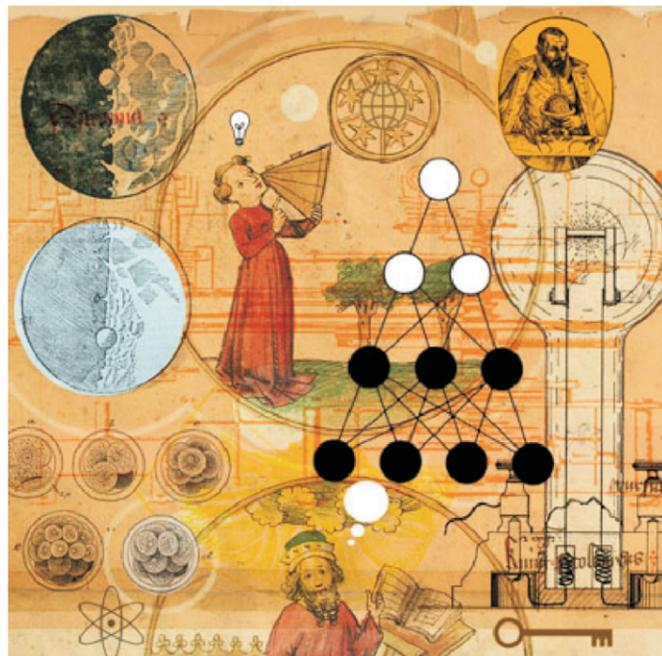


## HISTORICIZING KUHN: A CRITIQUE OF KUHNIAN THEORY OF HISTORY OF SCIENCE



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**Abstract:-**Thomas Kuhn makes a significant attempt at reconstruction of history of science as well as dissolving some of the myths such as science being a carrier of truth, of scientific community having a goal to attain it, etc. However the way Kuhn poses these questions makes it an idealist and ahistorical venture.

**Keywords:** Historicizing ,Kuhnian Theory , History of Science , historical location.

## INTRODUCTION

The *Structure of Scientific Revolution* by Thomas Kuhn is probably the best known post-war endeavour to bring the notion of historicity to the understanding of process of development of science. It has been widely influential and has brought a long set of admirers and critics. It is considered as heralding a critique of development of science in post-positivist and non-continuiest form. In many ways, it is a part of other endeavours that rejected the grand linear process of scientific development and discoveries. Part of the reason for the enthusiastic response to *The Structure* was due to the ongoing debate between those who considered the development of science as an evolutionary process, and those who saw it as a discontinuous process devoid of any goal. Kuhn was not the first and last to argue that the development of science is a discontinuous process. We will make an attempt to show that Kuhn's attempt of historicizing the development of science creates an ahistorical understanding of science which is devoid of its historical milieu. He anachronistically applied and normalized the capitalist division of scientists as constituting a separate body of thinkers from non-scientists and tended to apply this division seamlessly across history. This, I think, creates a problem in sustaining his argument for the periods when such distinction did not exist. Moreover I will also seek to show that Kuhn not simply remains unsuccessful in historicizing science but also remains oblivious of his own historical location. He becomes part of a group of scholars who take the reified understanding of science as yet another belief system of any kind.

In *The Structure* Thomas Kuhn builds the argument about how science develops from a period of normal science, to crisis, to revolution, and then again another period of normal science setting in, and this process keeps continuing. In this attempt there is a rejection of the dominant and prevalent view of both science being a culmination of goal ordained process and of scientists as constituting a body of truth seekers. Such understanding, it is argued, disguises the nature of science and scientific discoveries. Kuhn sees development of science as a discontinuous process effected by change/rejection of the existing paradigm. Kuhn uses the concept of normal science (research/science based on past achievement) and paradigm to elaborate these points. Normal science prohibits the development of new paradigms and clings to it. Normal science defines for a community of scientists what problems, procedures, and solutions are admissible, or in other words what, for them, is counted as science. In this period science becomes a puzzle-solving activity based on usage and further articulation of the existing paradigm. Obviously this notion of preserving a paradigm makes the scientific community a closed group with professional commitments to serve the existing paradigm. Anomalies and novelties are suppressed to a great degree. The anomalies that would not fit the existing paradigm are consciously avoided.

However there comes a time when anomalies accumulate to a point that there is a decline in confidence among some practicing scientists particularly young ones or those new to a particular field, who not much immersed in the existing paradigm are better capable than the old ones to allow change. This break in professional allegiance or in the paradigm has been called scientific revolution. However the change of paradigm, effected by revolutions, is not that a simpler process. The moment is driven not whether the puzzles have magnified or not but whether there are alternate paradigms available. New paradigms also might not deal with all the puzzles of the old paradigm, and that even the new paradigm is not all inclusive one. There are also times when both old and new paradigms are in existence i.e. the period of transition. This is a period when alternatives are frequently forthcoming than in any other period of normal science. This period is marked by different interpretations which disappear with the triumph of one of the pre-paradigm schools. The reigning of the new paradigm implies a new and more rigid definition of the field. Kuhn argues that those unwilling or unable to accommodate their work to it must proceed in isolation or attach themselves to some other group.

It is important to note that, Kuhn argues, the adjudication of invention cannot be precisely located in the periods of crisis. Such discoveries, for example the discovery of oxygen, X-Ray, electric currents, etc, could not have been predicted from the established theory. Likewise Kuhn argues that discoveries or inventions can be easily located in time and space in the period of normal science. However inhabitants of a particular paradigm in the period of normal science cannot perceive the counter-instances when they hurdle across them. This might not be the case when the "revolutionary" phase has set in scientific development. The recognition of the significance of anomalies could be assimilated only after more or less triumph of new paradigm. However the slow reception of new paradigm, to Kuhn, should not lead to the conclusion that development of science is an incremental process because its assimilation does not require the reconstruction of prior theory and the reevaluation of prior fact, but its displacement.

It is a pertinent question that why 'believers' of old paradigm fail to recognize anomalies? Kuhn argues that textbooks, which are an important source of information for scientists till a very late period in their career, make this process piecemeal. Text books tend to efface the anomalies to give the semblance of coherence within a particular paradigm. Textbooks, education, research protocols, etc create coherence

within the doctrine and 'solidarity' across scientific community around the notion of what counts as science. Kuhn makes the education process as the vehicle of acculturation. Education is treated as a mean through which a given paradigm is reproduced in successive generations of dutiful researchers and paradigm shift is achieved once some of the deviant researchers have decided to pursue a new paradigm. The resultant new paradigm then adopted by professional teachers and get embodied in textbooks, journals, etc. Once this has been accomplished a kind of trickle-down effect takes place creating popular perception of science.

As argued earlier Kuhn's work created much enthusiasm. Many in the academia took the arguments of *The Structure* to be anti-institutional. It was argued that science did not develop in the abstract, and that history of science developed in a different way from what has hitherto been perceived. For many it became a point of departure of the relation of knowledge to social context. However it is important to note that most of this enthusiasm was fundamentally misconceived. For a close reading of Kuhn makes it very clear that his argument of the development of science was devoid of social and historical context. Infact he himself argued in the preface that he has said nothing about the external social, economic and intellectual conditions in the development of science. However this argument leads to a sort of idealism in that development of science becomes a venture devoid of material context. Science itself becomes abstract from social milieu. Once development of science is devoid of its social context the only recourse left to Kuhn to explain the change through the 'genius' of young and dynamic 'revolutionaries', who open the new grounds for lesser worthies. In this 'psychologizing' theory of development of science, scientific communities is divided into two categories, one, the young and dynamic looking for new ways of doing things promoting flux of change, and, another old clinging to the orthodoxy restricting change. This elite historiography reproduces the popular historiography of science as succession of trail-blazers. Newton, Lavoisier, and Einstein are considered as reasons why paradigm gets replaced one by the other.

Kuhn's idea that normal science is based on paradigm whose normativity in turn is based on the group's unambiguous acceptance of that paradigm. The relation between paradigm and normal science creates the problem of objectivity of scientific knowledge. A close reading might prompt one to argue that scientific discoveries would be rational only if viewed from single viewpoint of unquestioned authority, i.e. in the period of normal science. Feyerabend goes further and argue that if one sticks to this idea of Kuhn then there is no way of distinguishing scientific research from that of a gang of criminals. In Kuhn's thesis the distinction between science and non-science becomes a problematic one. There is no criteria through which one can adjudicate about what counts as science. Science has lost its legitimate ground but to judge that still remains the task of scientific community. This privileging of scientific community who can judge what they are doing, does not simply reify the social influence over science but also creates immunity for scientists from outside community.

Kuhn uses the term 'believers' for the community of scientist. He replaces the idea of search for truth with lack of confidence in a method. Loss of 'faith' leads 'believers' to search for new meanings. It is to be noted that such theory has allowed some to conclude that it is no different from theology. If one stretches further, it can be argued, that science is nothing but a set of belief systems imposed by a group of scholars on older tradition. Further the reality-out-there is also constructed, and there is a relation between reality and our cognition. Scientists construct reality as do priests. Kuhn's point about the shift from one paradigm to another being a matter of faith raises the issue of overall progressiveness of science, and above all of its rationality. Kuhn argues that shift from one paradigm to another is a matter of faith since their does not exist any over-arching mechanism for adjudication between these two paradigms. This question about the progressiveness stems from the fact that Kuhn himself argues that scientists making a move from one paradigm to another are aware that the new paradigm is answering only a few of the anomalies encountered, and that the earlier paradigm has kept only a few unsolved. Though he argues that the proponents of the new paradigm do make a claim to progress, notably to make their case legitimate, but whether that is progress or not remains unanswered. This raises doubt not only about its progressiveness but also about its rationality. It is for this reasons that M.D. King, in an article, argues that Kuhn's scientists are thoroughgoing 'constitutionalists', 'reformers, not revolutionary'. He further argues that they are by training ingenious puzzle-solvers he will only lose faith in accepted procedures if they continually fail to produce solutions, and will look for alternative ways when the alternative paradigm promises future puzzle solving.

As would have become clear from the above discussion Kuhn quite frequently uses the phrases like 'group of believers', 'community of scientists', etc. However if read closely there is considerable tension with regard to their role. On instances they are seen as conscious agents whereas in some places they are ignorant of their activities. In one instance Kuhn talks about the scientist working in a paradigm and argues, "Scientists work from models acquired through education and through subsequent exposure to the literature, often without quite knowing what characteristics have given these models the status of community paradigms." In another instance in talking about the response of scientists to crisis, Kuhn argues, "...what scientists never do when confronted by even severe and prolonged anomalies. Though

they may begin to lose faith and then to consider alternative, they do not renounce the paradigms that has led them into crisis.” There is considerable divide in their acts. In the period of normal science they are unaware of the actual history of their paradigm, and remain in the domain of puzzle-solving. However in the period of crisis they become aware of the anomalies, however renounce it only at a time when an alternative paradigm is available.

If science progresses from puzzle solving, to anomalies, to crisis, and finally to a period of extraordinary science (revolution) and if the same process was repeated then linear notion of progression of science comes back, albeit, from back door. Kuhn, however, introduces the notion that two paradigms are not just incompatible but also incommensurable which is the real dividing line. Kuhn considers scientific revolutions as “those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one.” Kuhn argues that shift from one paradigm to another imply a change in the world view of the scientists, 'a displacement of conceptual networks through scientists view the world'. He also argues that most of the times the newer paradigm, in the absence of its own evolved and articulated terms and concepts, keeps using the language and terms of the earlier paradigm. However the difference lies in their incommensurability, within the new paradigm, old terms, concepts, and experiments fall into new relationship with one another. Kuhn argues that the period of normal science is marked by strong networks of commitments, at conceptual, theoretical, instrumental, and methodological which guide the puzzle-solving. Thus if they guide procedure for the research during the period of normal science then there can be no commensurability at these levels in the time when two alternative paradigms are available. This means that when scientists are faced with a choice between alternative articulations of the same paradigm they have no common standard to guide them. However when scientists are faced with a choice between alternative paradigms they have no over-arching standard to which they can appeal, as the two paradigms are incommensurable.

However it can be pointed out that his notion of incommensurability is vague. For example Kuhn argues, comparing Newtonian and Einsteinian paradigm about the object mass, that in Newtonian paradigm an object's mass is independent of its velocity whereas in the relativity mechanism mass increases as velocity approaches that of light, and only at a low relative velocity they can be compared. Kuhn argues that physical referents in Einsteinian and Newtonian concepts are by no means identical though they bear the same name. It can be pointed out that Kuhn does not make it clear the difference in the referent as to whether the same referent means two different things, or two referents have identical names. This in his account remains without much elaboration. Moreover the two paradigms remain incommensurable to each-other not just because different concepts are employed but also adherents of different paradigms also differ in what and how they see things.

To stretch this argument further his notion of incommensurability at various levels are all attributes from a subject's (the scientists) position. The difference between two paradigms is all about what scientists do, or more importantly, think. Why do they do what they do, and why do they think the way they think is outside the logic of historical development. Or in other words science is autonomous from all the other developments in history. The idea within the science gets transformed into another through the hands of great scientists. It comes close to Hegelian notion of *Idea* actualizing itself minus the element of progress and with full surprise of randomness! In his argument, with regard to shift in the paradigm, he gives emphasis to subjective and aesthetic considerations. Since there does not exist a higher mechanism from which both paradigms can be compared, and that even when the scientist knows that the new paradigm is not answering all the anomalies of the earlier paradigm and that earlier paradigm has failed with a few, Kuhn argues, that decision to shift from one paradigm to another 'can only be made on faith'. Thus for me Kuhn in challenging the positivist understanding of science slides into idealism. In his argument he cuts-off the community of scientists, as argued earlier, from the historical process. They become men thinking about particular scenario, facing anomalies and crisis, and seeing alternatives shift to newer revolutionary science. In arguing this he re-bestows the revolutionary scientists with the task of 'truth' seeking.

The more serious problem, one can argue, stems from Kuhn's reading of history of science backwards. Kuhn in talking about community of scientists, which he also argue constitute a closed group, implicitly accepts the modern capitalist division not only between technology and science but also between scientists and non-scientists as though a division which existed throughout history. He seems to have accepted the normalcy of this division across history, and thus his account becomes ahistorical. Kuhnian history, for example, cannot account for inventions and discoveries from pre-modern period. Most of them for him would be developments in the arena of technology. If accepted on this account Kuhn can be accused of selectively using his examples from modern capitalist period. His argument fails to account for the fact that such distinctions between technology and science and between scientists and non-scientists are themselves historically produced. Kuhnian theory would fail to account for the fact that inventions, discoveries, etc are themselves a product of modern capitalist institutionalization of them in the form of

ownership, patent, and thousand other ways.

This anachronistic reading of history of science and the understanding of scientists as constituting a separate community poses another problem. This distinction between scientists and non-scientists would have problem in acknowledging the contribution of other 'inferior' beings to the development of science. The example that comes to my mind is from the so-called Third World. As we quite well know that many a scholarship on the development of medicinal system in colonies has established that many breakthroughs in colonial medicinal system were brought about by the colonists' encounter with native system of curing. They sometimes played a very crucial role in major breakthroughs. But in the scholarly disposition of scientific discoveries the colonial source is not simply effaced but also prevented to develop on its own terms. However Kuhnian theory which acknowledges only scientists as the source of science cannot account for the 'non-scientists' contribution.

As late as the third-quarter of the nineteenth century, natural science was not considered as a separate body of thought. Science in past was closely linked to works mechanics, laboring artisans, gardeners, farmers, magicians, etc. In the period of industrial revolution there emerged a readymade market for these crafts, for which a separation between technicians (labour) and scientists (thinkers) had to be forged. Most of the universities till this time were presided over by the theologians who were considered as the ultimate adjudicators over what counts as truth. The so-called early scientists were simply suppose to provide means of improving inventions and controlling limited part of environment. Contrary to Kuhn, physicists and chemists were not devoted to what he calls as 'Newtonian Paradigm'. Infact they were no 'physicists' and 'chemists' as we know them. Practices what later came to be known as science were simply part of doing other things mostly in pursuit of profit for emerging bourgeoisie. Infact the word scientist as full-time practitioners of natural science entered English usage only after 1830s. The emergence of what came to be known as natural science, and a specific profession devoted to it, can be seen as the creation of same process of which industrial revolution was most determining constituent part.

One can say that Kuhn unwittingly, by developing a notion of scientific development away from its historical milieu and keeping the role of scientists as prime-movers in its change, takes up reified zone of science for granted. By doing this he de-radicalizes any pursuit of sociology of knowledge or social history of science. Interestingly in his brilliant study of Kuhn, Fuller points out the background of Cold-War and New Deal behind the emergence of Kuhnian paradigm and its influence. The person to whom the book was dedicated and was the mentor of Kuhn, James B. Conant was not only the president of Harvard University but also the Director of U.S. defence department, and later World Bank. The post-war impulse of historicizing the science and its social role was well captured by Kuhn. Ambiguities about science were well conceded but role of expertise well retained. To scrutinize the science one needs to be part of the charming community of scientists ("...very existence of science depends upon vesting the power to choose between paradigms in the members of specific kind of community" p. 167). Kuhn almost anticipated Fukuyama's end of history 'paradigm' as far as ability of masses to bring in change both in scientific and non-scientific realm is considered.

1. Kuhn himself acknowledged the debt of Alexandre Koyré's discontinuist historiography. Another person who shared this discontinuous notion of scientific development was his colleague Paul Feyerabend.

2. See Kuhn, Thomas S., *The Structure of Scientific Revolutions*, Third Edition, Chicago and London: University of Chicago Press, 1996, p. xii

3. K. Brad Wray, 'Is Science Really a Young Man's Game?' in *Social Studies of Science*, vol. 33, no. 1, Feb, 2003. P. 137-149. Wray puts Kuhn's thesis under empirical scrutiny and questions succinctly Kuhn's thesis of revolutionary change being brought about by the young scientists.

4. See Paul Feyerabend, 'Consolations for the Specialist', in Imre Lakatos and Alan Musgrave (ed.), *Criticism and the Growth of Knowledge*, Cambridge University Press, 1970

5. See John Watkins, 'Against 'Normal Science'', in Lakatos, Imre and Alan Musgrave (ed.) *Criticism and the Growth of Knowledge*, Cambridge University Press, 1970

6. See op. cit., Kuhn, 1962, p. 158

7. See M.D. King, 'Reason, Tradition, and the Progressiveness', in *History and Theory*, vol. 10, no. 1, 1970

8. Ibid.

9. See op. cit., Kuhn, 1962, p. 46

10. Ibid, p. 77

11. Ibid, p. 92

12. Ibid, p. 102

13. Ibid, p. 149

14. Ibid, p. 42

15. While delving on Kuhn's notion of incommensurability one has to keep in mind that Kuhn's use of the

concept of paradigm is itself pre-critical. Masterman, in his critique, has identified at least twenty-one ways in which this concept has been used in *The Structure*, which he categorizes in three groups of sociological, metaphysical, and construct paradigms. Kuhn himself, in a way, acknowledged this problem and changed the concept of paradigm with disciplinary matrix in his Postscript of 1969. See *The Nature of a Paradigm*, by Margaret Masterman, in Lakatos, Imre and Alan Musgrave (ed.). *Criticism and the Growth of Knowledge*.

16. *Ibid*, p. 155-56. He infact argues that subjective and aesthetic facts can sometimes be decisive.

17. *Ibid*, p. 158

18. Infact if one looks at the footnotes Kuhn's example of his scientific revolution are overwhelmingly from the modern period. Though he says at one point, when talking about Newtonian paradigm, that examples can be magnified but does not bother to give concrete examples which otherwise one would expect in a history of science.

19. See for details Goonatilake, Susantha, *Aborted Discovery: Science and the Creativity in the Third World*, Zed, London, 1984

20. See *The Social Locations of Scientific Practices*, by Hugh Lacey, in *History, Historicity & Science*, (ed.) Tom Rockmore and Joseph Margolis, Ashgate, 2006.

21. See Chapter 1, 'The Pilgrimage from Plato to NATO', in *Thomas Kuhn: A Philosophical History for Our Times*, by Steve Fuller. The University of Chicago Press, Chicago and London: 2000.