# AGAINST METHODISM: A SOCIO-HISTORICAL PERSPECTIVE OF SCIENCE

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**Abstract**
The received view of science is that of an objective enterprise which possesses the rational methods of inquiry which produce knowledge that is based on factual experience. Science claims to be the most reliable inquiry into the nature of reality; due to the supposed supremacy of the so called "scientific method" over those of other intellectual endeavours. However, the idea of "method" in science is itself a source of controversy to philosophers of science over the years. Indeed, scientists themselves do not bother so much about matters of methodology and as such, there is no unanimous agreement amongst scientists of the specific method which determines the techniques and procedures guiding their inquiry into nature. This notwithstanding, there have been several formulations of the scientific method as evident in the works of some scientists and philosophers of science alike over the years. The method of induction which was first explained by Aristotle was elaborated by Francis Bacon and later prepared the groundwork for logical empiricism and modern empirical science. Inductivism later became challenged by Karl Popper who declared that science only progresses by "conjecture and refutation." This paper argues in line with the socio-historical and pragmatic conception of science advanced by the likes of Thomas Khun, Paul Feyerabend, Richard Rorty among others that the scientific enterprise is not guided by a definite method, but by certain arbitrary activities that are relative to socio-cultural backgrounds. The paper further contends that the very idea of science is not to be viewed solely from a Western perspective, which gave birth to the appellation "Western Science," rather it should be seen in the light of the systematic attempts by every society and culture to understand, explain and predict their natural environment.
**Keywords:** Science, Empiricism, Socio-historical Method, Inquiry

## 1. Introduction

Science has crafted for itself an identity, which is that it serves as the paradigm of rationality and as the sole model of truth. It also prides itself as possessing the most powerful problem-solving tools of objectivity and rationality. However, one fundamental question that bothers philosophers of science is: what exact method, if any, is responsible for the tremendous successes recorded by science in the past two to three centuries? Peter Medawar (the Nobel prizewinning scientist) attempted to respond to the above question when he contends that even scientists themselves do not have a unanimous agreement upon a specific scientific method that guides all scientists in carrying out their inquiries on natural phenomena. Thus, in the words of Medawar, scientists "are not in the habit of thinking about matters of methodological policy. Ask a scientist what he conceives the scientific method to be, and he will adopt an expression that is at once solemn and shifty-eyed: solemn, because he feels he ought to declare an opinion; shifty-eyed, because he is wondering how to conceal the fact that he has no opinion to declare" (Medawar, 1984: 80).

Furthermore, and in allusion to the thoughts of Medawar, scientists are of the habit of regarding disciplines such as political science, theology, education, and even philosophy as pseudo-sciences (false sciences) or as falling in the class of the so called "irrelevant disciplines", but they (scientists) themselves are unable to state with precision, "what it means to be scientific." Moreover, if we do not have a clear-cut understanding of the specific methods, principles and techniques that aid scientists in going about their everyday inquiries, then we obviously cannot make much sense of the very idea of science. However, only a few scientists have shown interest in the methodology of science, as such; thereby leaving the conceptualization and critical evaluation of the idea of scientific method to philosophers of science. This explains Richard Feynman's claim that: "Philosophy of science is about as useful to scientists as ornithology is to birds" (Nola & Sankey, 2007: 2).

In view of the foregoing, the task we set out to achieve in this paper is to attempt a succinct clarification of the very idea of "scientific method", while also delving into some of the key issues and concepts involved in any discussion of scientific method. This paper would examine contentious debate in the philosophy of science about whether there exists or not a method of operation in the sciences.

## 2. The Very Idea of "Scientific Method"

As hinted above, science is supposed by its practitioners (particularly of the positivist orientation) to be the paradigm of rationality, but the methodology and techniques of operation that have aided its success have not bothered scientists themselves so much. Alan Chalmers, in the introduction to the third edition of his work, *What is this thing called science?* expresses that:

> Science is highly esteemed. Apparently, it is a widely held belief that there is something special about science and its methods. The naming of some claims or line of reasoning or piece of research "scientific" is done in a way that is intended to imply some kind of merit or special kind of reliability. But what, if anything, is so special about science? What is this "scientific method" that allegedly leads to especially meritorious or reliable results? (Chalmers, 1999: xix).

For the purpose of conceptual clarification, Robert Nola and Howard Sankey in their co-authored work, *The Theories of Scientific Method*, trace the origin of the word "method" to Ancient Greek *methodos*, which according to them "has its roots in the idea of being crafty or cunning. Later for the Greeks it came to mean "the pursuit of knowledge" or "a way of enquiry" (literally, "way of pursuit")(Nola & Sankey, 2007). In Modern times, the common understanding of the word, "method", is that of a way of carrying out an activity in accordance with a plan or set out procedure. According to Isaac Sheffler, "scientific method" "is the way techniques are selected in science; that is, the evaluation of alternative courses of scientific action" (Sheffler, 1963: 5). This definition already contrasts the term "scientific method" with "scientific technique". This makes it imperative to draw a distinction between both terms. Scientific technique is the particular way of applying a scientific tool or way of undertaking a scientific course of action. It involves how a scientific course of action or research program is being carried out, while scientific method refers to the rules of decision that guide the scientist on which particular technique to employ. Put simply, methods are the rules of making choices, while techniques are the choices being made.

One must acknowledge the fact that the distinction between scientific method and scientific technique is difficult to spell out. However, there is a more technical sense in which the concept of "scientific method" is employed, to refer to the general procedures for carrying out research in the sciences. This is the sense in which Arthur C. Danto construes the term. For him, scientific method consists in "(a) explaining natural processes through identification of the natural causes responsible for them and (b) testing any given explanation with regard to consequences that must hold if it is true"(Danto, 1972: 448). This conception of "scientific method" has received wide acceptance from scientific theorists, including Morris Cohen and Ernest Nagel who endorse it as the "most assured technique man has yet devised for controlling the flux of things and establishing stable beliefs" (Cohen & Nagel, 1934: 49-50).

There are certain identified procedural stages that are followed in the practice of scientific methods. However, scientists are not unanimous about the specific number of such stages. This is what Robert Nola and Howard Sankey both recognize as the different methodological practices within the sciences, which they list out as: "observational practices, material practices in experimentation and mathematical practices." For them, "they are part of the proper use of acquired skills and abilities embodied in our knowing *how to* observe, *how to* experiment and *how to* calculate" (Robert Nola& Howard Sankey,2007: 13). This shares similarity with the three phases of scientific method listed by A. D'Abro, namely; the "observational stage", "the experimental stage" and "the mathematical stage"(D'Abro, 1951: 77).

**3. Rules of Inference in Scientific Practice**

There are two commonly recognized rules of inference that aid scientists in arriving at conclusions or generalizations, namely: the inductive rule of inference and the deductive rule of inference. It was Aristotle who first explained how induction works in science in his *Organon.* He explains the principle of induction as a way of getting knowledge of the universal by making inference from our knowledge of particulars. In his *NovumOrganum,* Francis Bacon also discussed the importance of induction in the sciences. As shall be seen in the following section in this paper, Isaac Newton also appeals to the method of induction in his account of the rules of scientific method, which are clearly stated in Rule 3 and Rule 4 of his *Principia,* Book III. However, David Hume came to hold a fierce attack against the method of inductive inference in science. The deductive rule of inference, as against induction begins from making inferences from a general proposition or statement, then narrowing it down to particular propositions. The deductive system proceeds from the universal to the particular. The logical deductive rule of inference is therefore the method of drawing particular conclusions from general principles or laws as being common in the sciences. Both induction and deduction are methods of inference being used commonly by scientists in day to day scientific activities. In the philosophy of science, the both methods have been put under scrutiny as they require justifications as to how reliable they are in leading scientists to accurate conclusions or generalizations.

## 4. Formulations of Scientific Method in the History of Science

Principles or rules that guide scientific thought and practice can be traced down to earlier formulations by the likes of Rene Descartes, Isaac Newton and Duhem. It is presumed that the principles or rules of scientific methodology formulated by the aforementioned influenced later theorists of scientific method like Karl Popper and Imre Lakatos. Rene Descartes proposed an early theory of scientific method in his *Discourse on Method.* He projected the aim of science as being the attainment of certain or indubitable truths or knowledge. This is evident in his rules 1 and 2. Rule 1 states that: “The aim of our studies should be to direct the mind with a view to forming true and sound judgements about whatever comes before it.” Rule 2 states that:“We should attend only to those objects of which our minds seem capable of having certain and indubitable cognition” (See Rene Descartes, *Discourse on Method*).However, certainty has come to be criticized as an aim for science, since most scientific theories are specified with a degree of error, thereby making certainty too high an objective for scientific theories to meet. In his rule 3, Descartes set out to construct a line of demarcation between science and pseudo-science, by stating that: “Concerning objects proposed for study, we ought to investigate what we can clearly and evidently intuit or deduce with certainty, and not what other people have thought or what we ourselves conjecture. For knowledge (scientia) can be attained in no other way” (See Rene Descartes, *Discourse on Method*).Here he secludes conjectural and untested beliefs from science and claims that only that which is certified by our intuitions, testing and inferred by valid deductions qualify as scientific knowledge. In his rule 4, Descartes endorsed the idea of methodology in scientific practice, by making the claim that “we need a method if we are to investigate the truth of things.” He then proceeded to clarify his idea of method in science, expressing that: "by 'a method' I mean reliable rules which are easy to apply and such that if one follows them exactly, one will never take what is false to be true … but will gradually and constantly increase one's knowledge" (See Rene Descartes, *Discourse on Method*).

Isaac Newton on his part helped lay down the platform for inductive inference in scientific reasoning, as being evident in his rules 3 and 4 of his *Principia,* Book III, "The System of the World", as follows: Rule 3: Those qualities of bodies that cannot be intended and remitted (i.e. qualities that cannot be increased or diminished) and that belong to all bodies on which experiments can be made, should be taken as qualities of all bodies universally. Rule 4: In experimental philosophy, propositions gathered from phenomena by induction should be considered either exactly or very nearly true not withstanding any contrary hypotheses, until yet other phenomena make such propositions either more exact or liable to exception (Newton, 1999).

In Rule 3, Newton was particularly concerned with how to make generalizations from particular instances of experiments being carried out. Put in other words, he wanted to be assured of the plausibility of attributing properties assigned to particular objects being experimented to other objects elsewhere on earth or in other possible worlds. The essence of his Rule 4 is to affirm the status of science as an essentially experimental philosophy or enterprise. For him, whatever is not "deduced from the phenomena", or inferred from experimentation should be discarded as mere "hypothesis" and as such, unscientific. Emile Duhem is one who weighs against Newton's adoption of the principle of inductive inference, claiming that there is bound to be a contradiction in inference from premises to conclusion when taking such rules seriously. This he expressed in the following words: "we have recognized that it is impossible to construct a theory by a purely inductive method. Newton and Ampere failed in this" (Emile Duhem, 1954).

## 5. Scientific Method According to Logical Positivism

Logical positivism is a $19^{th}$ Century movement which proposed a radical view of science and philosophy, thereby changing the entire outlook and perceptions of those two fields. Logical positivism gave rise to the bifurcation of human knowledge into two broad divisions, which include: knowledge or statements based on empirical verification or fact and statements that are true in virtue of their meanings or terms. The likes of Alfred Jules Ayer, Moritz Schlick, Carl G. Hempel, and others are considered as logical positivists, due to their quest of ridding philosophy of its metaphysical or non-scientific impurities. The movement of logical positivism or Modern empiricism proposed a criterion of meaningfulness, which applies to all intellectual endeavors, including philosophy, theology, science and the rest. For the positivists, it is important to seek the authenticity or credibility of every idea of claim before accepting such ideas, and this can be done by demanding for the original sense impressions from which the ideas were derived.

The criterion of meaningfulness developed by the logical positivists is often considered to be a fall-out of the theoretical hypothesis developed by David Hume concerning the two criteria of significance, which involves seeking the impression from which every idea is apprehended, and also by distinguishing between the relations of ideas and matters of fact. Hume expresses this fundamental criterion of significance in the following passage:

> When we run over libraries, persuaded of these principles, what havoc must we make? If we take in our hand any volume; of divinity or school metaphysics, for instance, let us ask, does it contain any abstract reasoning concerning quantity 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 (Hume, 1975: 165).

The demarcation between knowledge that contains abstract reasoning (analytic statements) and knowledge that contains fact and existence (synthetic statements) in the above passage attributed to Hume gave solid grounds to the principle of significance and demarcation developed by the logical positivists, which is regarded as the verifiability principle. The verifiability principle or empirical verification implies that for any piece of knowledge or discipline to be regarded as being meaningful or significant, such knowledge must have to pass the test of empirical verification, and as such, must be in principle, verifiable by experience. The emphasis on empirical verifiability by the logical positivists implies that any discipline that is devoid of meaningful statements which are classified on the basis of their analytic and empirical features; are to be regarded as being irrelevant to the progress of human knowledge, and should therefore be jettisoned. The verifiability principle represents not only a tool of demarcation between science and pseudo-science, both also method of identifying and solving scientific problems generally adopted by the logical positivists. This is more affirmed in Moritz Schlick's contention that: "the meaning of every proposition is finally to be determined by the given, and by nothing else" (Ayer, 1959: 88-89). The "given" mentioned by Schlick implies propositions testable by empirical evidence.

## 6. The Critical Rationalism of Karl Popper

A thorough-going antagonist of the principle of inductivism is Karl Popper, who considers every attempt to ground scientific practice on the foothold of inductivism a misguided endeavour. KarlPopper is notable for his popular doctrine of falsificationism which he prefers as an alternative to inductivism. This, Alan Chalmers expresses in the following words: "Karl Popper was the most forceful advocate of an alternative to inductivism which I will refer to as "falsificationism" (Chalmers, 1999: 59). Popper associates his principle of verificationism with his vision of a scientific method. Popper illustrates the idea of method in science in the following words:

> A scientist, whether theorist or experimenter, puts forward statements, or systems of statements, and tests them step by step. In the field of the empirical sciences, more particularly, he constructs hypotheses, or systems of theories, and tests them against experience by observation and experiment. I suggest that it is the task of the logic of scientific discovery, or the logic of knowledge, to give a logical analysis of this procedure; that is, to analyse the method of the empirical sciences. But what are these 'methods of the empirical sciences'? And what do we call 'empirical science'?(Popper, 1959: 3).

Closely associated here, as reflected in the above passage, are 'methods of empirical sciences' and the conception of what 'empirical science' is. For Popper, the falsifiability principle is the criterion of demarcation of what falls within empirical science and what fails to. This principle is also closely identified with his idea of 'logic of discovery' which is the scientific method. The scientific method therefore aids us in understanding what science is. Popper expresses the link between his principle of demarcation (falsificationism) and his idea of scientific method in the following passage:

> In accordance with my proposal made above, epistemology, or the logic of scientific discovery, should be identified with the theory of scientific method. The theory of method, in so far as it goes beyond the purely logical analysis of the relations between scientific statements, is concerned with *the choice of methods* – with decisions about the way in which scientific statements are to be dealt with. These decisions will of course depend in their turn upon the *aim* which we choose from among a number of possible aims. The decision here proposed for laying down suitable rules for what I call the 'empirical method' is closely connected with my criterion of demarcation: I propose to adopt such rules as will ensure the testability of scientific statements; which is to say, their falsifiability (Popper, 1959: 27).

However, Popper does not conceive of the idea of scientific method in terms of rules of discovery, or rules of justification of hypothesis or theory or principles for ascertaining the truth of a theory. For him, the aim of science should not be the attainment of truth, nor should scientific theories be judged or evaluated on the basis of meeting the criterion of truth. Rather, scientific theories can only serve as approximations of truth. Alan Chalmers, expressing Popper's idea of methodology, puts it thus:

> Falsificationists freely admit that observation is guided by and presupposes theory. They are also happy to abandon any claim implying that theories can be established as true or probably true in the light of observational evidence. Theories are construed as speculative and tentative conjectures or guesses freely created by the human intellect in an attempt to overcome problems encountered by previous theories to give an adequate account of some aspects of the world or universe. Once proposed, speculative theories are to be rigorously and ruthlessly tested by observation and experiment. Theories that fail to stand up to observational and experimental tests must be eliminated and replaced by further speculative conjuctures. Science progresses by trial and error, by conjectures and refutations. Only the fittest theories survive (Chalmers, 1999: 60).

It is not appropriate to consider a theory as being true following Popper's line of reasoning, but what we can say about a theory is that it is the best available confirmation of observed experience that is available to us and is more reliable than the previous theories. What according to Popper, can be considered as method in the empirical sciences are succinctly expressed by Jack Aigbodioh as "continuous efforts on the part of scientists to refute or falsify existing theories on the basis of some possible or conceivable observations" (Aigbodioh, 1997: 25). What scientists should be preoccupied with therefore is the activity of fixing truths and beliefs and trying to prepare them for acceptance or justification. On the basis of these central assumptions, Popper goes on to give two examples of rules of scientific method:

Rule (1): The game of science is, in principle, without end. He who decides one day that scientific statements do not call for any further test, and that they can be regarded as finally verified, retires from the game.

Rule (2): Once a hypothesis has been proposed and tested, and has proved its mettle, it may not be allowed to drop out without 'good reason'. A 'good reason' may be, for instance: replacement of the hypothesis by another which is better testable; or the falsification of one of the consequences of the hypothesis (Popper, 1959: 32).

Underlying these rules of method given by Popper is the falsifiability thesis which is the rule of demarcation of science from pseudo-science. Falsificationism simply states that a theory which is not falsifiable does not belong to empirical science. Therefore, any theory which claims to be compatible with all observable facts is not falsifiable and therefore unscientific. Such theories never go wrong as they always find ways to accommodate any instances of change. According to Chalmers, "Popper drew the moral that genuine scientific theories, by making definite predictions, rule out a range of observable states of affairs in a way that he considered Freudian and Marxists theory failed to. He arrived at his key idea that scientific theories are falsifiable" (Chalmers 1999: 60).

Imre Lakatos came under the influence of Karl Popper, whose approach to science he finds interesting. Lakatos also drew influence from Kuhn's epic publication, *The Structure of Scientific Revolutions.* Although Popper and Kuhn proposed rival views of science, their views share much in common. Both Popper and Kuhn roundly reject positivism and inductivism, basing their accounts of the acceptance or rejection of the results of observation and experimentation in science on the background of theory or paradigm. Lakatos was careful not to follow the relativist dimension of Kuhn's account of science. Just like Kuhn, he considered scientific research or activity as taking place within a framework, which he called "research program."Lakatos's major task was to modify Popper's notion of falsificationism while examining some of its deficiencies. Popper's falsificationism does not state it clear how to identify faults with scientific theories, that is which particular aspect of a theory should be held liable to revision. Popper only suggests that it is left to the discretion of the individual scientist to identify where the fault is within the theory. For Lakatos, science cannot progress that way, not all parts of a scientific theory are equal, rather, what we have are basic principles or laws which form the core of a theory and the less fundamental ones which only form the peripheral parts of the theory. The basic principles represent the defining feature of a science and as such are not to blame for any failure that occurs in the theory. What should be held responsible for any apparent failure within the theory are the less fundamental components. Alan Chalmers summarizes Lakatos' conception of science in the following articulation: "A science can then be seen as the programmatic development of the implications of the fundamental principles. Scientists can seek to solve problems by modifying the more peripheral assumptions as they see fit. In so far as their efforts are successful, they will be contributing to the development of the same *research program* however different their attempts to tinker with the peripheral assumptions might be"(Chalmers 1999), p. 131.Over time, the task of scientists is to continually fix the "protective belt", that is, the sum of the additional hypothesis occupying the periphery in other to protect the hard core from falsification. In the words of Lakatos:

> Scientific research programmes may be characterized by their ‘hardcore’. The negative heuristic of the programme forbids us to direct themodus tollens at this 'hard core'. Instead, we must use our ingenuityto articulate or even invent 'auxiliary hypotheses', which form aprotective belt around this core, and we must redirect the modus tollensto these. It is this protective belt of auxiliary hypotheses which has tobear the brunt of tests and get adjusted and re-adjusted, or even completely replaced, to defend the thus-hardened core. A research programme is successful if all this leads to a progressive problem shift; unsuccessful if it leads to a degenerating problem shift (Lakatos, 1978: 48).

Lakatos sets out guidelines for work within a research program, in terms of negative heuristics and positive heuristics. A heuristic is a set of rules or hints which serves as a tool in aiding invention or discovery. Making the essential distinction between negative heuristics and positive heuristics, Lakatos writes that:

> The negative heuristic specifies the 'hardcore' of the programme which is 'irrefutable by the methodological decision of its proponents; the positive heuristic consists of a partially articulated set of suggestions or hints on how to change, develop the ‘refutable variants’ of the research-programme, how to modify, sophisticate, the ‘refutable’ protective belt(Lakatos, 1978: 50).

The negative heuristics help to specify what scientist are advised not to do, such as tampering with the hard core of the program. The positive heuristics of the program on the other hand specifies what scientists should do rather than what they should not do, guiding on how to protect the hard core by additional hypothesis which constitute the protective belt, which is in turn in need of constant modifications. What counts as the indicating factor of the merit of a research program is the extent to which it leads to novel predictions that are confirmed rather than falsified. When a research program leads to confirmed novel predictions, while retaining its coherence, it is said to be progressive, while a research program is degenerating when it fails to retain its coherence and at the same time is unable to yield novel predictions that are confirmed. The switch from degenerating research programs to the progressive ones represents Lakatos' own idea of a scientific revolution.

**7. Reviewing Science Socio-historically**

As earlier discussed in this paper, science is widely acclaimed to be the paradigm of rationality and as well possessing the scientific method, which is said to be responsible for the achievements recorded by science over the past two centuries. It has also been brought to fore in this paper that the general procedures for carrying out research in the sciences that we may call the scientific method, lacks clear-cut procedural stages. How then can a method that lacks defined procedural stages be held superior to other methods of inquiry?

The popular and rational image of science, that of being the paradigm of rationality and objective knowledge, and the possession of a powerful method of enquiry which is superior to other methods, as well as the Popperian notion of science as a system of falsification coupled with Lakatos' idea of science as a research program have all come under attack by Thomas Kuhn and his allies. Kuhn argues that neither logic nor observation, or any rational method plays a role in the account of theory formation. For him, science is not guided by any definite method but a system of arbitrary activities. As against the popular image of science as an intellectual engagement in constant pursuit of truth, Kuhn gives an account of scientific progress in terms of a shift in paradigms. Thomas Kuhn's 1962 publication, *The Structure of Scientific Revolutions,* had a revolutionary implication for scientific practice and changed the popular outlook of science as a system of falsification and as a paradigm of knowledge. For Kuhn, science should not be regarded as the only paradigm of knowledge and model of truth. Kuhn's contention is that the scientific enterprise is not guided by a definable method but by a system of continual shifts from one paradigm to another. Kuhn clarifies his notion of scientific paradigm by stating that they are "universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of researchers" (Kuhn, 1970: 10).A scientific paradigm incorporates a set of theoretical assumptions or axioms that are agreed upon or accepted at a given time by a 'scientific community.' For Kuhn, the use of scientific paradigms by scientists to solve particular problems that arise in the scientific community is 'normal science.'

According to Kuhn, there comes a time, no matter how successful a scientific paradigm is, when it becomes incapable of solving the problems it encounters. The consequence of this is that new paradigms are developed to solve and accommodate the problems that were *ab initio* unresolved by the old paradigm. In this kind of situation, where there is a problem of choice between the former paradigm and the new paradigm, a scientific revolution is said to have taken place. This further leads us to Kuhn's notion of incommensurability, since it is assumed that there are no common grounds or "common coordinate systems" on which to compare and choose between two paradigms. The choice of a better paradigm, (whether the old or the new) is not facilitated by an objective system or method. The notion of incommensurability is that two paradigms can be so different that they cannot be compared in any way. The implication of Kuhn's revolutionary philosophy for our discourse is that the idea of objective truth or knowledge should be rejected, since for Kuhn, there are no fixed sets of facts about the world that are paradigm-neutral. For Kuhn, beliefs, opinions, theories and hypothesis about the world are dependent on paradigms and can change when paradigms change. Theories are therefore relative to paradigms. This contradicts the notion of the universal excellence of scientific enterprise that stands superior to all other systems of inquiry.

Paul Feyerabend, the renowned methodological anarchist, in his 1975 publication, *Against Method,* attacks the very idea of the superiority of science to all other forms of inquiry. His fundamental assumption is that there is no such thing as scientific method which represents the surest and most reliable system of attaining rational certainty and objective knowledge. Feyerabend expresses his distaste for the idea of the universal excellence of science and the superiority of its methods of inquiry. In articulating Feyerabend's contempt for Methodism in all forms of inquiry, John Preston has it that Feyerabend raised such questions as: "What's so great about knowledge?" "What's so great about science?" "What's so great about truth?" "How does science differ from witchcraft?" "Does it (science) provide the only rational way of cognitively organizing our experience?" "What should we do if the pursuit of truth cripples our intellects and stunts our individuality?" In response to these questions, Feyerabend held no idea or no person sacred(Preston, 2002: 183). For Feyerabend, philosophers and scientists alike should free their mindsets and open doors to "ideas from the most disparate and apparently far-flung domains, insisting that this is the only way they can understand how knowledge grows."[27](Jimoh, 2013: 183).

In Feyerabend's writings, he opines that the history of science does not project a unique or unifying rational method of inquiry, but a series of opportunistic, chaotic, and inventive attempts made by a particular "community" (whether social or intellectual) to cope with immediate problems confronting them. The background of his methodological anarchism is that rationality is not only peculiar to science. In the introduction to his *Against Method,* Feyerabend writes that "Science is an essentially anarchic enterprise. Theoretical anarchism is more humanitarian and more likely to encourage progress than its law-and –order alternatives" (Feyerabend, 1975: 9).He then goes further to write that: "This is shown both by an examination of historical episodes and by an abstract analysis of the relation between idea and action. The only principle that does not inhibit progress is: anything goes" (Feyerabend, 1975: 14). The summation of his anarchist thesis is that there are no fixed, universal and absolutely binding principles that guide in conducting the business of science or other modes of inquiry.

The socio-historical account of the nature of science can also be explained from the perspective of African traditional cultural practices. This can be regarded as a cultural conception of science, which regards science as being predicated upon the cultural attempts to explain, understand and interpret the natural phenomena surrounding a group of people. The cultural conception of science falls in line with what Robert Bishop aptly describes as the activity conception of science, when he characterized science "as a mode of human activity by which we have progressively gained control over our environment" (Bishop, 2007: 9). Bishop further notes that this view is "closely connected with craft traditions, artisans and technology, and emphasizes that scientific practices grew out of our ordinary ways of coping with the world" (Bishop, 2007).The African conception of science is based on the African conceptual scheme which gives an ontological categorization of reality which is essentially driven by the three-valued trait in African thought system. This three-valued trait which obtains in African thought systems is being described by Jonathan Chimakonam as consisting of the "physical, the non-physical as well as the union of the two" (Chimakonam, 2012: 33). The union of the physical and the non-physical dimensions of existence in African thought systems represent a comprehensive interpretation of reality, which stands in contrast to the two-valued trait conception of reality often attributed to Western science. The two-valued trait bifurcate reality into the physical and the spiritual while giving utmost preference to the physical over the spiritual or metaphysical aspects of reality. This explains why Western scientific knowledge is regarded as being essentially based on the facts of existence devoid of metaphysical excesses. However, the African cultural perspective of reality gives preference to a fuller dimension of reality, while combining the physical, non-physical and the union of the two in a unified system of explaining, understanding and interpreting the African reality.

## 8. Conclusion

This paper began by drawing attention to the popular and rational image of science in which science is regarded as the most reliable system of inquiry that yields objective knowledge. Science is so regarded because there is believed to be a system or method of inquiry that guarantees success or accuracy of experimental results in the sciences. This method itself is however, not so much taken by scientists with utmost seriousness, as they mostly fail to characterize what should constitute the scientific method.

Part of what we have been able to do in this paper is to help analyze the concept of scientific method itself, taking us down through the trajectory from the earlier formulations of principles or rules of scientific methodology to the more recent ones. As evident in this paper, any worthy discussion of scientific methodology should not be deemed complete without an account of the ongoing discourse in the philosophy of science about the very existence of a method of inquiry in the sciences. However, most scientists would want to reckon that there is a "scientific method" that aids in carrying out operations in the sciences, but this position is currently a controversial one in the philosophy of science.

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