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IBN SĪNĀ'S APPROACH TO PHYSICS

H. S. Virk

Department of Physics
Guru Nanak Dev University
Amritsar

Ibn Sīnā's works mark the flowering season of Islamic philosophy which coincided with the Persian renaissance of the 10th century. This was a period in eastern Persia when literary creation matched the high tide of scientific achievement. The century saw both the composition of the *Shāh-nāma*, the Persian national epic, and the writings of al-Bīrūnī, the outstanding Muslim savant. The pursuit of free enquiry was not yet frozen into regimented thought. Ibn Sīnā represents the culmination of Islamic rational thinking in its most characteristic form. It is amazing that Ibn Sīnā should have risen to the heights of intellectual and scholarly achievements despite a career characterized by political and personal upheavals.

At the age of eighteen, Ibn Sīnā had mastered all the known sciences. He was a scientific man who attempted to bring the Greek theories to the level of that which needs to be expressed by the study of the concrete, when apprehended by a great mind. A paragraph from his autobiography reveals his immense power of comprehension. "For a year and a half, night and day, I was reading logic and studying the different branches of philosophy. When I was unable to solve any problem, I would go to the mosque and pray to God to open the closed door to me. Then I would return to my study. When sleep was overcoming me, I would wisely drink a goblet of pure wine. This would bring intelligence to my mind and power to my body. Then I would resume my studies. Sometimes when sleep did overwhelm me I would solve the problems, I was unable to answer before, in my dreams. This happened often. In this way I continued until I was as learned in the subjects of logic, mathematics and physics as I am today."

In the *Dānishnāmā*, we possess a complete, though concise, outline of Ibn Sīnā's philosophy, namely logic, metaphysics, physics, and mathematics. Of an Aristotelian turn of mind, Ibn Sīnā shows in his teaching the influence of peripatetic philosophy. He expands and develops Aristotle's logic and metaphysics but does not go beyond his mentor in case of physics. From Aristotle, he adopts also the notion of the categories, matter and form, potentiality and actuality, and in general, follows him in his terminology.

According to Ibn Sīnā, "The Sciences are founded on experiences and reasonings. They have objects, questions, and premisses. As there are universal premisses, so each science has its own peculiar premisses. The different objects of the sciences establish a hierarchy among themselves, according to their dignity. Besides this, the sciences are divided into theoretical science and practical science. The principal subjects of theoretical science are physics, mathematics, and theology; and of practical, applied physics, mechanics and art, and ethics." The problem of the classification of the sciences was very popular in the Middle Ages both in the East and in the West.

In the philosophical part of his physics, Ibn Sīnā discusses several of the primary ideas of the human intellect, *e.g.* power, time, and movement. He derives from physics a first acquaintance with the ideas which scholasticism employs in logic and metaphysics, that is, with the ideas of form and matter and the categories. The ideas of form and matter are suggested by observation of the physical world. Physical bodies, strictly speaking are constituted of two principles, matter and form; then there are attached to them the accidents which arise from the existence of the nine categories. Scholasticism divides these accidents into primary qualities, which are inherent in the body, and secondary qualities, which can be taken away without annihilating the body, but which contribute to its perfection.

Ibn Sīnā's conception of power is more closely allied to dynamics than to statics. He is interested in the energy acting from within the body rather than in the forces which move it from without. Like Aristotle, he allows that each body has a natural place, to which it always returns, by some hidden power, when it has been removed from it. The commonest example of these innate powers is 'weight'. This idea of power is developed in psychology and metaphysics. In physics there is no infinite power. Its effects are always either greater or less. Ibn Sīnā recognised the principle of mechanics: 'What is gained in power is lost in speed'.

Time, according to him, can be explained by movement; it cannot be imagined otherwise. Time cannot be conceived in immobility; it would then be of fixed duration, and no longer true time. 'Bodies', says Ibn Sīnā, 'are in time, not in their essence, but because they are in movement, and movement is in time'. Time was created, and it is nowhere except in itself. For the world in general, it is measured by the movement of the stars.

Ibn Sīnā also speaks of the locality of bodies, then of space and impenetrability. He tries to show, by somewhat subtle reasoning, that bodies cannot move in a vacuum, because, he thinks, the dimensions of a vacuum are impenetrable, from which he concludes that a vacuum does not exist. He does not admit the possibility of actual infinity. Like the ancients, he believes that the world is finite, and that there is outside of it neither fullness nor emptiness, but absolute nothing-

ness. He admits, again, that bodies are divisible in potentia to infinity and he rejects atomism. Atomism had its partisans at this time, the *mutakallimīn* ('theologians'), with whom Ibn Sīnā disputes. In this connection too, he analyses the idea of contact very cleverly.

Unfortunately, Ibn Sīnā hardly managed to rid himself of the errors of peripatetic physics, although he had the opportunity to do so. Yet, from a philosophical point of view his account, besides forming an interesting reading, bears witness to a very acute intellect.

He differs from Aristotle on some fundamental issues, notably the nature of the Primal Cause, which he defines as Necessary Existence, and more importantly, in the mode of deriving the Universe from the Primal Cause. Here he adopts a Neo-Platonist line and expounds the belief in a graded creation through emanation. His Neo-Platonism is, however, stamped by personal marks and independent thinking, particularly in the concept of Active Intellect, a heavenly substance which is the source of all knowledge and serves as a bridge between human intellect and the higher orders of existence.

Ibn Sīnā's Cosmology

Since the basic philosophical theme expressed in this section is Ibn Sīnā's theory of emanation, we shall compare and contrast his views with those alternative views which are significant in terms of his philosophical tradition. His doctrine of emanation is basically his solution to the problem : 'How can the ultimate being generate the world or relate to it ?' Alternative solutions to this problem with which we shall concern ourselves are the doctrines of co-eternity, represented by Aristotle, and the creation theory, represented by Islam.

Although it may be true that Ibn Sīnā availed himself of the Aristotelian vocabulary, *e.g.*, matter and form, generation and corruption, actuality and potentiality, as well as the four elements and related topics, many significant differences can be observed between their cosmologies, as will be discernible from the following summary of Aristotle's position, and particularly when this position is compared with Ibn Sīnā's views.

According to Aristotle, the generation of all substances is caused by their having the same form. About coming into being, Aristotle asserts (Metaphysica 1070 a) :

> "We note next that neither the material nor the form of a thing comes into being (when the thing comes into being) ; and I mean this even of the matter and form closest to things. For everything that changes is something that is changed by something into something. That by which it is changed is

> its first mover; what is changed is its material; and that into which it is changed is its form..... We note next that all primary beings (both those generated naturally and otherwise) come into being out of something with the same name."

In comparison with this doctrine, Ibn Sīnā's assertion that a body emanates from an intelligence substance and that matter is therefore generated out of an intelligence, is an anti-Aristotelian position. This difference accentuates a rather significant distinction in the cosmologies of Aristotle and Ibn Sīnā. The difference is best depicted in an observation Gilson makes in the context of the contrast he establishes between Aristotle's God and the God of Aquinas; Gilson holds Aristotle's God to be 'one of the causes and one of the principles of all things, but not the cause for the principle of all things', for He fails to account for matter in the Aristotelian domain of being. As a consequence, Gilson finds it impossible to reduce Aristotle's metaphysics to unqualified unity. In the system of St. Thomas, however, God is the cause of everything, even of matter. Hence, the notion of metaphysics itself is modified by the doctrine of creation, for a first cause is introduced into the realm of being and from this cause everything comes into being. W.D. Ross expresses an identical view in his study, *Aristotle's Prior and Posterior Analytics*:

> "the formal cause is not a distinct cause over and above the final or efficient cause or the eternal ground, but is one of these when considered as forming the definition of the thing in question. The one type of cause that can never be identical with the formal cause is the material, and hence the material cause is silently omitted from the present passage."

According to Aristotle, therefore, the ultimate being cannot even in a remote sense be the material cause of an entity, but can only move the material world as its prime mover. By contrast, Ibn Sīnā's ultimate being is a remote cause of the material aspects of the world on the following grounds. The ultimate being first of all generates an intelligence; the first intelligence in turn generates another intelligence and a body. This generation continues, as has been discussed, until the active intelligence is generated which generates the substratum-matter of the sublunary world. In this sense, then, we can call Ibn Sīnā's ultimate being the remote cause of the world—a doctrine which gives to his system a decidedly anti-Aristotelian bias. The two philosophers diverge also on the ultimate being as the perfection of persons and the notion of mystical union. In the Aristotelian system the prime mover is not in any sense regarded as the perfection of persons; any notion of mystical union would be meaningless in his system, whereas mystical union (*paiwand*) is regarded as the source of the ultimate happiness of persons by Ibn Sīnā. One could ask, however, in what sense the Aristotelian theory can be said to approach a union of the kind Ibn Sīnā depicts.

In this connection we might recall a famous passage in Aristotle's works in which he asserts that the activity of God is contemplation, and that the best activity in which man can engage is also, therefore, contemplation (*Ethica Nicomachea*, 1178, b 8-22) :

> "But that perfect happiness is a contemplative activity will appear from the following consideration as well..... Therefore the activity of God, which surpasses all others in blessedness, must be contemplative ; and of human activities, therefore, that which is most akin to this must be most of the nature of happiness."