A Critical Analysis of Karl Popper’s Verisimilitude Thesis and the Hallmark of Science

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Abstract: Karl Popper believes that science does not necessarily seek to unveil the truth. He does not assert that the unending formulations and testing of hypothesis or theories will ultimately generate truth or certainty. On the other hand, the image that science likes to project of itself is that of rationality per excellence. Armed with a special tool called the “scientific method”, the institution of science believes it now possess the tool with which it could now generate logic of justification and certainty. This tool or method is what Magee calls “the Hallmark of science”. This study examines the rationality of the claims of the scientific enterprise in the light of Kuhn’s, Feyerabend’s and Popper’s conception of “Verisimilitude” with the view to showing how problematic the whole idea is. In all, we shall present Poppers’ verisimilitude concept as a more rational ideology that the scientific enterprise should adopt in place of what is presently conceived as the hallmark of science.

Key words: Verisimilitude, Hallmark, Justification, Scientific Enterprise, Rationality, Word Count: 159

Introduction
But I shall let the little I have learnt go forth into the day in order that someone better than I may guess the truth and in his work may prove and rebuke my error. At this I shall rejoice that I was yet a cause whereby such truth has come to light”. (Popper, 2002:2)
- Albert Durer
The image that the scientific community likes to project of itself, and indeed the image that most of us accept of that community is that of rationality per excellence. The scientific community sees itself as the very paradigm of institutionalized rationality. The institution of science has therefore claimed to possess a special tool, what they now called, “the scientific method” which generates a logic of justification. By this they mean to provide a technique for an objective appraisal of the merits of scientific theories. This special tool is expected to aid scientists in the discovery of new theories.

Over the years, philosophers of science in the twentieth century have accepted this image and have considerably made efforts in analyzing the assumptions that the realities of the situation at least approximate to the image. But this position Popper found very fallacious. It was in this that Popper opined that “the history of science, like the history of all human ideas, is a history of irresponsible dreams; of obstinacy, or error. But science is one of the ways, a few human activity-perhaps, the only one-in which errors are systematically criticized and fairly often, in time corrected”. (Popper, 1963:216; Wogu, 2011:279-280).

I believe that this overwhelming popularity of this image of science arises in part from the great success of recent science, particularly physics. But this notwithstanding, this image of science has recently come under attack from various historians, sociologists and philosophers of science. Feyerabend, for instance regards the implicit beliefs in this image as not merely unjustified but as positively pernicious, it was to this end that his work on Against Methods, argued that society needs to be freed from this strangleing hold of an ideologically petrified science. For Kuhn, he saw a need for a revolution in science, Feyerabend and others, believed the scientific enterprise could and have not lived up to the image which the community projects of it. What they have so far held in high esteem is in popular channels, said to embody untenable assumptions concerning the objectivity of truth; the role of evidence and the invariance of meaning (Wogu, 2011:293-295).

Consequently, the image is not even capable of serving as an ideal which the practice of science ought to aspire to realize. This in my candid opinion - alongside some other scientists, historians and philosophers to whom I shall be making reference to - hope to show how out-of-line this thinking has become. I shall also attempt to show how this thinking is largely responsible for the philosophical problems that are today, rooted in the community of science.

The philosopher whose ideas shall form the main source of my arguments is Karl Popper. I shall also consider the work of Feyerabend, Kuhn, Lakatos and some others who have reasoned along this line of thought with the view to showing that the claims the scientific community holds as regards being the only avenue through which truth about reality can be reached, is more problematic than being correct.

The Conceptions of Science
For the nature of work proposed for this study, it seems most appropriate, reasonable and logical to begin with a working definition of science. This
may not be an easy task knowing that there is no standard definition of the term “science”. Consequently instead of looking for a definition of science, I believe it is most appropriate to look at various conceptions of science.

Literally, and according to various dictionary definitions, “the term science means knowledge arranged in an organized manner, especially knowledge derived from experience, observation, and experimentation”. (Udugwomen, 1992:20) For this reason, it is often claimed that scientific knowledge is proven knowledge. Science is thus based on what we can see, touch, taste, hear or smell. Invariably, what this means is that personal opinions, prejudices or preferences, superstitious and speculative imaginations have no place in science.

From this conception, it is clear that science is a discipline. It also shows “that science is characterized by systematicity and comprehensiveness. It has characteristic methods, addresses specific types of questions, advances specific types of answers and carries with it a kind of results (often changing) as well as characteristic set of propositions (also sometimes changing)”. Ratzsch, (1986:14).

Science has been broadly classified into two, namely real science and formal science. While the formal goes after sensory realities or empirical data, the later goes after abstract structures or entities, while the former achieves its result from and through experience, observation and testing of facts, the latter achieves its results through logical reasoning. Included within the preview of real science are the natural science, the social sciences, the cultural science and formal logic.

The three concepts, according to the first conception of science still under consideration, namely the empirical, the objective and the rational are central to real science. In other words, real science must possess empirical base, objectivity and rationality. A genuine science must therefore be in tune with relevant facts or empirical data by senses or by empirical process. Secondly, the empirical base of science cannot be an arbitrary one. Thirdly real science requires that there be some rational connection between empirical data and explanatory theory.

From these conceptions of science, the following working definition of science emerges: science is a theoretical explanatory discipline which objectively addresses natural phenomena within the general constraint that:

1. Its theories must be rationally connectable to generally specifiable empirical phenomena and that,
2. It morally does not leave the natural realm for concepts employed in the explanations (Ratzsch, 1986:15).

Another conception intended for consideration in this paper is one that identifies science with scientific methods. This conception recognizes experimentation as the only authentic procedure of observing the consequences of events and circumstances over which man is incapable of controlling or manipulating. A conception such as this makes no room for sciences like geology and astronomy (which are generally considered as exact sciences). Apart from that, it tends to undermine the strong theoretical and logical flavor needed to hold together
the results of observations and experiments.

On the other hand most philosophers conceive of science as a systematic process of searching for the truth about nature through logical interferences from empirical observations and testing. This conception involves drawing a generalization from instances which have been observed to occur several times. In a general sense, “observations are made using the sense organs to collect impressions; pre-requisite conditions for observations include the ability to imagine, curiosity to investigate and motivation to search for explanation” (Okoroji, 1988:35) The outstanding future of this conception is that, while the conception enables the scientist to piece together his observations in an orderly manner, the resolutions that he reaches are not considered all-embracing since it is practically impossible to make all observations concerning a phenomenon. The scientist obviously and actually jumps in to conclusions without waiting for further confirming instances. In situations like this, past and repeated observations generate a confidence in the future reoccurrence of the phenomenon.

A general statement is then formulated concerning the phenomenon. This is what is taken as a hypothesis. This hypothesis is a tentative law considering its range of application and this provides a basis for future observations.

As more and more instances are found based on the initial phenomenon, a hypothesis gradually develops into a theory. Though more confirmation will help to sustain the truth of the theory, it will not totally prove that the theory is true. As will be shown later in this paper, the study will argue that “this conception of science which is inductive in its modus operandi is replete with insurmountable difficulties. Chief among which is the problem of inductive leap i.e. “the leap from the known to the unknown”, “from the finite data of experience to an indefinite datum”. (Udugwomen, 1992:24)

Scientific Methodology

The enterprise of science has been progression ever since it began to evolve into its modern form from the 16th century to date. Discoveries have been noted to follow a pattern or procedure which can roughly be called scientific methodology. This procedure involves various elements such as observational procedures, patterns of arguments, methods of presentation and calculation and the evaluation of the grounds of their validity from the points of view of formal logic, practical methodology and metaphysics.

The general procedure held to be successful involves five major steps namely:

1. Problem formulation: Here questions are raised concerning the occurrence of certain phenomenon.
2. Design and planning of Research: At this stage attempts are made to find solutions to the steps raised in 1, above. The attempts to do this leads to the formulation of hypothesis.
3. Collection of Data: This involves going to the field to collect data: which are ultimately taken to the laboratory for analysis.
4. Analysis of Data: this involves testing the collected data through actual experimentations.
5. Conclusion: if the results are successful, the findings so made can be presented as a seminar paper or published as a text book or in a learned journal. These findings serve as a paradigm for future research work.

The Problem with Scientific Methods

Inductivism

According to some scientists, Chalmers, (1982), Black, (1973) science is principally concerned with establishing general laws. These general laws are defined from a great number of particular observations or facts of experience. For instance, if we represent the various facts that has been established as r, s, t, u; while T stands for the theory (or general laws) derived from them. The supposed relationship between the facts and theories may be represented in the following chart below:

- r is a fact
- s is a fact
- t is a fact
- u is a fact
- therefore T is a valid theory.

The above representation gives us a picture of what scientific knowledge is and what scientists do. Specifically, the method of Induction applied here shows that science is not based on speculative imagination but on what can be observed i.e. what can be seen, touched, heard etc. From this perspective, we infer that “scientific knowledge is reliable knowledge because it is objectively proven knowledge” Chalmers, (1982:1). This conception of how scientific laws or theories are arrived at is what we call INDUCTIVISM. Let us also mention here that this popular conception of science first gained currency during the great scientific revolution of the 17th century which was brought about by the pioneering works of scientists such as Galileo and Newton.

Inductive reasoning involves the movement of a limited number of observable statements to the justification of universal statements. Science for the naïve intuivitist is based on the principle of induction. To this end Chalmers states the principle of induction as: “if a large number of “A’s” have been observed under a wide variety of all conditions, and if all these observed “A’s “without expectations, possessed the property B. Then all “A’s” have the property “B”. (Chalmers, (1982:5). It is on this premise that the naïve inductivist think of scientific knowledge as a building resting on the secure basis provided by observations. This position which was hotly criticized by Popper, forms the foundation for the issues intended for discursion in this paper later on. In support of the inductivist claims, Chalmers further notes that:

As the number of facts established by observation and experimentation grows and as facts become more refine and esoteric due to improvements in our observations and experimental skills, so more and more laws and theories of ever more generality and scope are constructed by careful inductive reasoning. The growth of science is continuous, ever onward and upward as the foundations of observational data is increased (Chalmers, 1982:5)

Advocates of the principles of induction hold the view that a distinctive future of induction is the
use of inductive reasoning. They claim that the inductive method of scientific enquiry is far more superior to the deductive method because it is integrally connected with the discoveries of scientific laws and theories. They buttress their claims by saying that whereas the inductive methods enables us to make a leap from the infinite data of observation to laws covering all that are (i.e. known present) and all that will or could be (i.e. predict the future), the deductive method can never advance to knowledge of the hitherto unobserved. Max Black seems to be in support of this when he said “the so called inductive leap (from “some” to “any” and “all”) seem indispensible in science no less than in ordinary life” (Black, 1973:157).

The Problem with The Inductive Method

The search for uniformity in nature, and hence natural laws, has been central to scientific investigation since the time of Archimedes. It was Frances Bacon who first described the way scientific investigation is to be pursued. Bacon was dissatisfied with “the powerlessness of deduction to do more than render explicitly the logical consequences of generalization derived from external sources” (Edward, 1967:94). He thought, “If recourse to intellectual intuition or to self-knowledge is repudiated as a source of actual knowledge, nothing better seems to remain than reliance upon the empiricist principle that all knowledge concerning matters of fact ultimately derives from experience.” (Edward, 1967:94:11-12; Wogu, 2010:266-268). Bacon maintained that the aim of science is to move further and further away from ignorance. To achieve this, the scientist begins to carry out experiments. Depending on the outcome of his experiment, he may record his findings or cause them to be published. In the cause of time, he and other thinkers in the same scientific community, to put it in the language of Thomas Kuhn, would have accumulated a lot of similar shared and reliable data. As these data grows - to put it in the language of Magee - general features begin to evolve and the individual scientist began to formulate a general hypothesis. After this has been done, he begins to look for confirming or supporting instances of the hypothesis. If a good number of such confirming or supporting instances are found, then he has discovered a scientific law which will help mankind in discovering more of the secrets of nature. Thus, according to Bryan Magee, the existing stock of scientific knowledge is added to already existing knowledge and ignorance is further pushed backwards. (Magee, 1973:11-12) According to Magee, “the method of basing general statements on accumulated observations of specific instances is known as induction, and is seen as the Hallmark of science” (Magee, 1973:12). In Magee’s opinion, it is the use of the inductive method criterion that serves to draw a line of demarcation between science and none science, between scientific methods and none scientific methods. He says further that since scientific statements are based on observation of facts, they alone provide sure and certain knowledge. He concludes by saying that since science is a body of certain knowledge, the growth of science consists in the endless addition
of new certainties to the already existing evidence. However, good as this account of induction may seem, a problem however arise when we ask whether induction can be justified. That induction is fallible, is very obvious, even to common sense. Critics might seem to ask how we can be sure that the position of the intuitivist is stronger than that of the gambler who has had a sequence of throws. Can we possibly know that the law of gravitation will continue to hold true? The answer to these questions is a “Yes” and a “No”. “Yes” because it may turn out to hold true in future, but “No” because it is possible that tomorrow’s observation may go contrary to the direction the present evidence points. After all, much uniformity that has occurred in the past does not occur today.

**The Versimilitude Concept**

From all the issues raised above, it will interest you to know that Popper believes that science does not necessarily seek to unveil the truth. For truth in this context can’t be seen from within the ambit of science. He does not assert that the unending formulation and testing of hypothesis or theories ultimately generate truth or certainty. Through the fact of the refutations of our earlier theories, science enables us to know that the world as we perceive it to be is not the world as it is. For Popper therefore, although we may aim at the target (i.e. the truth) with the arrow of modus *tollens*, nevertheless we may never know when we have hit the target. So rather than devise a theory of realism founded on a doctrine of truth, Popper had proposed a concept called “versimilitude” by which the “truth likeness” of hypothesis or theories could be determined. In his exact words he writes:

> If we have empirical statements, then the class of the statements it entails is called its “truth content” and the gut of false statement it entails is called its “falsity content”. The verisimilitude is determined as truth content minus “falsity content”. The verisimilitude of two theories which offer competing explanations of the same phenomena may thus be supposedly compared if one of them explains or account for that which the other explains and also offer some additional phenomena; and the first theory has stood up to test in the extra domain where the second theory is unsuccessful, or which it does not cover (Oldroyd, 1986:77-97)

When we subject the views of Popper to verisimilitude concepts we discover that his concept of corroboration, which he defined simply as the degree to which a theory is “falsifiable”, further supports this concept of verisimilitude. The degree to which theories are falsifiable is one that has brought about the seeming progress in science. This factor he opines, has further caused scientists and philosophers alike to continue in the quest for reality, truth and perfection. One final position which Popper believes may never be attained if science must continue to strive for relevance. It’s thus important to highlight the fact here that Popper conceived of scientific changes in the light of the indications of *Hypothetic - deductive methodology* which has been often called “fabricationist methodology”.
It is important to note also that this concept of verisimilitude and corroboration personified in falsificationism is indeed anti-inductivistic, in that it completely rejects the claim of the inductivists (especially positivistic inductivists) who are of the opinion that theories are verified, confirmed, or established as true or probable on the basis of observational evidence: let us note that this very point is the principle on which the methods of scientific discovery and explanations are hinged upon.

Following this view, ad hoc hypothesis and theories that fail crucial tests as a result of contradicting basic statements, must be abdicated. This methodology reveals that science progresses by proposing highly falsifiable hypothesis or theories which they in turn attempt to falsify. The advancement in knowledge in the scenario between Newtonian physics and Einstein new physics of relativity offers a vivid example. This paper further notes that one additional factor that influenced Popper is the fact that Einstein did not consider his scientific discovery to be final or providing truth in its entirety. To this end, Einstein offers up his discovery to the crucial test. Popper saw in this action as an unwillingness to join in upholding dogmatic attitude which was prevalent among thinkers. (Marx, Freud, Adler to mention but a few in that dispensation) are some of thinkers who Popper disagreed with. This further explained why Popper said:

I can therefore gladly admit that falsificationists as myself, must prefer an attempt to solve an interesting problem by a bold conjecture, even (and especially) if it soon turns out to be false, to any recital of a sequence of irrelevant truism. We prefer this because we believe that this is the way in which we can learn from our mistakes and that in finding that our conjecture was false, we shall have learnt much about the truth and shall have got nearer to the truth. (Popper, 1963:231)

From the quotation above, we are told that we learn from our mistakes and that science thrives through trial and error. Because of the logical impossibility of deriving laws and theories from singular observations, and logical possibility of the deduction of their falsity from same, falsificationism becomes the Hallmark of science. We therefore see a great similarity in the contribution of Lakatos who agrees that the goal of science is to increase verisimilitude and corroboration. Lakatos, (1978:32)

**Kuhn’s Idea Of Verisimilitude**

For Kuhn, the great debate in 1965 between Popperians and Kuhnians exposed the divergence in the views of both men. In Kuhn’s most influential work entitled, *The Structure of Scientific Revolution* (Kuhn, 1970:19), he preoccupied himself with developing a theory of science that will be in line with historical situations, The character of scientific progress and the sociological characteristics of scientific communities. There we believe are the key features in the Kuhnians model.

Despite the differences that existed between Popper and Kuhn, Kuhn’s argument that the history of science is the study of discontinuous and incommensurable paradigm, to a large extent, in the opinion of this paper, aligns with the main themes of the verisimilitude concept. Kuhn’s
rejection of all forms of falsificationism on the grounds that all paradigms, irrespective of their landmarks in history, cannot hold tenaciously to the claims of truth in their scientific researches, since after a while, the views and ideals of a paradigm are abandoned for another, despite the presence of adhoc hypothesis which are initially introduced to suppress such anomalies. What Kuhn explains here is the reason behind “Paradigm shifts” or Gestalt switch.

By implication Kuhn’s scientific revolution holds that scientists cannot hold two competing paradigms at the same time because, apart from the fact that two scientists working on two different paradigms will find their thoughts incomprehensible, (Oldroyd, 1986:323) their paradigms cannot lay claims to truth both at the same time. By this paper sees a further alignment with the Popperian concept of verisimilitude irrespective of their difference.

Feyerabend’s Idea of Verisimilitude
Another challenging, yet thought provoking accounts of science in contemporary times, is the one that has been colorfully presented and defined by Paul Feyerabend in his famous book entitled “Against methods” (Feyerabend, 1975). Consequent on his ideas in the book, he has been known as a methodological anarchist because of his belief in the fact that “the whole notion of a methodology of science is an illusion”. To this end he proffered an anarchistic enterprise. This proposition was made because he believed that none of the methodologies adopted by the field of science had lived up to expectations. More specifically, he argues that none of these methods were compatible with the history of physics. Put differently, he states that all methodologies of science have not provided adequate rules for the guidance of scientific activities (Feyerabend, 1975:269). This position is further strengthened by the fact that all scientific methodology has their limitations. To this end, the only rule that truly has existed over time, according to him, is the rule that permits any man to use whatever method at his disposal, a situation Feyerabend called “Anything Goes”. In his own words, he argued that “test experiments conducted in the past only points to one thing, it speaks against the universal validity of any rules. All methodologies have their limitation” (Oldroyd, 1986).

Feyerabend in his arguments further argued against Poppers falsificationist methodology. But the point which this paper focuses on is that by holding this position, Feyerabend without knowing it, is aligns with Poppers verisimilitude concept for the real essence of Feyerabend attack on the methods of science is that these methods of science at one point in time, have been known to be unable to hold down on their claims of infallibility as regards their attempts to explain reality. This certainly explains why their methods continue to change every now and then. Now where two opposing methods are known to hold claims to a state of affairs, there is no criterion for justifying which indeed is most correct. Therefore to Feyerabend, it becomes methodologically wrong to tie down the field of science to any single method. Thus he suggests that the best idea is “Anything Goes.”
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Conclusion

These claims, in the opinion of this paper (Thomas Kuhn, Paul Feyerabend, etc) goes to corroborate Poppers verisimilitude thesis which holds, among other things that, the field of science in all her endeavours and quest to explain reality, as it pertains to the truth position of things or state of affairs, “science”, can only come close to the truth of things or of “a truth”, but not “the truth”.

References


(Popper, 1963) This mostly is because of the reasons we have previously discussed in the pages above. A typical example is portrayed in the methodologies used by Galileo, Newton and Einstein. Their methods were never the same yet they produced outstanding results. Where science attempted to enforcing a particular method on their scientists, such moves were known to further perpetuate the errors which other previous scientists had been known to make.


Wogu, I.A. P. (2011). “Influential Thinkers of the Modern Scientific Era” in Advances in The History and Philosophy of