INTRODUCTION
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The history of science from the Greek to the present is the one compartment of philosophy after another breaking away from philosophy and emerging as a separate discipline

-Alex Rosenberg

In the systematic study of Universal Particular, science is only a kind of radical endeavor of humans to reveal the vast and abundant secrets of the Universe. But in all the way science has got supreme command over other disciplines or say science is supposed to do so. The question, why science is supposed to be more reliable or why scientific knowledge is considered to be supreme over the other forms of knowledge, raised serious discussions in the philosophical circles. Many give the answer that particular methodology adopted by the science as the reason for this reliability of science. The new question that comes into focus with this is - What is the methodology of science? Different scientists and philosophers of Science tried to give a satisfactory answer to this question. But the scientists without caring about the discussions proceeded in a systematic way and new discoveries have been made. In this process, it is tried to conceptualize the methodology and the progress of science. Francis Bacon articulated the methodology of science as collection of facts through organized observation and deriving theories from them. But this methodology was not sufficient to answer the questions like, how a theory can be proved or disproved. Hence, subsequent theories emerged, inductivists account of inductiveism, Popper’s
falsificationism, Lakatos’ research programmes, Kuhn’s paradigms and Feyerbend’s incommensurability are different approaches in philosophy of science debating over the nature and methodology of science.

Introducing Popper and Lakatos

Karl Raimund Popper (1902-1994) was the most renowned philosopher of science in the twentieth century. He was born in Vienna and later he migrated to America. He was a social and political philosopher and a self-professed critical rationalist. His methodology of falsification made tremendous impact in the field of Science and philosophy of Science. His critical rationalism still holds many followers and has developed into a large area of study.

Imre Lakatos (1922-1974) was one of the most renowned original thinkers in philosophy of Science and philosophy of Mathematics of the twentieth century. He was a key participant in the Anglo-American philosophy of science debates of the 1960s and 1970s. A Hungarian by birth, he migrated to London. He was known for his thesis of the fallibility of mathematics and its ‘methodology of proofs and refutations’ and also for introducing the concept of the ‘research programme’ in his methodology of scientific research programmes.

Problem: Methodology of science

In philosophy of science, there are two classes of conceptualization of methodology. The philosophers in the first category try to find out a unified
methodology of science. Popper’s falsificationism and inductivists induction are included in this. The second category examines the methodology of science with a historical approach. They give historical theories of science. Lakatos’ research programme, Kuhn’s paradigms and Feyerabend’s incommensurability fall into this category. Kuhn and Feyerabend are against a unified method in science and Feyerabend takes an extreme position that there is no method of science which makes it supreme over the other fields of inquiry. In order to understand the problems associated with the methodology of science, this research work particularly analyses the methodology of falsification taken by Popper and the methodology of research programmes by Lakatos separately and later compares them.

In order to overcome the difficulties confronted by the inductivist, Popper introduced ‘falsification’. Differing from the inductivists, he argued that, science starts with some problems and scientists suggest some conjecture to solve the problem. Now the methodology of science is to try and falsify this newly formed hypothesis. This hypothesis is treated as a theory until it is falsified. This methodology- falsificanism, has easily differentiated science from non-science with the criterion of falsifiability. However, this methodology is not able provide a satisfactory theory appraisal. On the other hand, Lakatos’ research programmes attempts to give an alternative to the criticisms against Popper using his historical theory. Lakatos’ methodology can be viewed from two different points, one concerning the work done within a single research programme and the other through the comparison of merits of competing research programmes.
These two positions have also been widely criticized in the field of philosophy of science. This research work discusses and analysis the methodology of these two thinkers with the criticisms of the later thinkers and attempts to provide the hardcore problem of methodology of science.

**Tool of investigation: The theory Dependent Observation**

The foundational problem of philosophy of science starts with the question of observation and also it is the starting point of science itself. Observation play a key role in science and it is supposed to be the means of reliability and objectivity of scientific knowledge. Two rival theories are dominant in philosophy of science, concerning the nature of observation. They are: (1) Theory dependent observation and (2) observation dependent theory. Popper and Lakatos accept the former but in a varying degree. Their stand point on the theory dependent observation will help us to analyze the methodologies put forwarded by them in a precise manner.

**Analysis of Popper and Lakatos on the basis of Theory Dependent Observation**

Both Popper and Lakatos agree the position of theory dependence of observation. But theory dependent observation finds different applications. For Popper, the starting point of sciences is from the theory dependent observation and the theory dependence is confirmed to singular observational statements. These singular observational statements become the basis on which a theory is taken as scientific or not. The criticism of the falsification also lies in the fallible singular observational statements. Falificationists are confused to select the fallible observational instances
in a complex theory. In order to avoid this problem, Lakatos applies the theory dependent observation not only to singular observational statements but also to universal statements that make up the hardcore. Lakatos’ concept of theory extents over large space in the history of science and he tries to keep this theory stable, changing the singular observational language theories. This particular point makes a definite distinction between the Popperian theory dependent observation and that of Lakatos. This universal theory effect each and every singular language theories, Lakatos endeavors to generalize the Popperian theory dependent observation to a structured whole.

The scope of the thesis

Science is not altered with the discussions on the methodology and goes on with new discoveries and technological applications. No doubt science proceeds in a systematic way. Then what are the problems confronted by the philosophers to identify the methodology of science? The thesis traces out the difficulties within the problem of methodology and reveals why scientific knowledge is reliable than other fields of inquiry. This attempt enables scientist to systematize their observational process to refute the older theories and develop new creative theories. It also permits philosophers for understanding the various different dimensions for creating a structured argument to generalize and defend their standpoint on specific subject.
Research Methodology

The persistent problems are presented as it has appeared in different schools with the view point of theory dependent observation. On the analysis of Popper and Lakatos, the approach is to examine the works focusing the following themes.

1. Foundational Problems: It involves questions concerning the process of conceptualization. It also deals with observation of facts, formation of hypothesis and verification of hypothesis.


3. Axiological Problems: Here the problem of objectivity, rationality, progressiveness and truthfulness of scientific knowledge will be studied.

The study is primarily descriptive in nature. The different viewpoints from secondary sources are taken to structure the arguments through in-depth analysis.

Chapterization

In the first Chapter, a brief history of the methodology of science as it appears in different schools of philosophy of Science is explicated. The standpoint from which the history is presented forms, the background of theory dependent and theory free observation debate. The main concepts discussed are method of induction, method of falsification as it appears in the philosophy of Popper, methodology of research programmes as it appears in the philosophy of Lakatos, methodology of science as it appears in the paradigms of Kuhn and the concepts of Feyerabend and followers who reject a unified methodology for science. Here Hume’s questions on
the very basis of rationalism also taken into consideration as it cannot be taken away from the history of methodology of science when looked upon from the theory dependent and theory free observation debate.

The Second chapter deals with the relationship between theory and observation. The concept of pure observation and theory are presented. The concepts of observation statements, theory dependent observation, psychological observation against pure observation, theory ladennes of observation statements, experimental laws and proper theories are discussed. The relation between sense experience and observation are presented. The whole debate of theory dependent observation and theory free observation is critically analysed. This chapter forms the base for the research tool of analysis to compare Popper’s concept of methodology of science and Lakatos’ methodology of science.

In the third chapter, an analysis of Popper views under four heads is carried out. Under the first head ‘foundational problems’, Popper’s formulation of scientific process has been analyzed. Under the second head ‘methodological problems’, Popper’s methodological concepts are analyzed. Here how falsifiability works as the central theme of Popper’s methodology is critically analyzed. In the next head ‘axiological problems’, progress of science in Popper’s philosophy has been analyzed. Concepts like verisimilitude and the place of adhoc modifications in the progress of science have been scrutinized. In the final head ‘sum and substance of Popper’s
methodology’, the methodology of Popper has been presented with the basis of the analysis made under the above heads.

Similarly in the fourth chapter, an analysis of Lakatos is done under four heads. Under the first head ‘foundational problems’ is presented which Lakatos’ presents as a historicist. Lakatos’ concepts like protective belt of auxiliary hypothesis, positive heuristic and negative heuristic are discussed here. Also, how theory dependent observation and the language of the theory have been formulated in the Lakatos has been pointed out. Under the second head ‘methodological problems’, Lakatos’ analyzed to find how work with in a research programme and comparison of competing research programmes are methodologically explained in the structural account of science. Under the third head ‘axiological problems’, Lakatos’ standpoint on axiological grounds is developed. Under the fourth head ‘theory dependent observation and methodology of research programmes’ a critiques of Lakatos is made analyzing methodology of research programmes and theory dependent observation.

The final, fifth chapter conducts the critical comparison of Popper and Lakatos on the basis of the discussions made in the previous chapters. Here some common issues are taken as a reference point to compare the thoughts of the two philosophers. On the concept of theory dependent observation a comparison has been done to find their points of acceptance and divergence. Popper’s concept of ‘metaphysical research programmes’ and Lakatos’ concept of ‘research programmes is compared. The methodology of falsifiability and that of research programmes is critically analyzed
and compared. Attempts are made to find out the difficulties with respect to the philosophical analysis of methodology of science and finally provide a satisfactory explanation concerning the problem of methodology of science.