

Indian Logic and Philosophy of Science: The Logic-Epistemology Link

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18.1 The Logical and the Empirical in Indian Logic

There are many interesting themes in Indian logic which illustrate not just philosophical complexity and rigour but also their potential use in philosophy of science. 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.” An important task for Indian logicians was to critically understand which inferences are valid and what conditions they should obey in order to have certainty in inference. Thus, Indian logicians were deeply concerned about establishing a theory to know which inferential statements one could be certain about and the methodology to decide on their validity. The early *Nyāya* logic is exemplified by the five-step argument and there has been much discussion on whether it is equivalent to a syllogistic form.

Perhaps the most common representative example of inference in Indian logic is that of inferring the presence of fire from seeing smoke. The analysis of this example illustrates a deep and complex engagement with the idea of inference and various related philosophical themes. Some of the questions concerning this example are the following. How do we infer that there is fire given that we only see the smoke? How can we establish the validity of this conclusion? What are the criteria for knowing that our inference is right, that we are justified in making it? What kind of inferences can give us certainty? There are two kinds of inferences described by the *Naiyāyikās* and the Buddhist logicians. One is the inference one makes for oneself. This occurs when one sees smoke on a hill and then infers to oneself that there is fire on the hill. There is no further communication or convincing somebody else about this inference. The other type of inference is called inference-for-another, which is a

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demonstration of the inferential process and conclusion for another person. Through this rational demonstration, one can convince another about the inference that one has made and explication of the reasons one holds for making a particular inference. *Nyāya* has a five-step process to accomplish this. The five parts are (1) the statement of the thesis of inference, (2) stating the reason or evidence for this thesis, (3) citing an example of a generalisation supporting the reason and this example is such that it is well accepted by others, (4) application of the present observation to the generalisation and (5) conclusion or assertion that the statement of the thesis has been proven. The well-known illustration of these five steps is as follows.¹

1. Proposition: There is fire on the hill.
2. Reason: For there is smoke
3. Example: (Wherever there is smoke, there is fire), as in the kitchen
4. Application: This is such a case (smoke on the hill)
5. Conclusion: Therefore it is so, i.e., there is fire on the hill.

The structure of argument sets out the rational, logical way of convincing others that the inference one makes is perfectly valid. The reasoning is that we make an inference of fire when we see smoke because we know, from previous experiences, that wherever smoke is present so is fire. The second step states the reason, which is smoke, for making the inference. The reason in conjunction with a more general principle or natural law that we know allows us to make the inference. But given *Nyāya*'s commitment to empiricism, any inference we make has to be grounded in some observations, as given by examples. These examples should be commonly accepted and can be both positive and negative examples. Positive examples are those that support the inference, such as a kitchen because in the kitchen we know that smoke and fire are seen to occur together. Negative example, such as a lake, supports the inference by looking at cases where there is no smoke in places where there is no fire. The fourth step applies this general principle to the case at hand and finally, the fifth step, states the conclusion.

This five-step process is the Indian logician's equivalent of Aristotelian syllogisms. Thus, it is the most common example seen in a discussion of Indian logic. In the way it is presented, it seems clear that this process is not what was understood as logic in the West, largely because of the use of examples, inference which is of a singular case and so on.

The *Nyāya* formulation of inference was modified and replaced by an influential formalism by *Dignāga*, the great Buddhist logician. *Dignāga* reformulated the question of logic into a question of semiotics. Inference by its very nature is related to signs. Therefore, smoke, first and foremost, has to be considered as a sign which is in some sense related to what we infer. *Dignāga*'s logic is primarily an attempt to

¹ Matilal 1999, p. 4. See also Vidyabushan 1920, p. 61.

clarify what kinds of valid signs are possible and how we can make justified inferences from these signs. In this sense, *Dignāga* was concerned with justification of an inductive statement such as, "Wherever there is smoke, there is fire". The aim is to know how an inductive cognition can be absolutely certain.

There is yet another peculiarity in his formulation, and this has to do with the synonymic usage of sign, reason and evidence. These are terms that are often used interchangeably in Indian logic. *Dignāga*'s theory of inference sets out a structure of inference based on the nature of the sign, thereby defining when a sign can properly stand for another. He formulated the "triple nature of the sign", three conditions which a sign must fulfil in order that it leads to valid inference.

1. It should be present in the case (object) under consideration.
2. It should be present in a *similar* case or a homologue.
3. It should not be present in any *dissimilar* case, any heterologue.²

These conditions can be used to check whether any sign is a logical sign of another. These conditions are also conditions to check whether a reason is a valid reason or not. For example, in the thesis, "Sound is impermanent, because it is audible", the reason is audibility and the inference is the impermanence of sound. If we want to know if this reason is a valid reason for the conclusion, then we have to check if the reason satisfies the three conditions.

Dharmakīrti suggests three broad divisions into which inferences can be grouped: inference based on (1) own-nature, (2) causal relation and (3) non-perception. All three are not only interesting in their own right but are also kinds that can be discerned in scientific inference. The relation to science is further illustrated when we understand that the two kinds of inference based on own-nature and causality are based on the notion of natural relations and the presence of "natural" properties. The first kind, namely, inference based on *own-nature* is illustrated with the common example, "This is a tree because it is an oak tree". Considering that *Dharmakīrti* also used the term identity to describe this relation, it seems clear that this kind of inference is based on identifying the oak tree *necessarily* with a tree. This example also suggests, as others have pointed out earlier, that the inference is "based upon the relation of class inclusion" and can be seen as an analytical statement.³ What is interesting here is the relation of analyticity with inference. The idea that there is inference in analytic statements is an interesting one, especially given the fundamental idea that inductive inference increases knowledge content. The second kind which deals with causal relations describes examples such as the smoke-fire inference.

The third kind of inference is a unique one based upon non-perception. A commonly cited example of this type is "There is no pot here because no pot is perceived here." The basic idea here is that we also make inferences based on non-perception

² Matilal 1999, p. 6.

³ See Prasad 2002.

