ON THE PHILOSPHIC FOUNDATION OF SCIENCE

Charles C. NWEKE

Abstract
This paper comes as an attempt to restate the place of Philosophy in the evolution of human development and history. It represents the bid to address seeming, subtle and vocal moves to denigrate Philosophy amidst the reckoned progress of science and technology and more worrisome, deny it of an age long title- Mother of all Sciences. The paper reechoes, by tracing the origin of Science, the fundamental role of the mother Philosophy by being and begetting Science as its ancient offspring. It equally articulates the time and circumstances that informed the independence of the basic disciplines of Science from Philosophy. The paper's synopsis is the position that all the fields of science have their remote foundation in Philosophy.
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1. Introduction

The attempt to reaffirm the philosophic foundation of science, at the present era of seeming over glorification of science based on its huge advancement would portend a sought for intellectual trouble especially of science scholars. Nevertheless, the place of philosophy as the crib of human knowledge, development and civilization remains an undiluted fact hinged on known and recorded history. Science and the fields with which it is currently known, this paper posits, did not begin as independent area/s of knowledge. It was rather birthed much after initial philosophers' endeavours at wondering to understand the universe and the fundamental element/s with which it is constituted.

There have been concerted and subtle attempt to denigrate this historical fact, thereby denying the place of philosophy in foundation of human knowledge inquiry. These attempts present either as arguments that the known foremost philosophers of ancient time were basically scientists or that philosophy is part of science. There are even claims by individual fields of science to be the harbinger of all knowledge.

The content of this paper begins with a concise articulation of the origin of science tracing that history from the time of ancient Greek thinkers. This is followed by a section on how some basic areas of science were studied as philosophy. The section on the philosophy as the mother of all science was preceded by an exposition of period of independence of science from philosophy.

2. Origin of Science

History of science cannot be objectively chronicled without reference to its philosophical origin. That science has philosophical foundation is not a product of mere philosophic speculation, but a historical verifiable fact. What is today known as science and its specific areas began with the ancient and foremost known philosophers' attempt at inquiry into the universe in the bid to uncover the basic elements that constitute reality. The reckoned beginning of philosophy around sixth century BCE saw the emergence of the known first scientists of Western history. The ancient Greek thinkers such as Thales, Anaximander, Parmenides, Heraclitus, etc popularly known as the Pre-Socratic philosophers, presented the first recorded basic element of nature- water, air, fire, earth. Apart from proposing these basic elements, they provided the initial direction for the definition, meaning and future of the entire corpus of human knowledge based either on reason or/and sense data. Study of Classical Philosophy is insightful in this regard.

> Classical philosophy studies the fundamental problems concerning human existence through the eyes of our intellectual ancestors. Many thinkers from Classical times were pioneers of our modern philosophical and scientific ideas. The earliest beginnings of philosophy are traced back to the sixth century B.C.E., when the first scientists of Western history, the Pre-Socratics – among them Thales, Heraclitus and Parmenides – advanced revolutionary theories concerning the natural world, human knowledge and humans' relationship with the gods. (www.classics.pitt.edu)

It is very important to note that the ancient philosophical thoughts and works of preceding thinkers especially Pythagoras, Democritus, Euclid, etc led to discoveries which informed many known and surviving scientific theories and fields. After the discovery of the four basic elements initiated by Thales, the next point of enquiry was the question of _form' which saw Pythagoras propounding a theory about number which gave birth to mathematics. In his –History of Science|, Williams(2018) submits that:

> The problem of form was first attacked systematically by the philosopher and cult leader Pythagoras in the 6th century BCE. Legend has it that Pythagoras became convinced of the primacy of number when he realized that the musical notes produced by a monochord were in simple ratio to the length of the string. Qualities (tones) were reduced to quantities (numbers in integral ratios). Thus was born mathematical physics, for this discovery provided the essential bridge between the world of physical experience and that of numerical relationships. Number provided the answer to the question of the origin of forms and qualities.

One of the most popular mathematical theories, the Pythagorean theorem credited to Pythagoras, the first person to identify philosophy as love of wisdom, ranks among his other discoveries. The five regular solids, sphericality of the earth, the theory of proportions, the Pythagorean tuning, division of the globe into five climatic zones and the identity of the morning and evening stars as planet Venus are equally notable scientific discoveries of Pythagoras.

In further response to the primary element the universe is constituted, Democritus championed the invention of atoms and proposed that matter is governed by atomic principles. Thus:

- Everything is composed of ‒atoms‖, which are physically, but not geometrically, indivisible
- Between atoms, there lies empty space
- Atoms are indestructible
- Atoms have always been, and always will be, in motion
- There are an infinite number of atoms, and kinds of atoms, which differ in shape, and size. (Williams, 2015)

Matt Williams(2015) captured the invention of Democritus in these words:

> And along the way, many names stand out as examples of people who achieved breakthroughs and helped lay the foundations of our modern understanding. One such person is Democritus, an ancient Greek philosopher who is viewed by many as being the ‒father of modern science‖. This is due to his theory of universe that is made up of tiny ‒atoms‖, which bears a striking resemblance to modern atomic theory.

A critical lens on these submissions could engender the argument tilting towards negating the philosophic claim of origin of science. It could be thought that those pioneers of science were only coincidentally philosophers whose scientific discoveries and theories were independent products of their scientific thinking without any recourse to and different from philosophy. It could be argued that they were doing science without calling it science. However, to the disappointment of such thought inclination, scientific outputs of the thinkers were products mainly of their metaphysical, cosmological and epistemological enquiries about what is,what it is like,the universe, truth and knowledge. In fact, the basic areas of science like mathematics, chemistry, physics, astronomy, medicine were studied in the ancient Greek era as part of philosophy. Spirkin avers to this effect that, ‒Many general

guiding ideas that lie at the foundation of modern science were first enunciated by the perceptive force of philosophical thought.‖ In fact, ―Hellenic science was built upon the foundations laid by Thales and Pythagoras. It reached its zenith in the works of Aristotle and Archimedes.‖(Williams, 2018)

3. Science was studied as Philosophy

The ancient philosophers of ages were not only inventors of science; they established avenues for cross fertilization of ideas and imparting of knowledge. They created academies and became foundational teachers of known history. In that era, Greek academies were terrains mainly for study of Philosophy. In fact, ―The latest theories of the unity of matter, motion, space and time, the unity of the discontinuous and continuous, the principles of the conservation of matter and motion, the ideas of the infinity and inexhaustibility of matter were stated in a general form in philosophy.‖(Spirkin) Aspects of science including mathematics, geometry, and medicine were studied as Philosophy.Dr. Alannah Freer in writing ―A History of Science‖ captures this point succinctly. He stated that:

> Pythagoras was the first scientist recorded to have taught the science of the Ageless Wisdom through mathematics, astronomy, geometry, harmonics, medicine and numerology in a form that has survived the test of time and is still recognisable today.

After the time of the early ancient Philosophers, one of the most popular Greek philosophers of Socratic period, Plato emerged with popular philosophic and scientific achievements. He is known to have established an academy in quest for truth and propagation of knowledge. Reflecting on his contribution to science, SaugatAdhikari(2019) notes:

> Plato played a vital role in encouraging the Greek intelligentsia to regard science as a theory. His Academy taught arithmetic as part of philosophy, as Pythagoras had done, and the first 10 years of a course at the Academy included the study of geometry, astronomy, and music.

The philosophical thoughts and works of Aristotle, after Plato, provided a redirection for human inquiry using scientific means. He invented logic and observation as crucial tools for the knowledge of the natural world. His other achievements in the areas of science reverberated so vigorously that he is considered by many scholars as the main inventor of science as well as the first real scientist. In the work, *The Lagoon: How Aristotle Invented Science*Armand Marie Leroi (2014) posits that:

> Aristotle is considered by many to be the first scientist, although the term postdates him by more than two millennia. In Greece in the fourth century BC, he pioneered the techniques of logic, observation, inquiry and demonstration. These would shape Western philosophical and scientific culture through the Middle Ages and the early modern era, and would influence some aspects of the natural sciences even up to the eighteenth century.

Anselm H. Amadilo and Anthony J.P. Kenny(2020) also hold the view that:

> Aristotle's intellectual range was vast, covering most of the sciences and many of the arts,including biology, botany, chemistry, ethics, history, logic, metaphysics, rhetoric, philosophy of mind, philosophy of science, physics, poetics, political theory, psychology, and zoology. He was the founder of formal logic, devising for it a finished system that for centuries was regarded as the sum of the discipline; and he pioneered the study of zoology, both observational and theoretical, in which some of his work remained unsurpassed until the 19th century.

In the time of Aristotle, science did not exist with the name ‗science', rather it existed as natural philosophy. Its fields as they are known today were studied as philosophy. Steve Joyce (2018) philosopher and writer captured it thus:

> What we now call ―science‖ was predated by something called ―natural philosophy,‖ which attempted to infer what is true about the natural universe mainly by means of reasoning based on casual naked-eye observation. In the 4th century BCE, Aristotle believed that all the universe's secrets could eventually be deduced using logic based on the knowledge of his time. He then went on to deduce that the earth stands motionless at the center of the universe, while the planets (including the sun and moon) and stars were embedded in rotating, concentric, hollow crystal spheres, with the earth at their common center.

4. Modern Period

Apart from the foundational contributions of ancient philosophers, philosophy/science relations continued to reflect in the thoughts of many modern thinkers. Rene Descartes, the father of modern philosophy, and other notable 17th and18th century philosophers contributed some popular scientific theories. Descartes, for instance, proposed the universal conservation of motion. Baruch Spinoza's substance monism contains in his theory of monads, basis for universal scientific determinism. Galileo is known for his popular theory of the shape of the earth. In the preceding times of the enlightenment,

Newton and Einstein‘s theories of absolute space and relativity respectively are responses to the philosophical inquiry about space and time. In the words of A. Spirkin:

> We may also recall the Cartesian reflex and the philosopher's proposition on the conservation of motion in the universe. On the general philosophical plane Spinoza gave grounds for the universal principle of determinism. The idea of the existence of molecules as complex particles consisting of atoms was developed in the works of the French philosopher Pierre Gassendi and also Russia's Mikhail Lomonosov. Philosophy nurtured the hypothesis of the cellular structure of animal and vegetable organisms and formulated the idea of the development and universal connection of phenomena and the principle of the material unity of the world. Lenin formulated one of the fundamental ideas of contemporary natural science—the principle of the inexhaustibility of matter—upon which scientists rely as a firm methodological foundation.

5.Independence of Science from Philosophy

Various studies have shown that disciplines of science, from antiquity continued to be taken as philosophy for many centuries. The point of independence of science commenced with the gradual coming of the enlightenment age. Modern science was actually born in 17th century with the invention of instruments like microscope, telescope, barometer and clock. Modern Biology and Chemistry began to be developed as independent fields in 18th century. Steve Joyce (2018) philosopher and writer holds that, ―…the improved discipline continued to be called ―natural philosophy‖ until the 19th century, when the word ―science‖ was adopted to replace it.‖The acknowledgement, among scholars of science, of the philosophical foundation of science is not in doubt. American Association for Advancement of Science (AAAS) maintain in their ‒History and Philosophy of Science‖ that:

> Until the 19th century, natural science was primarily known as ‒natural philosophy‖, and contemporary philosophy still maintains deep connections with science. Some of the greatest intellectuals of all time were both scientists and philosophers. In the 17th century, Descartes, Leibniz, and Pascal developed modern science and articulated its philosophical foundations.

6. Teaching History of Science in Institutions

The teaching of history of science in any institution of learning cannot be complete without the basic crucial account of how the initial philosophic endeavours of ancient thinkers shaped science. Department of Classics, University of Pittsburg, USA, for instance, presents in its study course ‗History of Science‘ that:

> The ancient Greeks were the first mathematicians and scientists of the West. Thinkers such as Thales, Anaximander, Pythagoras and Empedocles attempted to make sense of the world by studying the evidence they found in

> it. Anaximander proposed that the earth was a solitary body, floating free and unsupported in the universe, and produced one of the first maps of the world. Empedocles was among the first to believe that the world consisted of diverse material elements acted upon by forces of attraction and repulsion. The atomic theory of matter begins with the Greeks. Euclid remains one of the most influential mathematicians of all time. His contemporary Archimedes was a famous inventor and is also credited with discovering a geometrical technique which anticipated calculus and the fact that the surface and volume of a sphere is 2/3 that of its circumscribing cylinder. Through early astronomy, the Greeks developed the idea of mathematized science. In the field of medicine, they began with case histories and folk remedies, and ended up with an understanding of the nerves, the ability to patch up wounded gladiators, and even the ability to remove cataracts with eye surgery. They invented the first steam engine, vending machine, automatic doors, and more. And they sustained glorious cities with over a million inhabitants without using electricity, fossil fuels, gunpowder or nuclear fission as sources of energy.

In articulating ‗A Brief history of Science', The Open University, Scotland submitted that:

> The first people to try and develop the theory behind their observations were the Greeks: people such as Pythagoras, who concentrated on a mathematical view of the world. Similarly, Aristotle and Plato developed logical methods for examining the world around them. It was the Greeks who first suggested that matter was made up of atoms - fundamental particles that could not be broken down further.

7. Conclusion: Philosophy as the Mother and Science of Sciences

The exposition so far has shown how philosophy birthed science. Thus it should not just a mere claim when people hear the expression, ‗Philosophy is the mother of all sciences'. Philosophy indeed is! Not only did Philosophy lay the foundation for the existence of science, it nurtured science to some level of maturity before its various disciplines sprouted independently. Nevertheless, it is to be noted that even at independence, development and advancement, disciplines of science have not actually departed from the basic philosophic nature of inquiry into reality. In other words, studies of science are remotely studies of philosophy. The area of sciences' departure from philosophy is the method of science. While philosophy maintains its central character of criticality together with sometimes being speculative, science thrives on empirical explorations.

Philosophy is also reckoned as science of sciences in its role of keeping the reins of sciences in continuous rational check. Philosophy understudies every field of science and with its critical essence and other methods, understands the possibility of those fields operating outside their essences and expectations. In other words:

> Philosophy may be called the "science of sciences" probably in the sense that it is, in effect, the self-awareness of the sciences and the source from which all the sciences draw their world-view and methodological principles, which in the course of centuries have been honed down into concise forms. (Spirkin)

Thus, there is philosophy of virtually every other discipline with the task of questioning their fundamental assumptions and in its normative or prescriptive nature, multiplies options for those other disciplines. So in the academic field of philosophy, one sees areas like philosophy of science, philosophy of mathematics, philosophy of medicine, etc.

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