INQUIRY ON INDIAN SCIENTIFIC RATIONALITY: EXPLORING THE ELEMENTS OF SCIENTIFIC METHOD IN INDIAN EPISTEMOLOGY

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It seems a matter of surprise that Philosophy of Science, in its long history, has not cared to take account of the potential contributions from non-western philosophical traditions. Considering the fact that philosophers till very recently used to categorically ascertain that East of Zeus there is nothing worth being called philosophy, this brings little surprise. However, in India since the latter part of the twentieth century, there have been overenthusiastic claims from different quarters about the relation between ancient Indian intellectual tradition and modern science. These claims can broadly be divided into two: one is that ancient Indian civilization had elements of science in their Mathematics, Astronomy, Metallurgy, Linguistics and so on. There is a bright possibility for this, and in fact this claim can be neatly verified as there is substantial documentation on this subject. The second claim is that some concepts in Modern Science, particularly in Quantum Theory and Cosmology are described in / anticipated in ancient Indian Idealistic Philosophy. This is a claim largely untenable and even undesirable. Quantum theory, in fact comes up in the evolution of modern science, and has unique features in many respects. To claim that the elements of it are already present in Indian Philosophy or Indian metaphysical thought is to mistake both Indian Philosophy and Modern Science. To set the ground clear it would be good to examine whether Indian rationalistic tradition has anything to contribute to Philosophy of Science[1].

There is no branch of knowledge system that has influenced and molded the life of human beings since modernity as Positive sciences and

its sway over other knowledge streams still continues in spite of several attacks on it from different quarters , like say, anti foundationalism, Relativism, Feminism, and other post modern theories. The special aura that the Positive sciences have is largely due to the unique method they practice, which has received such a wide acceptance that every discipline tried to mimic that method in some minimal way. Even if we were to ignore this over enthusiasm on the part of academics to uphold science and its method, one thing is definite; the scientific method as it is followed now at the global level has created a revolution, to say the least, in the history of human knowledge. In the west science was separated from philosophy after attaining maturity, but this development which we would call the moment of fission, for a multitude of reasons did not happen in the history of Indian sciences and as a result, the sciences remained, as the critics allege, at a rudimentary level.

Is scientific method a unique inventory of the western civilization? Contemporary Philosophers like Gadamer would argue that modern science grew out of Western Philosophy, and therefore, there is a civilizational continuity between Western Philosophy and modern science[2]. Granting that as far as civilizational origins are concerned, modern science and Western philosophy are in kinship, we may point out that with regard to conceptual origin, there is a common conceptual and methodological space shared by science and a few philosophical traditions, and Indian philosophy is one among them. There is much in common between Indian rationalist traditions and the practice of modern science. To make a first step, let's acknowledge that concepts such as inference, reasoning, methods of knowing, causality etc. are central to both science and Indian epistemology. Further, both in science and in Indian epistemology doubt plays a significant role. While in modern science Descartes inaugurated the move towards certain knowledge by beginning with doubt, Indian epistemology begins with prioritizing the nature of doubt.

Generally speaking Realism has been conceived as that ontology best voices science. In India Realistic schools were more vibrant and active than their idealistic counterparts. Given the fact that scientific rationality was alive during ancient and classical period, one may wisely conclude that other ontological positions would have arisen only in response to the issues posed by the sciences, and in that sense, the idealistic

traditions indirectly responded to science through their response to the rationalistic philosophies.

Generally speaking, there is no particular ontological position that best voices science. Of course Realism would be the closest doctrine that one might choose for this role, but the complexities of Scientific Realism actually raise more questions than answers. Given the fact that ancient Indians did actively engaged in scientific practices and also had flourishing practices of Mathematics and Astronomy, it seems reasonable to believe that a living philosophy in those times would have arisen only in response to the issues posed by their Sciences. While the Indian rationalistic tradition embodied one kind of response, one that was concerned with basic problems of empiricism and valid knowledge, the spiritualistic tradition indirectly responded to science through their response to the rationalistic philosophies. Matilal describes "Indian logic as the systematic study of informal inference – patterns, the rules of debate, the identification of sound inference, vis-à-vis sophistical argument, and similar topics."[3]

To talk about the Western Science, Logic is one discipline that functions as the common element between Science and Philosophy. Philosophy of Science in the West has extensively discussed the occurrence of logic in Science. Prof. Sundar Sarukkai captures the difference in the use of phrases 'Logic in Science' and 'Science in Logic.[4] He argues that Philosophy of Science, based on Western Philosophical Tradition actually demands that Science be logical, while Indian logicians demand that logic be scientific. It is this question of priority, whether logic comes first or science that is at the heart of the difference between Indian and Western Philosophy of Science. This difference may be characterized by the question "Should logic be scientific or should science be logical?."[5] Logic is not scientific for Western intellectual tradition since the essential character of logic is to be outside the domains of the empirical in an explicit manner. In contrast, for Indian logic, it seems that the central concern was to make logic scientific. This in turn implies that logical statements will have to respond to empirical concerns. While this move militates against the very notion of logic in the Western tradition, it is precisely this demand on logic that makes Indian logic essentially correlated to scientific methodology.

Nevertheless we could cite certain common elements both in Indian Logic and in Modern Science. If we look at any scientific theory we will see that it employs inferential moves too frequently. Let us consider Newton's second law of motion, which states that the change of motion is proportional to the motive force impressed: and is made in the direction in which that force is impressed. In current notation this is written as, Force= Mass x Acceleration.[6] One way of looking at this statement is thus: where there is acceleration, there is force. It is useful to compare this with the smoke-fire example, a rather over- used example. Note that the inferential statement 'where there is smoke there is fire' does not permit the reverse inference 'where there is fire there is smoke' which is false. Similarly , the inferential derivation of the Newtonian law 'where there is acceleration there is force' also does not permit it reversal 'where there is force there is acceleration' which is again false, since we can have many forces that cancel out each other and therefore there will be no net acceleration. This point to be noted is that both traditions alike acknowledge that scientific generalization is cares of *Anvayavyatireki.* More interesting distinction lies in the way inductive inference are treated in Indian systems. The problem of fallibilism in inductive inference is a common theme discussed by both Indian and Western systems. Whereas Hume acknowledged defeat, the Indian logicians waged a long battle against Skepticism about induction, leading finally to complex formulation of pervasion. The concept of pervasion is one issue that received considerable attention at the hands of Indian logicians. It speaks about the peculiar relation between the major term (*sādhya*) and middle term (*hetu*). *Vyāpti* or the invariable concomitant relation is an inductive generalization based on our empirical observations. But a close look at the issue would reveal that the central concern for Indian logicians was to specify which relations carry the characteristic of pervasion. Dignagas, the famous Buddhist logician had worked extensively on this. He formulated the triple nature of the sign, the three conditions which a sign must fulfill in order to be a part of an vivid argument. They are,

- It should be present in the case under consideration –i.e, in the *pakṣa.*
- It should be present in similar cases or homologues, for example, in a kitchen

- It should be absent in any dissimilar cases or hetrologues, for example, in a pool [7]

The first condition is just a reassertion of what is to be proved. The second and third conditions have scientific insights concealed in them. The second condition is incorporated to have a degree of certainty about this signification by citing similar cases. It is a kind of verification of what is to be ascertained, citing for example, the case of kitchen. The third condition is in fact a negative one. Demanding that the sign, in order to be a valid one should not be present in location where the signified is not be present. Indian logicians felt that the presence of many verified cases is not enough to establish the truth of an empirical generalization. Verification/ confirmation of a hypothesis are not sufficient to establish it. The dissimilar cases are those which do not positively verify/confirm the relation, but function as negative examples, affirming the relation between the sign and the signified.

Now let us move to take you to the Semiotics in Indian reasoning and show how Indian logicians, through semiotics, developed a distinct scientific methodology. It is obvious that Indian logicians wanted to eliminate the arbitrary relation of sign and signified. They were keen on restricting the use of valid signs, though formalism in language and logic was not unfamiliar to them. On the other hand Western logic lavishly uses symbolic notations both in ancient and modern logic. For instance, the Aristotelian universal affirmation "All Greeks are Mortals" can be represented by "All A is B". Note that this move of letting A and B stand for something else is actually a Semiotic one. Indian philosophers would feel that symbolizing thus, is arbitrary and therefore there can be no necessary pervasion relation between symbols A and the set of Greeks. Nevertheless, Indian Philosophy along with Modern Science agrees that to move from an empirical observation to a hypothesis, or in other words, to construct a theory about some observation we require signs. The first step towards constructing a hypothesis is to put it in languages. The use of language marks a distinct qualitative shift from the universe of observation to that of expression. The most important and fundamental characteristics of a sign is that it always stands for something else. Further, a sign of an object only represents it and hence signs do not capture the reality of the

world, but they can be faithful to the lawful relations that are present in the world.

It appears that Indian philosophers were largely focusing on signs which have a logical and necessary connection with the signified. The basic point is that while there could be a sign which can, in principle, stand for anything, the Indian logicians were concerned about finding the subset of these signs which have a special, natural relation with the signified.

The contribution of Indian logicians on semiotics indirectly made them subscribe largely to philosophy of science. Some explanations needed here: there is indeed a special relation between signs and science, the former opening up a new world of entities and processes which are unobservable by normal perception. For science, there are at least two modes of perception, the direct and the indirect, in the indirect perception, instruments extend the range of perception in order for us to be able to perceive things, which we cannot do with our unaided sense. In the world of instrumental perception, we are always interpreting what we perceive because all that we have are signs that are referring to something else. Knowing well that only signs are accessible to us, it is not surprising that science is fundamentally concerned with knowing that for which these signs really stand for. Now, signs that science use are largely natural signs. They are signs that are in necessary relation with the signified. Conversely, this goes to suggest that the use of natural signs by Indian philosopher is indicative of the exercise of scientific methodology in logic. In both traditions, the experimental methodology necessitated the use of natural signs.

One will also be enchanted by the fact that the five member syllogism suggested by Naiyayikas exhibit visible similarities with scientific explanation. We shall make a quite comparison of the five member syllogism with DN model of explanation proposed by Carl Hempel.

- This mountain is fiery
- Because it has smoke
- When there is smoke, there is fire, like in kitchen

- This mountain has smoke which is in concomitant relation with fire
- Therefore this mountain has fire.

Now consider the DN model. This model describes explanation as a deductive argument from some premises, one/more of which is a general law. The conditions of DN model are:

- The explanation must be a valid deductive argument
- The explanation must contain at least one general law.
- The explanation must be empirically testable.
- The sentences in the explanation must be true.[8]

We can see the similarity between the Nyaya five step processes and the DN model here. This similarity with DN model should make us realize that Nyaya *Parārtha prāmanya* in fact, is a deductive explanatory process. Both DN model and Ny*ā*ya are examples of scientific structure which add strength to the scientific explanation.[9]

To sum up, one can say that while in the West logic came first and then scientific explanation, in the Indian tradition scientific explanation came first and logic was part of the larger structure of explanation. This takes us to our earlier claim that Indian logic can be characterized as one which demands that logic be scientific. Where Indian logic differs from the Western tradition is that here logic is not completely about 'laws of thought', but a fine combination of the 'laws of world' and 'laws of thought'[10]. Also since in Western logic there is no existential commitment to logical terms, inference is disconnected in principle from explanation. But such formalism is alien to Indian logic for multiple reasons, to cite just reason; they make no reference to empty terms. Hence their logic is always empirical and this brings inference and explanation naturally together.

We have tried to argue that Indian Philosophy seem to be concerned with issues that are fundamental to scientific methodology. This should not be taken to mean that Indian Philosophy had anticipated modern science. All that we wish to assert at this stage is that at most it may have anticipated some issues in scientific methodology, and philosophy of

science. On the contrary if someone is interested in enlarging the disparities between Indian reasoning and modern science here is a way. One may just remember what Wright has said about scientific theorizing; he argues the greater distance between data and theory is the best way of theorizing, as is manifested in many scientific theories. If moving away from basic observations leads to better theories, Indian reasoning falls short of the mark, for there are close comparison with facts of every stage.

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