The Role of Philosophers in the Development of Science: A Historical Approach

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ABSTRACT
In the development of science, philosophy has played an important role. There was a time when philosophy and science were considered to be one and the same subject called ‘Natural Science’. The earliest philosophers of science belonged before Socrates. In the Medieval period Islamic World contributed significantly to the development of Science. At least the name of three philosopher scientists can be mentioned here-Ibn-Sina, Ibn-Al-Hayatham and Al-Biruni. Modern Science was began with Francis Bacon’s discovery of ‘Inductive Method’. After that a number of philosopher scientists have contributed to the development of science. Some of the important names are like Rane Descartes, Galileo, Isaac Newton, David Hume, Whewell, John Stuart Mill, Karl Popper, Thomas Kuhn, Fayerbend etc.

Keywords: science, philosophy, development.

1.0.0. Introduction:
Philosophy is generally understood as an abstract subject whose main purpose is only to put questions and making some puzzles solutions. But it is perhaps interesting to learn that the seemingly far flung disciplines of philosophy and science were once regarded as one and same subject called ‘natural science’. Science is how mankind strives to understand the world around us in all its complexity and beauty, its origin, our origin and our actions and relationships with this world and each other. Science is the essential academic tool that we use to develop the technology that has enabled human civilization to progress from a life of survival to one of comfort and convenience. The history of philosophy of science provides us the utmost clarity and appreciation of the various discoveries and inventions of science. It also studies the use and merit of scientific discoveries by explaining whether these scientific discoveries are actually a study of truth. Over all the history of the philosophy of Science evaluates and interprets the nature of truth found in scientific endeavor.

2.0.0. Methodology:
Descriptive and analytical method is applied to prepare the study. The data are collected from secondary data sources and historical approach is applied to compare the facts of analysis.

3.0.0. Delimitation
The study delimits its discussion to specific contributions made by certain philosopher of science.

4.0.0. Objectives:
- To explore the interconnectivity between science and philosophy.
- To explore that the development of science is the resultant of philosophical ideals and ideas.

5.0.0. Analysis and discussion:
The Greeks:
History reveals that the earliest philosophers of science, are the men who belonged before to Socrates, and considered science as the knowledge of nature and the things which are true for every community. Pre-Socratic philosophers like Thales, Anaximander, Anaximenes, Pythagoras, Heracletus, Lieucippus and Democritus etc. belonged to this category. These men were mainly speculators or theorists, particularly interested in astronomy. A major turning point in the history of early philosophical science was successful attempt made by Socrates (470 B.C.) to apply philosophy to the study of human things including human nature, the nature of political communities and human knowledge itself. He criticized the older type of study of physics as too purely speculative and lacking in self-criticism. He was particularly concerned that some of the early physicists treated nature as if it could be assumed that it had no intelligent order, explaining things merely in terms of motion and matter.
Plato (420 B.C.) had the archetypal Greek belief, that humanity was born with an innate knowledge of everything and that learning was a process of unlocking the memories. His argument was that everything had a perfect potential abstract form and that any knowledge gained through observation and experiment was filtered by the senses. Empirical knowledge, according to Plato, was mere opinion. Therefore, he reasoned, that pure knowledge could be advanced by deduction alone.

Aristotle (384 B.C.) contrasted Plato's view by arguing that knowledge could be gained by comparing with what was already known and perceived. He insisted on inductive reasoning and believed that it is necessary to establish some basic premises before scientific demonstrations. Aristotle used the term 'first principle' to illustrate his belief that gathering knowledge was a process of gaining experience, building upon what is already known to be true. Aristotle believed in 'observational science', and performed many measurement and observations, including describing the hydrological cycle and undertaking taxonomic work, separating many animals into families according to shared characteristics.

Thus both Plato and Aristotle showed two different ways of scientific demonstration and the reason is why Aristotle is referred as the Father of Science and Plato as the Father of Philosophy.

Beyond the Greeks, the ancient Romans also have contributed to history of the philosophy of science. The Romans, as their architecture and engineering shows, were far more interested in the empirical applied side of Science, using mathematics and practical knowledge to create some great technological advances. They much relied upon the methods used by Aristotle and Ptolemy.

The Islamic Contribution:
The Islamic world in the early medieval period preserved the philosophical knowledge of the Ancient Greek Philosophers, adding to it techniques and philosophies learned from the Vedas of India. The Vedic mathematics and astronomy were enriched and spread throughout the Western world by the Islamic Scholars. In this regard the name of two great scientists Ibn-Sina (980-1037 A.D.) and Ibn-al-Haytham are to be mentioned. Ibn-Sina built upon the scientific processes postulated by Aristotle and was the first philosopher scientist to bring the metaphysical issues of God to scientific platform. Ibn-al-Haytham, also was the first scholar to define the modem scientific method, laying down the steps of the scientific process and attempting to unite the induction of predictions and generalization with the deduction of experiment. He also pointed out that scientists should not regard themselves as infallible and that they should be open to criticism.

The other great contribution to the history of the philosophy of science during the Islamic Golden Age was Al-Biruni, who was the first philosopher to understand the importance of error within scientific experimentation. He understood that any experiment would contain small and random fluctuations, and that repeated experimentation was the only way to neutralize these inaccuracies.

Francis Bacon : 
With the decline of Islamic world and Islamic' House of Learning', during the medieval period of Renaissance, with the collaboration of Science and religion, many scientific discoveries were made to understand the nature of reality. But the actual history of the philosophy of science began with the meticulous and innovative work of Francis Bacon. Bacon (1561-1,626 A.D.) was the first philosopher of science who wanted to understand nature by discovering its laws. He criticized prevalent deductive method known as Aristotle’s Syllogism. According to him though Syllogistic reasoning gives us some clarity in our thought but it is quite useless in discovering something new. So he redesigned the scientific method largely based on induction. Induction, he said, based on observation could discover the new laws of nature and natural phenomena. Thus the idea of experimental science came from Baconian Philosophy of science. He believed that research could be used to test the validity of the real world. Earlier there was no real distinction between science and theology. Science was very much seen as attempting to explain the perfection of creation, with God as the initial first principle. It was Bacon who for the first time planted the seed of division between science and theology.

Rene Descartes (1596-1650 A.D) :
Rene Descartes, who was one of the most famous philosophers of the beginning of Modem period, attempted to explain cosmos and epistemology by deducting from Aristotelian 'First Principle', based around the divine, but at the end of his life even he realized that the cosmos was simply too complex to be derived from first principle alone.

Galileo (1564-1642 A.D) :
Galileo, famous as a scientist, was also a highly respected philosopher. He took the Baconian views of science to another level, further emphasizing the need for both empirical and rationalist thinking. He wanted to
idealize concepts especially of physics, mathematics and geometry and it was the first example of using modeling as a foundation of the scientific method.

**Christian Huygens (1624-1695 A.D.)**: Christian Huygens discovered the hypothetico-deductive method. A hypothetico-deductive method is that where a scientist proposes a hypothesis and then tries to deduce the probability through experiment and empirical observation. With the discovery of this method the history of philosophy of science saw the first divergence of science from metaphysical philosophy.

**Isaac Newton**: Sir Isaac Newton is another great example of scientist philosopher. Of course he disregarded hypothesis as a method of scientific discovery. According to him any scientific undertaking should be begin with analysis, where a scholar performed observations and experiments and then made conclusions depending upon the results. Newton also believed that the Almighty was behind every process in the Universe, and that it was too complex to be explained by physics alone. He saw his works as uncovering the laws of the universe behind creation.

**David Hume (1711-1776)**: David Hume was another main contributor to the history of the Philosophy of science. Hume was the first philosopher who expressed doubt regarding the certainty of introduction. Induction can only give us probability and no necessity or certainty. He highlighted that any inductively derived "proof" could be undone by a single contrary observation.

**Whewell (1794-1866 A.D.)**: The nineteenth century's great contributor to the history of the philosophy of science was whewell. Whewell attempted to update the philosophy of Bacon and firmly believed that inductive processes could lead to absolute proof and that science could guarantee unbreakable truth. Importantly, he believed that scientific philosophers needed to not only try to developed philosophical ideas, but that they should look back at how science had developed. He postulated that philosophers need to take a historical view looking at the processes that scientists already used rather than merely attempting to tell them what they should do.

**John Stuart Mill (1806-1973 A.D.)**: British philosopher John Stuart Mill is another name of scientist philosopher. Mill said that certainty of inductive reasoning is based on two primary principles- the principle of the 'Uniformity of Nature' and the 'Law of Causation'. But he realized that the two principles on which induction is based, cannot guarantee absolute truth because they are mere assumptions. He stipulated that however many times a hypothesis was found to be proved by empirical evidence, this could not guarantee that this would always be the case and so science could only ever be possibility, as believed by Newton. Mill’s other contribution is his Laws of Agreement’ also known as Mills Method of Experimental Enquiry, used to determine a causal effect in any relationship, by a process of elimination.

**Karl Popper (1902-1994 A.D.)**: One of the biggest names in the history of the Philosophy of science of twentieth century is Karl popper. Popper tried to distinguish the boundary between science and non-science, arguing that metaphysics was non- observational, and therefore could not be science. He championed the idea of falsification, where a hypothesis must be potentially disprovable for it to be regarded as scientific. He said that theological, epistemological and metaphysical questions were not falsifiable and therefore not scientific. Many fields such as social science, anthropology and even psychology are not sciences according to his strict definition. These fields rely upon case studies, which by definition, are non-falsifiable.

The idea of falsification placed popper amongst the greatest philosophers of science of the last century.

**Thomas Kuhn**: The 1960s saw a complete change in view with the publication of Thomas Kuhn's book, "The Structure of Scientific Revolutions". This book is commonly regarded as the most influential text in the history of the philosophy of science. He brought up the idea that the philosophy of science had to look at the history and evolution of science. Kuhn also contributed to the philosophy of science with the idea of paradigms and paradigm shifts.

**Feyerbend (1924-1994)**: Feyerbend believed that the scientific method was an artificial construct. He suggested that very few scientists actually followed any such method and took a very open view of science, implying that there can never be a strict definition of what constitutes a science. For example, fields such as social science, economics, archaeology and even psychology fall somewhere in-between science and non-science.
6.00. Findings:

- Science in its initial period of development were totally dependent on the philosophical ideas. The Greeks were the pioneer in this regard.
- The Islamic revolution was also blessed with scientific attitude and scientific temperament which reflects in the works of then Islamic philosophers of science.
- In the modern period the methods of scientific inquiry were developed basically by philosopher scientists. The name of Bacon and Mill are noteworthy.
- Contemporary philosophers of science have critically examined the different structural changes adopted by science.

7.00. Conclusion:

Philosophy and science and their interconnection has endured for thousands of years. In the present condition things are not only been preserved but is also growing substantially stronger. Science without can never be good science. 'Physics without metaphysics 'is an impossible endeavor in the higher of the term. True sciences can never break their connection with true philosophy. But still there are divergent of opinions. Some says that science should adopt a strict and selective method with definite philosophical outlook. On the contrary some relies on an open and free procedure. In this way philosophy of science has historically been met with mixed responses from the scientific community.

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