THE IMPLICIT METAPHYSICAL CHARACTERS OF MODERN SCIENCE

Chinedu S. Ifeakor & John-Paul Nnamaka Nwuguru*

Abstract
Philosophy and science have historically the same epistemological maternity namely- the search for truth. But science was subsumed and studied in philosophy. However, with the scientific revolution that heralded the wake of 17th century and its epistemological exigencies, science sought for independence in order to employ its own particular language in its peculiar internal logic. This particular move for independence was hardly unconnected to empiricity and high possibility of verifiability which science promises. Notwithstanding the laudable successes and glories recorded by science since the Ancient, Middle, Modern and Contemporary epochs, and which became most evidently glaring in the radical technological advancements of the late 20th century to date, modern scientists seem to be deceived into believing that science is absolutely independent of philosophy (metaphysics) but obviously, they were oblivious of its impossibility. Against this backdrop of over claim of science independence by the scientists, this paper x-rays the philosophical contents of science, vis-à-vis the unavoidable implicit metaphysical characters buried in the foundation of scientific practices. Given the two concepts involved in this paper (Metaphysics and Science), the method of dialogic was employed to help bring out the relationship and interaction between the two concepts, and the anticipated result is that the former is fundamentally present in the later.
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Introduction

Given its global exploits and empirical orientation, the epistemological field of empirical science claimed sufficient and total empiricity, devoid of dents of metaphysics. But how true is this claim? Is science totally and wholistically empirical as claimed? Granted that science has thrived rapidly since the dawn of the modern period, are modern scientists as empirical as they claimed or are there some metaphysical characters that unconsciously formed the background of their practices which they know not of? We note however that the growth and progress of modern science since the modern period seemed to have threatened the progress of metaphysics with the arguments of non-clarity of terms, indistinctness of entities, non-verifiability of claims and spuriousity of contents. David Hume the father of British empiricists and most thorough going logical empiricist was a notable exponent in the litany of the critics of metaphysics. In his *Treatise on Human Nature*, Hume speaks of metaphysics with such a disgusting tone of resentment. His derogatory statements on metaphysics can be captured thus:

> When we run over libraries, persuaded of these principles, what havoc must we make? If we take in our hand volume of divinity or school metaphysics, for instance let us ask, does it contain any abstract reasoning concerning quality or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames; for it can contain nothing but sophistry and illusion.[i]

Hume saw metaphysics as a wasted venture because it does not follow or obey the systematized paradigm of empirical science; and any claim of knowledge that does not pass through the eye of scientific model is for him epistemologically inauthentic and devoid of valid content. This is absurd and scientific tyranny. However, corroborated by his contemporary, Emmanuel Kant who had claimed to have been woken from his dogmatic slumber by Hume's accounts and criticisms, equally launched a similar attack on metaphysics. But, although Kant's criticism on metaphysics was vehement, his epistemological dualism, particularly his doctrine of *'noumena'* became the stepping stone upon which the German idealism thrived, with Hegel as the chief protagonist. Hence, Kant writes:

> Though we cannot know these objects as things in themselves, we must yet be in a position at least to think them as things in themselves; otherwise we should be landed in the absurd conclusion that there can be appearance without anything that appears.[ii]

Kant was rather more severe on metaphysics in his book *Prolegomena to any Future Metaphysics,* where he launched several arrays of skeptical questions on the dwindling, non-progressive and stunted growth of metaphysics. He however benched his submission on the claim that metaphysics "taunts the reason with endless and unsatisfying hopes and as such remains unprogressive."[iii] Rudolf Carnap and his Vienna Circle colleagues cannot be put out of this league of critics. The metaphysical obscurity according to him is a conscious and calculated effort of the metaphysicians in order to avoid being categorized within the circuit of empirical science. Thus he asserts:

> Metaphysicians cannot avoid making their statements non verifiable, because if they make them verifiable, the decision about the truth or falsehood of their doctrine would depend upon experience and therefore belong to the region of empirical science. This consequence they wish to avoid, because they pretend to teach knowledge which is of a higher level than that of empirical sciences. Thus they are compelled to cut all connection between their statements and experience, and precisely by this procedure they deprive them of any sense.[iv]

From the forgoing however, one could easily see that verifiability, observability and self-evidence formed the common denominators that punctuate the paradigm

of the critics' critique of metaphysics. But do these deluge of criticisms actually proved the wholistic empiricity of modern science without any philosophical/metaphysical contents? Granted that science is much akin to empirical entities; are all scientific propositions self-evident as claimed by the scientists? Is science completely and totally empirical? Or are there implicit metaphysical characters that formed the background upon which scientific tenets are hinged?

This paper argues that science is not totally and completely empirical as claimed by the scientists. It proceeded to itemizing and explaining the various metaphysical characters of modern science which the scientists are oblivious about.

Metaphysics and Science: The Journey So Far

The metaphysical characters of science are those unempirical presuppositions/assumptions which formed the background for the most if not all the entire scientific plays. These assumptions are considered to be 'given' and are always constant in nature, in the mind of the scientists. So, the question of existence of those assumptions is for them unnecessary, given the fact that it is obvious. But this 'obvious fact' lacks scientific foundation. It is rather metaphysically based. This unscientific believes punctuate most of the scientists' endeavours and unconsciously serves as their guiding **'principles'**,though unconsciously. Hence, science is known for principles. But let us give a brief touch to the concept of 'principle' especially as it relates to the topic under consideration.

Principle

"Not only is it that the history of philosophy abounds in principles: the principle of sufficient reason"[v] but that the word 'principle' has actually enjoyed varied usage pending the contexts of adoption. But then, it has retained a single meaning within its varied contexts of usage namely – guide towards a process. To this effect however, the need arises to state clearly a working definition or meaning of 'principle' in this work. To this end, chamber dictionary would be our guide.

Principle is "a source, root, origin; a fundamental or primary cause; a beginning; essential nature; a theoretical basis or assumption from which to argue, etc."[vi] "A principle will often be put forward as an alleged obvious truth from which to derive further truth. The principle or principles may be thought so basic and general that all or most knowledge, or anyway of philosophical, can be derived…"[vii] Moreover, Dilworth conceived principles more as presuppositions of modern science. That is, metaphysical principles that guides scientific practices. Thus he writes: "the basic presuppositions or principles of modern science are here seen to be ontological, to concern the nature of the subject-matter of science."[viii]

He considers these principles as being ontological to the nature of science than being another thing. We must at this juncture note that the question of **'ontology'** is a matter of metaphysics. "So the basic presuppositions or principles of modern

science will here be taken to be ontological in nature, that is, to be very general assumptions regarding the nature of what modern science sets itself to investigate."[ix] This implies that these principles in their relatively pure form constitute the core and the foundation of modern science. Based on the above logic however, principles should be conceived as together delineating an ontological paradigm or an ideal conception of reality (whether empirical or transcendental) which may generally be presupposed in the doings of science. Those principles are themselves metaphysical principles.

Metaphysical Principles And Scientific Paradigm

Uniformity Principle and Scientists Dependency

The practice of modern science presupposes that nature everywhere is the same. According to Dilworth, the modern scientists work on the metaphysical framework and presupposition that nature is same and regular notwithstanding the place of observation of a particular nature. Thus, for the empirical scientists, the homogeneity and consistency of nature is non-negotiable, though they are unconscious of this indispensible and unempirical fact. It may not be debatable to say that these empirical scientists came from different races and cultures. But racial and cultural diversity do not convert or change what 'is' into what 'is not'. Culture variations are not and cannot be a barrier to the uniformity of nature. The reality of this principle however punctuates the reasoned actions of the scientists and tries to place them on a better plan for future events. Hence, Dilworth writes:

> In some form or other the principle of the uniformity of nature has been assumed by human beings of all cultures and all historical epochs in their daily lives. Without the adoption of this principle and an assumed awareness of some of the rules according to which natural change take place, there would be no basis for reasoned action concerning future, whether near or distance.[x]

Uniformity principle is actively fundamental behind the scene of the scientific practices. This is because all that an empirical scientist does is on nature. He interacts and examines any kind of nature of his interest. For instance a scientist may decide to investigate on a nature called 'iron'. He examines, testes, and researches about this particular nature called 'iron'. Finally, he comes up with a conclusion that the nature 'iron' is both ductile and malleable. He would inductively conclude that all the nature called 'iron' is both ductile and malleable notwithstanding the location, time and place. Therefore 'iron' is same and uniform everywhere at all time. Thus Dilworth hints:

> As a basic presupposition of modern science, however, the principle takes on a particular form which has a specific implication regarding the nature of the world which science investigates. The form of the uniformity principle which will interest us in what follows is that according to which similar states

> of nature are followed by similar states. Thus, if a particular state A is similar to a state B, and A is succeeded by A', then B will be succeeded by B', where A' and B' are similar.[xi]

Principle of uniformity of nature is not only basic but also necessary because without it the scientists cannot conduct experiment; and if they do not conduct experiment, then they can neither confirm hypothesis nor refute it. And if they cannot confirm or refute hypothesis, then they would lose their future scientific predictions. Again, the fact that when one decides to re-test or re-verify already verified proposition, one would have a similar result if the similar conditions are observed, proves the reality and indispensability of uniformity principle. Hence every experiment under the same or similar conditions will give the same or similar result everywhere. Based on the above assumption, all the scientific experiments would yield the same result any where if all conditions are met. For instance, Boyle's law states that "The absolute pressure exerted by a given mass of an ideal gas is inversely proportional to the volume it occupies, if the temperature and amount of gas remain unchanged within a close system."[xii] This can be mathematically expressed thus: P α 1/V therefore PV = K, where P is pressure of the gas, V is the volume of the gas, and K is the mathematical constant. This experiment will give the same result everywhere if the necessary conditions are kept irrespective of who does it and where it's done.

However, although the empirical scientists are oblivious of their dependency on some metaphysical principles, they are essentially under the '*deterministic*'[xiii] principle of uniformity of nature. It is this principle that informs most of their practical actions as scientists. For instance a scientist who enters his laboratory and came up with a drug substance called *paludrine*, tested it on human person and it gave the desired result. He would finally distribute it across the world without testing every person in the world due to his optimistic conventions; necessitated by his sub-conscious presupposition that human person (colour or race notwithstanding) is one everywhere. Therefore, the drug substance called *paludrine* would have approximately same effect in every person. Not forgetting however that there could be some exceptions as regards immune systems that are allergic to some kind of substances; but exceptions do not nullify rules rather they prove them.[xiv]

A closer look at this principle would reveal that all laws presuppose the principle of uniformity of nature. Thus it is more of a methodological principle than a law about the universe *per se*. "Whether one takes the principle in a stronger or weaker sense, it is of course important to establish what should be the case in order for two states to be or not to be similar."[xv] This implies that whether the empirical scientists agreed or not, they continued to be under the influences of the uniformity principle and all other metaphysical principles that formed the spinal cord of their praxis.

Principle of Substance and Scientists' Practice

Substance according to Chamber Dictionary is "that which makes anything what it is."[xvi] Thus, everything has its substance and "none of the categories other than the substance can exist apart."[xvii] It is the substance that makes a thing what it is and everything finds definition based on its substance. In the same vein, everything except substance is either predicated to a substance or present in a substance. Simply put, it is that of which nothing can be predicated to, but present in that which can be predicated. Therefore, everything is predicatable and are predicated to substance because it (substance) underlie everything that is. Based on this fact, Bacon says: "Nothing is made from nothing, nor can anything be reduced to nothing; but the actual quantity of matter, its sum total, remains constant, being neither increased nor diminished."[xviii] In line with Bacon, Kant writes "In all change of appearances, substance is permanent; its quantum in nature is neither increased nor diminished."[xix] While for Spinoza, substance is that which exists in itself, and is conceived by itself; that which does not need the conception of any other thing in order to be conceived.[xx] All these ideas, point to the independent existence of substance.

However, the metaphysical principle of substance as conceived by Craig Dilworth focuses on the idea that the scientists presupposed that there is what is called substance. Their presupposition implies that no matter what may happen in the scientist's laboratory or whatever changes that may occur in nature, there must be something that will remain unchanged, and on the bases of which they can say that change has taken place. Thus, scientific practices are hinged on the presupposition that things actually change but despite the changes, there are things that remain to account for the changes. Those things that remained owe predications of those things that changed. This entails that the modern empirical scientists already know that there is something that continue to exist and are not changed or affected within space and time. And the fact that nature is constant gives credibility and stability to scientific results. This knowledge lacks scientific root. Hence Dilworth writes:

> The conception that is of particular relevance to modern science is that according to which substance exists perpetually and change is but an alteration of the substance. An important corollary of this conception is that no (portion of) substance either comes into or goes out of existence. This conception might be termed the principle of the perpetuity of substance, but for ease of reference we shall simply call it the principle of substance, bearing in mind the notion of substance intended.[xxi]

So, deep down in scientists' sub-consciousness is the presupposition that there is a 'being' whose permanency and perpetuity is non-negotiable and which informs and underlie their (scientists) laboratory practices. Little wonder did Omoregbe writes that "the word substance literally means standing under, or that which stand under."[xxii]

Furthermore, we know there are diverse branches of science and each of those branches possesses their own unique 'internal logic of existence'[xxiii]. Every branch has a peculiar way of looking at reality. They may have different approaches to what substance is. Notwithstanding these possible diversities in the conceptions of substance, there is a crossroad between them. That is why the principle of substance is applicable to all the branches of science. Thus Dilworth opines:

> Similarly, the way in which substance is conceived in one scientific discipline might well differ from the way it is conceived in another, while the principle of substance be applicable to both. In fact, it could be argued that the substances of different disciplines must differ in some significant respect in order that the disciplines actually be different. Furthermore, the substance of a discipline can [xxiv]take different forms.[xxv]

The above observation implies that science has so many aspects. These aspects have their different substances and their various forms of the substance. However, the substance of these aspects of science exhibits certain level of dependency on one another due to their close similarity in the scientific practice namely- **definition of substance and methodology**. This would imply that the substance to a particular branch of science could presuppose the other. Hence;

> What we find in the case of modern science is that the substances of certain disciplines are presupposed by those of others, placing the disciplines in a hierarchy of ontological dependence. Thus the substance of chemistry presupposes that of physics, that of biology pre-supposes that of chemistry, and that of the social sciences presupposes that of biology.[xxvi]

Therefore, the activities of the modern empirical scientists are necessarily punctuated by their presupposition of the constancy of substance. And this substance is just there in nature unquestionably. "If the universe is of the nature of a whole, substance is its first part; and if it coheres merely by virtue of serial succession, on this view also substance is first"[xxvii] So, whether the scientists know it or not, their unconscious presupposition of substance forms the background upon which they operate as empirical scientists.

Scientists and Metaphysics of Causality

"The principle of causality states that change is caused."[xxviii] The implication of this fact is that, to every change there is a cause and change is the effect of a cause which is subject to the scientific investigation. However, the concept of 'cause' has enjoyed a long historic attention. The history of philosophy is replete of what caused a particular effect. Hence, "A cause is that which brings about a certain effect."[xxix] Thales and the Ionian thinkers no doubt speculated much about the cause of the universe.

> The early Greek philosophers were struck by two factors as they observe the universe. First, they observed that although there were

> changes everywhere that things changed from one form to another nevertheless there was a continuity in the midst of the changes. There was always something which did not change but remained permanent and persisted through the changes. Secondly, these early philosophers also felt that there was a basic unity in the midst of the plurality of things…[xxx]

Nevertheless, although there was no unanimous agreement among the ancient philosophers on what the *primary cause* and the basic unity of things is/are, they have a common denominator that things are caused by another thing, and there is a 'fundamental unity underlying the diversity of things'[xxxi].

> Our universe is constituted by such basic elements as Water for Thales; Air for Anaximenes; The Unlimited or To Apeiron for Anaximander; a combination of four elements: air, water, fire and earth, for Empedocules; Nous (Mind) for Anaxagoras, Numbers for Pythagoras and Atoms for Democritus and Leucippus.[xxxii]

The one recurrent fact above is that there is something that remains constant amidst the changes. Hence, at the end of the book four, chapter eight of his metaphysics, Aristotle opines thus "for there is something which always moves the things that are in motion, and the first mover is itself unmoved."[xxxiii] This implies that there is a 'being' superior to other beings which causes and sets others in motion. All these subsequent statements lend credibility to the first premise of this metaphysical principle- the principle of causality.

The concept of causality is of high concern in science. Scientists believe and are convinced that things are caused. Thus, 'to every effect there must be a cause' is not just a cultural believe but also a scientific one. This is why scientists often go to laboratory to either prove the cause of an effect or the effect of a cause. The reality of this fact is evident in medical, engineering, agricultural, etc fields of science. But the question is, what is the empirical bases of the belief that things are caused, as held by the scientists? Has such a priori knowledge any empirical scientific background? In as much as they cannot scientifically account for such unconscious optimism, it remains a metaphysical principle that guides the practices of scientists.

On another note, every historical age or epoch has a conception of 'cause'. In the same vein, every human culture has the notion of 'cause'. "Like the principle of the uniformity of nature, it has been and is held in some form or other by human beings of all cultures."[xxxiv] Some cultures attribute most of if not all the causes of an effect to be of a supernatural origin, while some attribute it to be of a physical source. Although the culture of the empirical scientists have no room for supernatural causes, traces of it is found in some of the 'Newton's'[xxxv] work. Hence, the empirical scientists believe that every effect must have a corresponding cause; and this cause must be of a physical origin verifiable and testable. This is why if someone goes to a doctor and report of some signs and symptoms of

malaria, the doctor will first collect some specimen and go into the laboratory for tests. Why? He cannot just conclude that the patient is positive of any particular medical condition without a certified medical examination. To do that would be 'a jump in the medical logic' because he (doctor) is guided by the metaphysical principle of causality- to every effect there is a cause. Thus, he presupposed that the signs and symptoms are effects of the yet to be discovered cause which is the essence of the medical test. We must note that the answer to the question of a 'cause' may be empirical; it does not negate its metaphysical undertone. As Ogbozo hints, "a cause-inquiry (i.e. an inquiry into the cause of a thing) is ultimately metaphysical though an empirical answer may be given to a cause by scientists."[xxxvi] In corroboration to the above submission, Henri Renard writes: "the principle of causality, like the principle of contradiction is a metaphysical principle insofar as it involves an immediate deduction or intellectual reflection that transcends the empiricism and particularity of sensible experience."[xxxvii]

However, it seems that the empirical scientists are too monistic in their conception of 'cause'. They often believe that there must be a 'physical cause'; and this 'physical cause' is testable, verifiable and confirmable. These facts prove the scientists monistic conception of 'cause'. But how correct could such submission? Is it not possible that there could be another 'cause' apart from 'physical cause' which perhaps may be metaphysical? Are all 'causes' measurable and testable as believed by the scientists? Could it be that Aristotle has wasted his time in his doctrine of formal cause? What we are saying is that there could be a metaphysical cause which cannot be verified by any scientific medium. Therefore scientists should dilute their monism as regards the principle of causality. Hence Dilworth advised that natural causes should not be solely attributed to the physical causes. Something more than the 'physical cause' could also be considered. "But all 'natural' causes need not be conceived of as being physical, and there are important alternatives to be considered, the foremost of which is the idea of a formal cause."[xxxviii]

The perennial debate between the realists and the empiricists has always been, 'which between the formal cause and physical cause should be given primacy?' [xxxix] Each of these notions of 'cause' has a long historical origin traceable to the ancient Greek philosophy. For instance:

> The physical notion originated with Thales and was further developed largely by the Ionian philosophers, while the formal notion originated with Pythagoras, became the cornerstone of an extremely influential philosophy in Plato, and adopted a particularly noteworthy guise in Aristotle's notion of a final cause.[xl]

This notion of 'cause' informed Aristotle's theory of *hylemorphism* where he separated matter from the form in contradistinction from Platonic form and matter. It equally informed his (Aristotle) distinguishing between the four causes: the formal cause is the shape which a thing is made; material cause is the matter from

where a thing is made; the efficient cause is the energy through which is a thing is made; while final cause is the purpose for which a thing is made.[xli]

More importantly than not, the very theory of causality lacks empirical foundation; instead, the doctrine of causality is of a metaphysical origin which cannot be tested or verified scientifically. Thus, at the subconscious level of the scientists is the *a-priori* conclusion that 'to every effect there must be a cause'.

Conclusion

Despite the fact that science began to define its autonomy from the Copernican, Galileo and Newtonian epochs, the autonomy of science is not an absolute one as claimed by the scientists, nor is it determined by any philosophical system. Hence, there are issues that science appeals to metaphysics for reasonable support, and there are issues that metaphysics makes recourse to science for a better interpretation of nature. The activities of the scientists are mainly on the questions of the existence of being, though from the empirical dimension. As a matter of fact, "nothing can be more metaphysical as the question of existence."[xlii] For a wholistic attention and comprehension of a being, metaphysics is inevitably involved. Thus**,** Lowe hints:

> Metaphysics is most perspicuously characterized as the science of essence- a primarily a priori discipline concerned with revealing, through rational reflection and argument, the essences of entities, both actual and possible, with a view to articulating the fundamental structure of reality as a whole.[xliii]

From the above, it is evident that science cannot make an enduring justifiable claim of absolute autonomy and independent of metaphysics without consciously or unconsciously contradicting itself in practice. But scientists are not conscious of this fact. Hence philosophy as a more in-depth oriented discipline dared to bring to bear that which is latent in science. But Scientists seemed not to be comfortable with this fact; not necessarily because it threatened their authority but because it questions their absolute independency.

William Shakespeare, in Julius Caesar, Cassius told Brutus thus:

> Therefore, good Brutus, be prepared to hear. And, since you know you cannot see yourself so well as by reflection, I, your glass, Will modestly discover to yourself that of yourself which you yet know not of. And be not jealous on me, gentle Brutus.[xliv]

Philosophy is a mother of all sciences. It is also "the salt and light of knowledge." [xlv] Mother is like a mirror through which the children censor themselves. So, like the above Shakespearean stanza, philosophy is a glass that mirrors beyond the scientific empiricism. Thus, the task of philosophy/metaphysics in this debate is to discover in science that science which the scientists know not of. I.e. the science of the foundation of science namely- metaphysics.

***Chinedu S. Ifeakor, PhD**
Nnamdi Azikiwe University, Awka
Email: cs.ifeakor@unizik.edu

***John-Paul Nnamaka Nwuguru**
Nnamdi Azikiwe Universityu, Awka
Email: nnamakajohn@gmail.com

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