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VERIFIERS AND THEORY CHOICE

All discussions of scientific method after Kuhn's work can afford to ignore the problem of theory choice and Kuhn's negative views concerning theory–neutral verificatoin of rationality of theory choice. In this paper I shall examine some of the issues involved in Kuhn's central thesis of the distinction of normal science as against scientific revolutions, the latter being marked by apervasive crisis of loss of paradigm. The notion of paradigm shift is according to Kuhn outside normal scientific heuristics and methodology. Kuhn's central contention shall be examined in detail in this paper and I would sustain my position against Kuhn's view, that there is only a logic of intra–paradigm discourse and its unity. Our contention in brief is that the concept of science would be subverted if an extreme interpretation of paradigm shift as advocated by Kuhn is literally and seriously taken. As such, after examining the arguments that Prof. Kuhn and his followers have given for the position of incommensurability of paradigms, I would attempt to make a plea for the recognition of the role paradigm free verifiers in most of our scientific inquiry. Kuhn's project was to give an account of the nature of the scientific enterprise and the reasons for its special success–an account which would fit the history and practice of science better than what he claims are the obviously inadequate accounts standardly found in science text–books and in many discussions in the philosophy of science. Kuhn proposed a fundamental change in our perception and evaluation of a familiar episode from the

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history and practice of science–normal science consists for the most part of a very important kind of puzzle solving in which the nature of the puzzle and the terms set for its solution are not themselves regarded critically subjected to test by scientists in any significant way. Normal science takes place within 'holistic paradigms'–extremely broad theoretical, metaphysical and methodological models of nature and some of them lead to the discovery of her secrets. Kuhn argues that the theories which are part of scientific paradigms are not refutable by observations at all. This is because, on Kuhn's view, sensory experience is not fixed and neutral and theories are not simply–man made interpretations of given data, " what occurs during a scientific revolution is not fully reducible to a reinterpretation of individual and stable data–paradigms are not corrigible by normal science at all ". Instead, it seems that the paradigmatic theories in fact define what is to count as a relevant observation, they define the ' world ' within which the scientist works, so a theory is not refuted by experience but instead simply abandoned when there are a large number of problems with it and when possible more fruitful way of perceiving the world is at hand.

To Kuhn " reasons constitute values to be used in making choices rather than rules of choice " and that such values can be differently applied, individually and collectively by men who concur in honouring them.

Theories are constructed in science with a view to ascertaining the possible structure of underlying reality as seen through a specific set of observable phenomena. On the basis of a set of observable data, scientists try to construct a model that best represents the structure of reality. It is also accepted that sometimes a model which is taken to be the representative model of the structure of reality at one time is rejected as redundant or untenable. I have shown that the analysis of Kuhn for all its

surplus concern for details of actual history of scientific theories has shown a degree of lack of understanding of the veriegated functions at " theory ", " hypotheses " and the propostions that any on going scientific enterpritra employs. My first criticism is on his unperceptive use of the term ' theroy ' on the part of Kuhn and his devotees to designate a hypotheses, a rule or definition and axiom which do not have the same function within the structure of scientific enterprise. For example, the rule of uniformity of nature or seeking a simple explanation does not figure in the course of testing my set of alternative empirical hypotheses concerning a precise area, but are heuristic assumptions of all cognition which cannot therefore be subject to any adhoc decisions on the part of investigators to fragment the procedure of empirical confirmation of the hypothesis under question. [3]

Analysis of Verifiers and Theory-Choice :

The most decisive method of testing or evaluating a theory[3] would seem to consist in seeking an answer to the following set of questions :–

a) Whether or not it either implies or suggests a certain model of the growth of scientific knowledge;

b) Whether the statement of the model is a self-consistant one i.e., it does not imply denial of the possibility of the growth of scientific knowledge;

c) Whether the model is a useful one i.e., the model has the useful consequence of rendering the growth of knowledge measurable and evaluable. " The worth and contribution of a knowledge[4] claim of whatever level or of a new idea, or of a theory must be tested and evaluated in terms of its consequences rather than in terms of its generating sources whatever." [5]

According to an important conception of the growth of scientific knowledge which Scheffler has developed in some detail " underlying historical changes of theory, there is a constancy of method, which comprises not merely the canons of formal deductions but also those criteria by which hypotheses are confronted with the test of experience and subjected to comparative evaluation."[6] Proponents of this view admit that " We do not have explicit and general formulations of such criteria at the present time " but they insist that the criteria " are embodied clearly enough in scientific practice to enable communication and agreement in a wide variety of history of science and that such communication and such consensus indicate that there is a codifiable technique of rational theory choice".[7]

The key idea here is that just as logic provides us with a way of determining the merits of arguments, evaluative criteria of theory choice provide us with a way of determining the merits of scientific theories.[8] These evaluative criteria which may be recommended on the grounds that they are conducive to the goals of science ideally provide the means for adjudicating scientific disputes concerning feasibility of alternative scientific theories.

It should not be thought that this approach to theory choice is incompatible with equivocal comparisons of the merits of theories. As Scheffler observes " the existence of evaluative criteria is compatible with borderline regions in which these criteria can yield no clear decisions and even the objective availability of clear decisions is consistent with honest differences of judgement, not to mention plain misunderstandings ". However, we should expect carefully informed scientists to adopt similar views and not to persist in espousing different theories over long periods of time.

If such a conception of rational theory choice is correct, a scientist's resistance to a new scientific enterprise of theories can

be rational only in the event of an " honest differeuce of judgement " or a " plain mis–understanding in borderline; fully informed scientists should not adopt any theory, while in clear cut cases they should not continue to defend an older view when the majority of scientists have adopted a newer one ". Moreover, if the failure to conform to the objective criteria of assessment characteristics of good scientific practice signals the presence of extra–scientific, subjective influences citing such factors to explain the choices of resisting theories will not only be appropriate but necessary. As the view is maintained that the resistance should be explained in this way is relatively common.

But Kuhn holds an opposite conception of theory–choice According to this view " what scientists share is not sufficient to command uniform assent about such matters as the choice between competing theories and " every individual choice between competing theories, depends on a mixture of objective and subjective factors ", although the choices that scientists should make are constrained to a certain extent ". In these matters there is no such a thing as "proof", theory choice depending in part on " personality, education, and —— prior pattern of professional research ". Characteristic of such permissive accounts is that they recognize the possibility of divergent approach and, hence the possibility of scientists rationally resisting a new scientific ideas. Scientist's personality and education might prevent him or her acting in a " high risk way ".

Concerning the scientific knowledge the account of theory choice is one of the most striking features of science. When one considers science as a whole it is difficult to overlook that scientific doctrine constitutes a vast and highly ramified system of observation statements, experimental results, hypotheses, theories and methodological and metaphysical principles to which scientists have varying and limited access. Although scientists can rea so

nably hope to acquire understanding of a small part of the system and a rough and ready appreciation of how the parts fit together, they cannot reasonabley hope to achieve more than this. In the normal course of events, they have to rely on the results and methods of area with which they are relatively unfamiliar and they are typically unaware of either the bearings of their work being done in these areas of their own.

This general conception of theory–choice can be developed in many ways. According to Landen scientists should " choose the theory with the highest problem solving adequacy ".[9] Though it is common to talk about problem solving among the scientists and philosophers, not much agreement has been found as to what is taken as a problem, what kinds of problems there are and what constitutes a solution to a problem. To Landen there is a difference between an empirical problem and a conceptual problem. A theory solves an empirical problem when it entails, alongwith appropriate initial and boundary conditions, a statement of the problem; a theory solves or eliminates a conceptual problem when it does not fail to exhibit a conceptual difficulty of its predecessor. It is important to note that on this account, many different theories may solve the same empirical and conceptual problem. The worth of the theory world depend on how many problems it solves. Unlike most models of explanation which insist that a theory does not really explain anything unless it is the best theory or possesses a high degree of confirmation, the problem solving approach allows a problem solution to be credited to a theory. Independent of how well established the theory is, so long as the theory stands in a certain formal relation to the problem within the problem–solving model of Landen, one has to see that for every theory, one assesses the number and the weight of empirical problems it is known to solve, similarly assess the number and weight of its empirical anomalies and

finally assess the number and centrality of its conceptual difficulties or problems. Therefore, the scale of progress prefers that theory which comes closest to solving the larger number of important empirical problems while generating the smallest number of significant anomalies and conceptual problems. We accept theories which promise fertility in extending the range of what we can explain and predict. One must pursue and explore the highly progressive theories, whereas only the most adequate theories be accepted.

The crucial point in any discussion of methodology of paradigm shift calls for recognition of inter paradigm frame of an on going scientific enterprise which alone permits continuity (which is sometimes questioned by the upholders of this model of paradigms of science) in a scientific cognition. It is not possible at all to understand the sense of this paradigm shift outside arbitrariness and mere craze for novelty, if it makes no sense to say that the shift was warranted in a particular direction in favour of solutions of the anomalies that had been noted in the working of anterior paradigms. Modification, transformation and elimination of anomalies, procedures and framework must be valid in a sense outside the earlier and later paradigms that replace the earlier. This meta–paradigmatic framework provides for the interparadigm discourse, and all theory appraisal terms like efficiency, comprehension, etc. call for paradigm neutral interpretation in order to make any descriptive sense of cognitive enterprise.

Conclusion

In the light of the above remarks the problem arises as to what extent the role of verifiers could be raised to the level of inter paradigm discourse, even if it is conceded that all observation statements are theory laden. Is it possible to translate

the representation under one system of measurement to another without residue or are such inter paradigm transfers in principle incommensurable? Consider for instance shift from classical mechanics to relativistic mechanics. In both theories 'mass' can be characterised as the ratio of force to acceleration. In Hamilton it is the 'linear momentum.' To say that these are not parts of the meanings of 'mass' and 'linear momentum' is to beg the question. To say that only those characterisations of the terms which do change should be allowed to count in "part of meaning" of the term is unwarranted. In other words, certain features are in a sense shared by competing paradigms and are common to both of them suggests that there is an agreement between competing paradigms and they are commensurable and comparable through appeal to shared meanings.

While there is no denying that science employs kinds of structured empirical constructs that, in the tradition of P. Duhem, Kuhn has exploited to suggest that they are free from external constraints and valid by confirmation of empirical objects. We would be doubting the theory of theoretical entities of scientific objects which argues that such theoretical constructs nevertheless are objective correlatives which are capable of inter hypothses convergence and reinterpretation by two geomtries describing a set of points in a particular domain. What is to be noted here is that a structured configuration of points could be given alternative description which can be as precise as a geometrical topology; yet there cannot be any doubt in principle that in either of the two systems two descriptions or languages is a possibility of radical translation of all the strings in one mode of describing to another without any residuary change of truth value.

Lastly, it would be very difficult to give any satisfactory account of growth of science if the full implication of Kuhnian

insistence of incommensurability of inter paradigm discourse is relentlessly maintained. His latest recapulation that nature being the reference of our scientific enterprise and the final arbitor, is neither here not there; either we have some notion of nature, which, as rightly pointed out by modern examination of theoretical constructs, [10] is in some way constituted by our rational categories and yet manages to act as a touch stone for a set of alternative problematic hypotheses and if this is not so then Kuhn fails miserably in articulating the role of nature in deciding the direction of science. [11]

I hope I have shown that the idea of incommensurability thesis in Kuhn is methodology perverse in as much as it fails to take note of the crucial role of verifiers in formulating any measure of problem solving adequacy of competing scientific theories and as such is an inadequate delineation of actual scientific practice.

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NOTES

1. Kuhn, T. S., *The Structure of Scientific Revolutions*, Chicago University Press, 1970. Kuhn is confused about the notion of "Theory". He is committing a category mistake in thinking that all theories belong to one homogenous type. But only in one sense we can say that there can be alternative theoretical formulations that range over a given unproblematic range of observed data, despite the fact that this range, in the first instance, was constituted by introducing certain stipulative definition, and likewise at still lower ranges observation statements themselves may require some linguistic conventions and so on.

   In short, Kuhn misses the neat levels and tiers of different senses of 'theory' and 'theory dependence' in the scientific study of the phenomena.

It is clear that theoretical constructs, data and observation statements all employ variously abstract definitions and conceptual frameworks. These multiple frameworks must not be confused with alternative theoretical hypotheses which need to be scientifically preferred, on the methods of empirical support supplied by experiments and observations in terms of predictions and their verifiers (i.e. theoretical constructs, data and observation statements). Thus in modern epistemology of science everybody knows that no verifiers are completely and categorically free from theoretical incorporations. Nor could they be isolated in any test situation while testing hypothesis or preferring one out of a set of hypotheses by means of these verifiers. The level of hypothesis and its abstractions has to be distinguished from levels of its apposite verifiers and their theoretical nature. In no way latter could be considered equiform with the hypothesis under examination.

3. It is a theory regarding phenomena which in any case science tacklesl while students of epistemology ask questions regarding the conceptua-status of theories of phenomena themselves.

4. Knowledge is either a singular proposition or universal assertion regar, ding the nature of phenomena and it is possible to continuously approach a more reliable representation of the phenomena.

5. Landen, Larry; *Progress and its Problems*, University of California Press, 1977

6. Scheffler, S., *Science and Subjectivity*, Bobbs Merril, 1967

7. This concerns details about the procedure to be followed as to how to pick and choose from among the various theories about the unproblematic domain.

8. Kindly refer to earlier note 2 above about the various functions of scientific theories and theoretical abstractions where we emphasised the distinction between theoretical abstractions or observation data from the level of theoretical positing of hypothesis in scientific procedure. To speak of one theory simpliciter is to indulge in gratuitous category mistake.

9. The notion of scientific theory uses a notion of problem solving adequacy, and the latter can be represented as follows :- it entails a possi' bility of occurances of predictions which are confirmed by observations which are called theory verifires and problem solving adequacy is a large set of positive verifiers and no negative evidence against the hypothesis. These two together consititutes the notion of "problem solving adequacy".

10. Pandit, G. L.: "Epistemology and an Interactive Mode of the Growth of Knowledge", *Indian Philosophical Quarterly*, Vol. III. 4, July, 1976.

10. As a student of Philosophy of Science Kuhn very strongly disputes classi cal platonism and respected orthodoxy of the methodological position that sharply draws a cleavage between the context of discovery and the context of justification. Rather he advocates mostly that Philosophy of Science till recently had noting to do with science and scientific practice and was in the habit of indulging in gratuitous abstractions concerning theoretical criteria of preference with anyone acquainted with actual history of science would dismiss as purely mythological and far too idealised to elaborate the concrete facts of scientific performance, and even scientific model building, and as such Kuhn brings in a certain degree of historical concreteness to the epistemology of science.