Lakatos' Immeasurable Contribution to Knowledge:
The logical theory of the scientific method
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Introduction

I shall argue in this article in the favour and for the allegiance to the methodology of the scientific research programmes introduced by Imrè Lakatos. I shall argue for this theory of the scientific method for its clarification, and relation to scientific progression. I shall argue that the theories brought forth by Popper and Kuhn provides lack of clarity, and scientific method usage unworthy of scientific placement, that is, supplying insufficient discerning criterion in their theories. It is in fact the case, that Popper and Kuhn's demarcation of pseudoscience and science in their theories set forth are pseudoscientific within themselves. Furthermore, I shall address Lakatos' criticism, introduced by Paul Feyerabend in his paper *'How to Defend Society Against Science'* in which Feyerabend scrutinizes the methodology of the scientific research programmes.

Popper's Logik der Forschung; Falsificationism Theory 1934/1959

Popper utilized his demarcation criterion between science and pseudoscience based upon falsificationism. Popper originated his demarcation criterion as a '*dogmatic or (naturalistic) falsificationism.'* Such criterion establishes every scientific programme is deemed fallible without '*qualification*.' *[1] pp. 12-13* That is, strict empiricist thought is employed. In short, the basis of this brand of falsificationism creates all scientific theories as having an equalized chance; proof mechanisms are non-existent and may not prove theories scientific, it may only disprove theories in scientific procedure and proof. In this respect then it is the Popperian belief that in scientific study and honesty there must be an experiment pre-specified that can disprove the theory, if such experiment in fact contradicts the theory set forth, the theory must be given up. Popper realized dogmatic falsificationism was unrealistic and in argument results to nothing. Thus, methodological falsificationism was what Popper published. Methodological falsificationism is based upon conventionalism and falsificationism. Conventionalism being the philosophical belief that the perception of moral theories are not being linked with natural processes; it further can be demarcated by '*passivist'* and *'activist.' [1] p. 20* In which passivists believe that knowledge in truth is marked in the mind; mental activity brings about distortion, whilst, activists believe that the book of Nature may not be read without mental activity, that is, free of one's bias and expectation. Lakatos later regenerated this methodological falsificationism through reformation, he added more demarcation criterion; this shall be discussed later in the article, by which it provides defence to Lakatos' theory.

Kuhn's Structure of Scientific Revolutions 1962/1970

Kuhn's theory of the scientific revolution rejects the idea that scientific theories are cumulative in the nature and history of science. Kuhn's demarcation criterion between science and pseudoscience reveals itself in *'scientific revolutions'* or *'paradigm shift(s).'* Scientific revolutions are defined by Kuhn as: '*Scientific revolutions are here taken to be those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one; [2] p. 86.'* This underdeveloped theory based upon normative thought, suggests revolutions are irrespective, that is, scientific revolutions are abrupt changes in mind. In this normative thought Kuhn's ideal is the quality he wishes to instil of irrefutability in normal '*paradigms.'[2] pp. 86-100* In short, for Kuhn the basis of the scientific revolutions or paradigm shifts is the change from the dominant theory, to the new theory. For Kuhn commitment is everything, as he places in his words: '*Without commitment to a paradigm there could be no normal science; [2] p. 93.'* Kuhn refutes the idea of degenerating scientific theories being refuted at once; rather his theory proposes paradigm shifts should never be made. In the case that these paradigm shifts need occur, it shall only occur in times of '*crisis'; [1] p. 9'* Kuhn also refutes naïve falsificationism. In Kuhn's perception of science: science never really should progress, commitment is everything. Blind allegiance is compulsory, rather than continuity in true scientific factuality.

Popper and Kuhn Controversy 1965

Popper and Kuhn had controversy, in which they suggested the downfall of both theories through the eyes of one another. In 1965 Popper and Kuhn had a debate. *[3] pp. 7-8.* Kuhn in essence disregarded all brands of falsificationism: all of Popper's doctrines. Kuhn did not see the evident validity of perpetuating a change in the programme or '*saving'* any falsificationism. This sounds quite like a contradiction of Kuhn's own theory in which scientific theories of a certain paradigm should not be abandoned, and commitment is everything. Thus, commitment is only a comprehensive criterion utilized for Kuhn's own philosophical theory, without being applicable to outside theory? Kuhn's criticism extends to the domain of pseudoscience, as his *'crisis'* falls into social psychology not scientific matter of fact. Once again, even sophisticated falsificationism of Popper was overlooked by Kuhn. In truth, Popper illustrated descriptiveness of scientific objectivity. Kuhn was as well descriptive in nature and wished to express this descriptiveness in scientific mind. *[1] p. 92* Rather, than this one-sided illusion set forth, Lakatos described such, a change in research programmes, as a change from degenerative to progressive: '*Purely negative, destructive criticism, like 'refutation' or demonstration of an inconsistency does not eliminate a programme. Criticism of a programme is long and often frustrating process and one must treat budding programmes*

leniently. [1] p. 92 With this, naïve falsificationism's hardcore of programme downfalls is replaced through an optimistic outlook: regenerating Popper's programme to success. Henceforth, the Popper and Kuhn debate provides insight to the regeneration of scientific method.

Lakatos' Methodology of the Scientific Research Programmes 1973

Lakatos offers us his theory of the scientific method: the scientific research programmes. Every conjecture of scientific discipline is in relation to one another in terms of connected scientific research. That is, scientific knowledge is in a continuity of scientific progression and immortal scientific history. Every scientific conjecture is not isolated in nature, it does not stand alone: it is all connected. These attributes constitute a continuous research programme. *[1] pp. 1-8* The laws, scientific doctrines, ancillaries, and so forth of the scientific theory formulate the '*hard core*' of the programme. *[1] p. 4* This '*hard core'* is the absolute basis of the research programme, and must be uncompromisingly protected with the utmost caution. This protection ascertains a protective belt forming auxiliary hypotheses. The research programmes as well contains a *'heuristic'* which is in turn a problem solving mechanism; it dissolves anomalies, perhaps turning such anomalies into evidence for the programme. Hitherto unknown anomalies are solved with evidence, and provide further proof to the programme. *[1] p. 50* The negative heuristic in terms of Popper suggests avoiding certain experimentation or study, whilst the positive heuristic in terms of Popper suggests direct study of a certain scientific discipline. *[1] p. 47* The utilization of the negative heuristic warrants avoidance of *'modus tollens'* at the hardcore of the programme thus protecting it from absolute refutation. *[1] p. 48* The protective belt is a subdivision of the negative heuristic, and is formulated of auxiliary theories to protect the hard core. This protective belt has the attribute of being flexible, that is, to change when necessary. This probable necessary change is compulsory in order to protect the hard core and keep it in place. *[1] p. 5, p. 48* The criterion between progressive and degenerating programmes can be characterized through problem shifts, if the problem shifts are progressive they are described as such and the same for degenerative, respectively. A research programmes is progressive if it leads the programmes forward through these progressive problem shifts, and a research programme if degenerative if it is led by degenerative problem shifts. Thus, this sort of progress can be characterized as *'theoretically progressive'* which may be immediately known, though some may not be, such as in empiricist thought: long refutation(s) reign and success is known through novel facts and/or additional theories. So, another criterion that may be necessary is that of adding *'consistently progressive theoretical problemshift(s).'* Meaning that the research programme must be perpetuating increases in theories of content; this content must be corroborated, thus there is a need for '*intermittently progressive empirical shift(s).' [1] pp. 48-49* The positive

heuristic immediately degrades anomalies though anomalies are never completely diminished. Thus, the positive heuristic develops these anomalies in no specific order. This positive heuristic prevents the scientist from being overwhelmed with these anomalies: the anomalies are anticipated, but attention is placed in building the theory rather than refuting. The composition of the positive heuristic may even use metaphysical approaches. Furthermore, this heuristic forms the *'relative autonomy of theoretical science'* historical facts' rationality that could not be explained by other falsificationists. *[1] pp. 49-52*

Lakatos versus Popper

I will now compare Lakatos' theory and that of Popper's theory. Popper's falsificationism theory was improved by Lakatos and used in the scientific research programmes. After the rejection of dogmatic or naïve falsificationism, any type of falsificationism was not broadly accepted as this naïve or dogmatic falsificationism refuted new programmes before they were even established. *[1] pp. 12-13* Popper published methodological falsificationism. Lakatos did in fact agree with Popper in regards to his sophisticated falsificationism: '*-by a sophisticated version which would give a new rationale of falsification and thereby rescue methodology and the idea of scientific progress. This is Popper's way and the one I intend to follow.' [1] p. 31*

Lakatos reformulated this methodological falsificationism through additional demarcation criterion. In short scientific theory is falsified by three criterion: (1)another theory has more empirical content or prediction of novel facts; (2) the new theory includes the old theory's material that is not refuted; and (3) the theory explains the success of the old theory that is now refuted and the new theory's new/additional content is corroborated. *[1] p. 32*

Viewing once again sophisticated methodological falsificationism; it can be seen that if we take many subsequent theories, such as X1, X2, and so forth it is plausible then to define such as *'theoretically progressive (theoretically progressive problem shift)'* as each new theory contains pieces of the '*hard core.'* As well to contain some new evidence proving some novel or hitherto unknown facts. Through additional auxiliary hypotheses a possible refutation of the '*hard core'* is avoided. *[1] p. 33*

In contrast the latter information would be known as '*empirically progressive (empirically progressive problemshift)'* in the case excess empirical information is confirmed, and if these new theories leads to the discovery of new novel fact(s). Furthermore, the criterion would thus be known as progressive if containing the latter two principles and then degenerative if not. Scientific problem shifts are then brought

about only if they match this criterion. Falsification occurs when there is a new theory with corroborated evidence and it overpasses the other theories in continuum. In short, in Lakatos' words: *'given fact is explained scientifically only if a new fact is also explained with it.' [1] p. 34*

Thus, this new falsificationism changes the problem; instead of falsifying one theory it falsifies many. This is problematic in the sense that if one theory is named scientific the theory next in line would be a mistake. *[1] pp. 34-35* There are major differences, then, between naïve falsificationism and this new formulation: experimentation is not compulsory falsifying criterion: it is a distinct barrier. The most notable difference from naïve falsificationism is: '*—no experiment, experimental report, observation statement or well corroborated low-level falsifying hypothesis alone can lead to falsificationism. There is no falsificationism before the emergence of a better theory.' [1] p. 35* Thus, the change from naïve to sophisticated falsificationism is a semantic difference. With this change, falsificationism does not have to be abandoned but may be used as a tool, without complete restraint of development of scientific theories. In the naïve falsificationism, the theory was limited and restrained in its development of scientific theories and thus was not progressive or useful.

Popper's demarcation criterion was too ambiguous and broad. It offered an excess amount of opportunities for its decline and most of all; its criterion was a disappointment to new programmes. After this reformulation by Lakatos, the hard core of the Popper programme was less anomalous and clarified the point of the programme. Lakatos believed in falsificationism but his programmes incorporated it only to a small degree; in the matter of degenerative and progressive programmes' distinction. Lakatos' theory extends to all depths, though Popper's does as well it is an impediment to a progressive programme or degenerative programme to further develop itself and reach stabilization. Lakatos' programmes do not wish for a depth to be taken in order to refute a programme, one may stay with the programme until it is made progressive: *"—two rival research programmes, and one is progressing while the other is degenerating, scientists tend to join the progressive programme. This is the rationale of scientific revolutions. But while it is a matter of intellectual honesty to keep the record public, it is not dishonest to stick to a degenerating programme and try to turn it into a progressive one." [1] p. 6* Furthermore, the scientific research programmes allow time in discoveries such as perpetuation in theories or theories' content. The content must be corroborated, thus there also needs to be an '*intermittently progressive empirical shift.' [1] p. 49* Thus, also unlike Popper in which a theory is solely proved irrational or refuted; Lakatos' programmes have to time to progress so the rationality is not immediate and neither is the refutation.

Lakatos versus Kuhn

I will now compare Lakatos' theory and Kuhn's theory. As described previously, Kuhn's theory refutes the claim that science is cumulative or discovers eternal truths. Lakatos' theory incorporates related conjectures around a similar theory and scientific discipline, to be one rather than many: theories are connected. In order for science to be progressive and allow for positive novel facts some existing facts must be utilized, so Kuhn is wrong in his belief that scientific theories are solely standing alone facts and theories. Kuhn also holds belief that scientific revolutions or paradigm shifts are irrational and similar to some catastrophic anomaly. Kuhn therefore refutes scientific progress, and the scientific method of demarcation between pseudoscience is flawed. Kuhn believes these changes to be only in times of *'crisis'* as aforementioned. In this regard, the scientific theory of Kuhn turns into one of mere social science of psychological terms. In science there is no emotion, no crisis, only an evolutionary continuance. Kuhn also contradicts in the case of Popper; he refutes naïve falsificationism which is justifiable but contradicts Kuhn's own belief that scientific revolutions should not be made, as Kuhn does not even believe that one could save naïve falsificationism. Thus, Kuhn's theory is insufficient and is pseudoscientific within itself.

Lakatos' Critic Feyerabend 1975

Feyerabend openly criticized Lakatos' scientific theory in his *'How to Defend Society Against Science.'* Feyerabend reveals his position as following: '*A decisive feature of Lakatos' methodology is that such evaluations are no longer tied to methodological rules which tell the scientist either to retain or to abandon a research programme. Scientists may stick to a degenerating programme; they may even succeed in making the programme overtake its rivals and they therefore proceed rationally whatever they are doing (provided they continue calling degenerating programmes degenerating and progressive programmes progressive). This means that Lakatos offers words which sound like the elements of a methodology; he does not offer a methodology. There is no method according to the most advanced and sophisticated methodology in existence today.' [4] paragraph 17* Feyerabend asserts that Lakatos is correct in not pointing out *'methodological rules'* to make the scientist abandon or commit to programmes, but rather what Lakatos' lays out is not sufficient. It is Feyerabend's belief that the scientific research programmes are not sufficient in theory and lacks in demarcation criterion. It can be the case that Lakatos' does not specify conjecture rules in detail but in scientific terms it is not possible to lay forth a strict foundation. The hard core, heuristics, and so forth protect scientific conjecture and provide a logical imprint of the scientific method. Feyerabend most notably expressed that there is no method that can be in existence. In comparison, science is not normative, it is broad, and thus

there can be no bound to the infinity to what one can perceive or lack thereof. That is, science cannot be expressed in one simplistic way, and Lakatos' theory allows any scientific theory to fit around the parameters of his theory therefore. To suggest there is no method in existence is to suggest there is no science, no existence for such, marking the line to metaphysical inquiry.

Lakatos Methodology of the Scientific Research Programmes: Logical Methodology

I shall now remark at this point as to why I believe Lakatos' methodology of the scientific research programmes, in theory is the most logical method: it surpasses that of Popper and Kuhn. Popper's falsificationism is an immediate rationalization: it does not allow programmes to fully progress. There is no time for progression for scientific conjecture. Additionally, Popper's demarcation criterion of pre-specified experimentation requirements proves to shut down theories before they can develop and as well hinders scientific progress. Kuhn refutes the concept that scientific progress is cumulative and continuous; he as well refutes scientific progression through alleging scientific revolutions or paradigm shifts are irrational and therefore degenerative programmes/theories are more acceptable then to fail in allegiance or commitment. As well Kuhn crosses into the field of social science by suggesting *'crisis'* as the only possible means of scientific revolution. (i)Lakatos, improved and reformulated methodological falsificationism by utilizing sophisticated methodological falsificationism, and uses this as a tool, not a whole like Popper. (ii)Lakatos lacked in application of irrationality, into a pseudoscientific domain. (iii)Lakatos also allows for paradigm shifts as Kuhn places it. Lakatos agrees with changing allegiance to a progressive programme, under logical criterion, and as well allows one to retain the degenerating programmes in order to turn it successful. (iv)Lakatos' theory also allows for progression of theories with regards to utilization of time. Scientific research programmes progress and on the verge of degeneration can be turned around. (v)Furthermore, Lakatos theory promotes a freer criterion allowing further scientific progression. Feyerabend suggests that Lakatos' theory is not a theory whatsoever, and rather offers words that sound like a theory and that such a method could never be in existence. This refutation is equal to admitting science to be unable to be corroborated. Thus, Lakatos theory in essence provides all that is needed to nurture further scientific discovery and progression.

Conclusion

In summary, I have established in chronology the notable methods of the scientific method. Firstly, Popper and his falsificationism required an experiment be provided beforehand which would falsify the set forth scientific theory. Secondly, Kuhn refuted the idea that science is a continuum of knowledge, and believed that scientific revolutions are irrational, abrupt changes in mind, and that commitment to a theory is more novel than proper science itself. Thirdly, Lakatos' scientific research programmes improved and surpassed the theories of Popper and Kuhn. Lakatos utilized Popper's falsificationism as a tool, not as whole after reformulating its demarcation criterion. With such utilization, it allows time for empirical evidence to be confirmed which is known as an '*intermittently progressive empirical shift.*' Moreover, there is time for the '*hard core*' of the programmes to progress, whilst being protected by its heuristics. Lakatos did not wander into pseudoscientific domains as Kuhn did with his scientific revolution to which he proposed could only occur in times of '*crisis.*' Furthermore, Lakatos did not place restrictive rules upon the programmes, and the scientist is free to change to a progressive programme or stay with a degenerating one in order to make it progressive. Additionally, the discovery process and commitment is left open for scientific discovery. Thus, in closing it is evident that Lakatos created a useful and scientifically favourable programme, for future scientific novel discovery.

Bibliography

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