Research & Reviews: Journal of Pure and Applied Physics ISSN: 2320-2459

Exploring Aristotelian Physics and its Impact on Modern Science

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Opinion Article

Received: 08-Nov-2022 Manuscript No. JPAP-22-71307; **Editor assigned:** 11-Nov-2022, Pre QC No. JPAP-22-71307(PQ); **Reviewed:** 25-Nov-2022, QC No. JPAP-22-71307; **Revised:** 02-Dec-2022, Manuscript No. JPAP-22-71307(A) **Published:** 09-Dec-2022, DOI:10.4172/2320-2459.10.S5.001.

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ABOUT THE STUDY

In physics, theories of gravitation postulate mechanisms of interaction governing the movements of bodies with mass. There have been numerous theories of gravitation since ancient times. The first extant sources discussing such theories are found in ancient Greek philosophy. This work was furthered by ancient Indian, medieval Islamic physicists and European scientists, before gaining great strides during the Renaissance and Scientific Revolution, culminating in the formulation of Newton's law of gravity. This was superseded by Albert Einstein's theory of relativity in the early 20th century.

Greek philosopher Aristotle (fl. 4th century BCE) believed that objects tend toward a point due to their inner gravitas (heaviness). Vitruvius (fl. 1st century BCE) understood that objects fall based on their specific gravity. In the 6th century CE, Byzantine Alexandrian scholar John Philoponus modified the Aristotelian concept of gravity with the theory of impetus. In the 7th century, Indian astronomer Brahmagupta spoke of gravity as an attractive force. In the 14th century, European philosophers Jean Buridan and Albert of Saxony—who were influenced by certain Islamic scholars developed the theory of impetus and linked it to the acceleration and mass of objects. Albert also developed a law of proportion regarding the relationship between the speed of an object in free fall and the time elapsed.

In the early 17th century, Galileo Galilei found that all objects tend to accelerate equally in free fall. In 1632, he put forth the basic principle of relativity. The existence of the gravitational constant was explored by various researchers from the mid-17th century, helping Isaac Newton formulate his law of universal gravitation. Newton's classical mechanics were superseded in the early 20th century, when Einstein developed the special and general theories of relativity. The hypothetical force carrier of gravity remains an outlier in the search for a theory of everything, for which

various models of quantum gravity are candidates. The Ionian Greek philosopher Heraclitus (c. 535 – c. 475 BCE) used the word logos ('word') to describe a kind of law which keeps the cosmos in harmony, moving all objects, including the stars, winds, and waves.

In the 4th century BCE, the Greek philosopher Aristotle taught that there is no effect or motion without a cause. The cause of the downward motion of heavy bodies, such as the element earth, was related to their nature (gravity), which caused them to move downward toward the Earth's centre, while light bodies such as the element fire, were moved by their nature (levity) upward toward the celestial sphere of the Moon.

The 3rd-century-BCE Greek physicist Archimedes discovered the centre of mass of a triangle. He also postulated that if the centres of gravity of two equal weights was not the same, it would be located in the middle of the line that joins them. Greek philosopher Plutarch (c. 46 – 120 CE) suggested that the gravitational attraction was not unique to the Earth. Two centuries later, the Roman engineer and architect Vitruvius contended in his De architectura that gravity is not dependent on a substance's weight but rather on its 'nature'.

If the quicksilver is poured into a vessel, and a stone weighing one hundred pounds is laid upon it, the stone swims on the surface, and cannot depress the liquid, nor break through, nor separate it. If we remove the hundred pound weight, and put on a scruple of gold, it will not swim, but will sink to the bottom of its own accord. Hence, it is undeniable that the gravity of a substance depends not on the amount of its weight, but on its nature. In the 6th century CE, the Byzantine Alexandrian scholar John Philoponus proposed the theory of impetus, which modifies Aristotle's theory that "continuation of motion depends on continued action of a force" by incorporating a causative force which diminishes over time.