, then it can be covered at the same speed with another opportunity. This possibility is the quantity of motion. And the quantity of motion is what is usually called time.

2. Movement has preceding and following moments that are part of it. Time is precisely the quantity and measure of preceding and subsequent moments of movement.

3. If bodies are changeable, then they must have a previous and subsequent state. The previous and subsequent states of bodies are determined by comparison with time. In other words, change in things manifests itself directly through time. Therefore, time is the relationship between essential precedence and succession" [1,118-119].

These statements relate to the philosophical aspect of Ibn Sina's teachings about objective truth and the existence of time as a philosophical category. For us, judging from the point of view of physics, his statement about the inseparability of movement from time is more important. "In reality," he says, "every movement and change occurs in time, during a certain interval." And in this, Ibn Sina's teaching about time corresponds to modern physical concepts. According to Ibn Sina, time is an eternal and infinite category. The main feature of Ibn Sina's teaching about time is the recognition of the objective, material nature of time and its connection with matter and its movement [1,120].

Space. Speaking about space, Ibn Sina points out the erroneous point of view of those who believe that space is an abstract, non-physical extension. From his point of view, the inconsistency of this concept lies in the fact that its authors contrast spatial extension with bodily extension, while the nature of both spatial and bodily extension is the same [1,115-116].

"Space," writes Ibn Sina in the "Book of Healing," "is nothing more than the boundary of the enclosing body. It embraces the moving body, is equal to it, is stable and filled with the moving body. A moving body is separated from space and moves in it with the help of movement. It is impossible for two bodies to exist in it at the same time. From here the existence and essence of space becomes obvious" [1,116].

It is known that Ibn Sina denied the existence of emptiness. He writes about this: "...Supporters of emptiness argue that the world is in emptiness, and that there is emptiness in the world. This opinion is close to the imagination and far from reason. The reason for the opinion about the existence of emptiness is the existence of air, which is not visible to the eye. But people thought that there was nothing, and that space was empty, and therefore imagined that emptiness was possible [3,171].

METHODOLOGY & EMPIRICAL ANALYSIS

From Ibn Sina's point of view, space is neither body nor form. It is something in which the body resides. It surrounds anybody. The presence of a "place" determines the existence of a "filled" space. From the "Book of Healing" and "Book of Knowledge" it follows that Ibn Sina clearly understands the difference between the concepts of form, body, volume and "place".

Defining what a body is, he convincingly substantiates the three-dimensionality of space: "... A body is something, having found the length of which, you find in it another length, crossing the first at a right angle, and also a third length, perpendicular to these two lines at the point where two straight lines intersect [3,107-108].

Movement. In the philosophical and physical teachings of Ibn Sina, movement is associated with the categories of space and time.

In the Book of Knowledge, he defines movement as follows: "Motion is usually called what occurs in space, but now the meaning of this concept has become different, more general, than spatial movement. Any state and action of something, which is potentially (such and such) a thing, because of this potentiality is called motion" [3, 168].

The problem of movement throughout the entire period of development of ancient and medieval science was the central and most complex problem of natural philosophy. Already in our time, A.

Einstein noted that: “The most fundamental problem, which has remained unresolved for a thousand years due to its complexity, is the problem of motion” [11,362].

Speaking about uniform motion, Ibn Sina gives the definition of rest.

“The opposite of every movement is rest. A body that moves in relation to place, or in quantity, or in quality, or in another sense, if it moves uniformly, (it will reach a) state called rest” [3.169].

Ibn Sina claims that the movement of bodies can be “direct”, natural - unforced movement, and movement by accident, - under compulsion. Let's look at how he explains these types of movement.

“Movement under compulsion (, violent movement - K.A.) is a movement when a body moves from one proper place to another proper place, but this movement (occurs) not on its own, and the reason for the movement is outside the essence (bodies). Movement by accident is that a body is in another body that is moving. Therefore, its movement occurs due to the movement of the body in which it is located” [3,170].

For each of these types of movement, Ibn Sina gives examples. He considers the fall of a stone, the fall of water, the rise of fire and air to be examples of natural movement [3,170]. Following Aristotle, he defines a natural place for each of these four elements (water, fire, air and earth). The natural place for air and fire is “up”, and for earth and water it is “down”. Therefore, the falling of solids and liquids downwards and the movement of lungs upwards are considered natural movements. Ibn Sina considers an example of violent movement to be everything that is pulled, lit and thrown [3,170], that is, any movement that occurs “under duress” and the reason for which is outside the body itself.

An example of movement by accident is the movement of clothes located in a chest, when the chest moves from place to place, for example, from one house to another, but at the same time their own “place” remains, which is the chest [3,170].

Mechanical issues. Ibn Sina addresses issues of mechanics both in his encyclopaedic works and in special treatises devoted to various issues of natural science, which were mentioned above.

RESULTS

The treatise “The Measure of Reason” [5] is devoted to practical mechanics, the description of the action of simple machines and mechanisms.

Based on the achievements of ancient science, primarily based on the teachings of Aristotle, and relying on the achievements of the science of his time, Ibn Sina made a significant contribution to the development of some topical problems concerning the essence, mechanism and source of movement.

a) Dynamic concept and mechanical movement. The dynamics of Ibn Sina developed, first of all, as a result of assimilation of Aristotle’s dynamic concept. But this teaching was subjected to significant modernization, as a result of which Avicenna’s own “concept” was formed. Under the influence of the teachings of Ibn Sina, the so-called “school of Avicenna” was formed in the medieval Muslim East, to which such scientists as Abu-l-Barakat al-Baghdadi (d. about 1164), Fakhr-id-din ar-Razi (XII c.), Nasir ad-din at-Tusi (1201-1274) and many others.

Ibn Sina sets out his theory mainly in the “Book of Healing” and in a brief summary of this book called “Book of Directions and Instructions” [12].

b) Rectilinear and circular aspiration. In the “Book of Directions and Instructions,” Ibn Sina gives the following consideration to show that all bodies have “aspiration in potency,” that is, they initially contain aspiration: “A body that has no aspiration either in potency or in action, has no violent impulse through which it moves. In other words, the body moves only due to violent desire. Let us assume that

a body moves over a certain time interval, covering (during this time) certain distances. Let us now suppose that there is another body which has some tendency and resistance. It is clear that it will cover the same distance in a longer time. Now suppose that there is a third body, which has a weaker impulse than that of the second body, which in this time and under the action of the same engine covers a distance, the ratio of which to the distance traversed by the first body is the same as the ratio of the time spent by the second body, to the time spent by a body that does not have aspiration. This third body, which moves by violent motion, will cover the same time and the same distance as the body that has no desire. But then it turns out that two violent movements of two bodies, one of which allows resistance and the other does not, must be equally fast or slow, but this is impossible" [12, 105].

These considerations allowed Ibn Sina to establish that there are two types of aspirations in accordance with the type of trajectory that it generates: circular aspiration and rectilinear aspiration.

Further, Ibn Sina takes these arguments to "a body limited in the sense of the direction of its movements," "perfect" movements of the "highest" sphere—the "superlunary" world. In other words, to a body that neither arises nor is destroyed. There must be some kind of "desire" necessary for this movement to be realized. This "striving" is associated with the concept of both "place" and "form" (this is a circular "striving").

In this case of rectilinear motion, according to Ibn Sina, the body occupies "its own place," that is, the space to which the body belongs, and allows its movement. From this follows the existence of a straightforward aspiration.

Thus, Ibn Sina defines aspiration as a certain "permanent form" preserved in the body, and this is reminiscent of the concept of impetus, which appeared by the Parisian nominalist Jean Buridan (d. 1358) three centuries later. The theory of Ibn Sina and the theory of Jean Buridan are close from one more point of view. Both of them apply the concepts of aspiration - driving force - impetus to solving the problem of accelerating the fall of heavy bodies.

Acceleration and fall of heavy bodies. In connection with these concepts, Ibn Sina considers two types of movements:

1. uniform movement, which "contains no difference," that is, uniform;
2. deform movement containing this "difference."

Uniform motion is the uniform circular motion of celestial bodies. The deform movement is a "local" violent and natural movement. But there is a difference between "local" movements: "natural" speeds up towards the end of the movement, and "forced" slows down.

Local movement can also be uniform (uniform), but this is very rare. The movement of celestial bodies can neither accelerate nor slow down, it always remains uniform.

In all cases, the principle by which Ibn Sina explains acceleration in "natural" motion is completely clear. This acceleration is the result of the action of the source of movement, which is carried out with the help of "natural aspiration," that is, with the help of successive portions of aspiration. At the same time, the body strives to take its "natural place".

d) The theory of simple machines and their classification. The science of "simple" machines, or rather mechanics, in the medieval Muslim East was called "ilm al-hiyal," literally "the science of ingenious tricks." The most important work of this period on simple machines is "The Measure of Reason" by Ibn Sina [5].

The treatise consists of five chapters. In the first chapter, Ibn Sina gives the names of five simple machines. The second chapter is called "On the Definition of Simple Machines." It defines each of the

five "simple machines" and how to use them. “On the preparation of simple machines for action for lifting loads” is the title of the third chapter.

The most interesting is the fourth chapter, called “On the connection of simple machines with each other.” In the fifth chapter - “Concluding Remarks”, Ibn Sina writes about making simple mechanisms so that they are strong and stable.

Concept of heat and electricity. Ibn Sina’s ideas about the nature of heat and electricity are reflected mainly in his scientific correspondence with Abu Rayhan Beruni [6], “Sawdust of Nature” [7], and in the treatise “Reflections on the Causes of Thunder” [10].

Scientific correspondence as a form of scientific discussion in the history of science has always played an important role, continuing virtually to the present day from the correspondence of Archimedes to the correspondence of Bohr and Rutherford and other famous scientists of our time. In the history of science in the Middle Ages, scientific correspondence played a very important role, actually replacing direct contacts between scientists.

CONCLUSIONS

In the scientific correspondence between Ibn Sina and Abu Rayhan Beruni regarding the works of Aristotle, the fundamental natural philosophical and physical problems of that time are discussed in the form of questions and answers. We know eighteen questions of Abu Rayhan Beruni regarding “Physics” and “The Book of Heaven” by Aristotle and Ibn Sina’s answer to them [6].

In the fourteenth chapter of the fourth section of “The Sawdust of Nature,” Ibn Sina tried to explain the cause of thunder and lightning, rain and hail, and the differences between spring and winter clouds [7]. These problems, the causes of thunder, he dedicated a special treatise entitled “Discourses on the Causes of Thunder” [8, 9, 10]. From the treatise “Discourses on the Causes of Thunder” and “Sawdust of Nature” it is clear how correctly Ibn Sina understood and explained the problems and issues of electrification of dissimilar bodies and the representation of heat. Of course, there are points that are made that these problems can be explained more than a thousand years ago. Despite this, some of his explanations of natural phenomena have not yet lost their valuable significance.

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