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On the Distinctions between Nyāya and Syllogism

Md. Shahidul Islam*

Abstract: T*here are important distinctions between the nyāya of* Navya-nyāya *and* the *Aristotelian syllogism. The sentences of nyāya express cognitions, whereas those of syllogism express propositions. I have shown that sometimes confusion between cognition and proposition arises because of the differences in the ontological presuppositions of Aristotelian and Navya-nyāya logic. I have found* vyāpti *as another important distinguishing feature of nyāya; and, against Matilal, I have claimed that* vyāpti, *when it is identical with non-deviation, is not stricter than Aristotelian A-relation. Lastly, unlike syllogistic fallacies, hetvābhāsa are showed not to be formal fallacies. Also, I have argued that nyāyas, unlike syllogisms, cannot be classified as valid or invalid.*

India has a very rich tradition in logic continuing for two thousand years. Three main schools of this tradition are *Nyāya*, *Buddhist*, and *Jaina*. The Nyāya school started at about 150 AD with the work *Nyāya-sūtra* by Akṣapada Gautama. It reached a new stage of its development through the *Tattvā-cintāmaṇi* of Gangeśa. In fact, Gangeśa founded the Navya-nyāya school through this book. Like the Western logicians, Indians have reflected on inference. But they saw inference as a medium of knowledge, and their discussion on logic was closely connected with metaphysical and epistemological issues.

'Nyayā' is a technical term of the navya-nyāya school. It refers to the linguistic expression of a kind of inference that the school explored. In Aristotelian logic, the corresponding concept of 'ny āya' is syllogism. As we all know, an effective way to understand a concept is to compare it with a similar concept. So, by comparing nyāya with syllogism, it would be possible to grasp the nature of nyāya. Throughout the essay, I will use 'Aristotelian logic' to mean traditional logic and 'Aristotle's logic' to mean the logic got directly from Aristotle. Aristotelian logic is a slightly modified and developed form of Aristotle's logic.

Cognition and Proposition

* Md. Shahidul Islam, Assistant Professor, Department of Philosophy, Jahangirnagar University

In traditional or Aristotelian logic, propositions are the objects of inference. They are abstract, and are primary bearers of truth-value. In Navya-nyāya logic, by contrast, objects of inference are difficult to identify. Mulatti (1972, 31) argues to establish that propositions are the objects of inference in both Aristotelian and Navya-nyāya logic. The objects of inference of the Navya- naiyāyikas are bearers of truth-value. Therefore, to Mulatti, they are like propositions. But we cannot use, he said, expressions like 'proposition of', whereas 'cognition of' is possible. So, the correct translation of sanskrit *jñāna* is *cognition*. Quine has taught us the problem of individuation of propositions. Moreover, if we assume the existence of proposition we have to accept the concept of synonymy. Two sentences would be synonymous when they express the same proposition. But Quine's analysis shows that it is not possible to give an objective meaning of 'synonymy' (Quine, (1970, 3)).

If we abandon the problematic concept of proposition, what would be the alternative? A very good alternative is to consider cognition as the Navya-nyāya object of inference. A cognition is not a totally abstract thing. It is a mental state. But if we consider our object of inference as some mental state, we will fall into the trap of psychologism. To avoid it, Frege claimed the existence of abstract propositions. But Navya-nyāya logicians were able to avoid the trap of psychologism in a brilliant way. Matilal clarified this point well. He showed that a cognition refers to the structure of a mental state and this structure is verbalizable. That is why, in spite of being a mental state, a cognition is not a subjective entity. I think Matilal's arguments, in this regard, are more convincing than those of Mulatti. Therefore, I will not equate cognitions with propositions. Confusion about the right meaning of cognition may cause problems. I will show this point by referring to Sibajiban Bhattacharyya. In his essay titled "Some aspects of the Navya-nyāya theory of inference" (Bhattacharyya, 2001) . Bhattacharyya talks as if there exists a thing called inference. He says this inference can be expressed in different languages. The following two arguments are the expressions of a single inference.

Expression of an inference in Aristotelian logic:

(Inf A-1) All men are mortal
Socrates is a man.
Therefore, Socrates is mortal.

Expression of the previous inference in Navya-nyāya logic:

(Inf NN-1) Whatever possesses humanity possesses mortality
Socrates possesses humanity
Therefore, Socrates possesses mortality.

The following quote from Sibajiban establishes that the sentences of the above arguments express an inference.

> "Each of the three sentences expressing an inference …." (Bhattacharyya, (2001, 166))

For Bhattacharyya, inference is something in the real world, not in language. Now, if Navya-nyāya and Aristotelian logic can express the same inference in two different ways, we cannot use such term as 'Navya-nyāya inference'. But Bhattacharyya did so (Bhattacharyya, (2001, 163)). One may argue what Bhattacharyya means by N*avya-nyāya inference* is Navya-naiyāyika expression of an inference. But that is not the case. The proof is the following phrase used by him: *expressing Navya-nyāya inferences in English*(Bhattacharyya, (2001, 166)). As Navya-nyāya inference is expressible, it cannot be an expression by itself. Thus we see that the use of 'inference' is confusing in the above-mentioned article of Bhattacharyya. Now, I will try to show the source of this confusion.

Difference in ontology

Both the Aristotelian and Navya-nyāya logicians agree that there is a psychological process involved in the act of inferring. But they differ as to the object of that act. For Aristotelian logicians it is a proposition, but for the Navya-naiyāyikas it is a cognition. I think both the parties differ in their opinion in this regard due to their different ontological presuppositions.

In his ontology, Aristotle talks of substances. His world is composed of substances. There are primary substances to which properties can be ascribed. Each primary substance is a particular discrete thing, e.g. a man, a mango, a tree, a bird and so on. But secondary substances are classes which include primary substances as their members. Men, birds, mammals are examples of secondary substances. Aristotelian logic is mainly concerned with secondary substances, i.e., with classes. Each primary substance is also regarded as a class with a single member. Even a property is a class of those (and only those) objects which possess that property. We can show the classes of Inf A-1 in this way:

> All men are included in the class of things that have the property of mortality.
> Those things that are Socrates are included in men.
> Therefore, those things that are Socrates are included in the class of things that have the property of mortality.

But Navya-naiyāyikas do not deal with classes. They presuppose an ontology of *dharmas* and *dharmins*. Dharmins are locations, and dharmas are locatees. Locations possess locatees. Locatees can be properties, or even

things. A locatee in an inference can play the role of a location in another inference. In Inf NN-1, *humanity* and *mortality* refers to two locatees, and Socrates refers to a location.

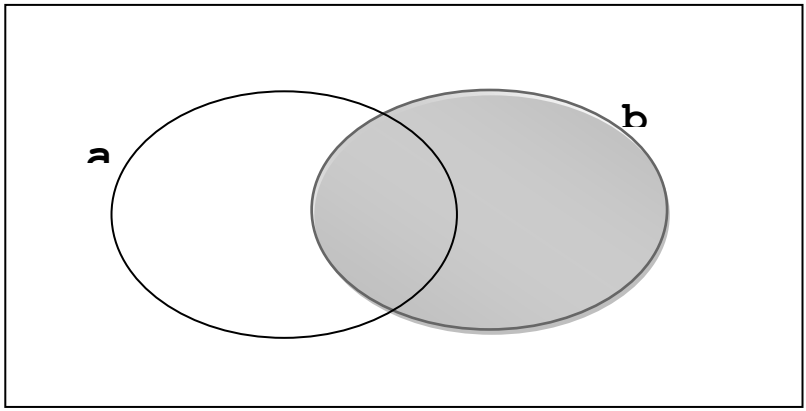
Thus, Aristotelian logic deals with one kind of things, class; but Navya-nyāya deals with both *dharmas* and *dharmins*. Dharmas are near to Aristotle's properties, and dharmins are close to primary substances. Neither a dharma nor a dharmin is a class. The difference in ontology may have caused the different conceptions of the object of inference in Aristotelian and navya-nyāya logic.

Vyāpti and A-relation

Now, we will turn to vyāpti, the basis of Navya-nyāya inference. The navya-nyāya inference can be expressed in five sentences of which the third one (udāharan□a) expressing the relation between the *hetu* and *sādhya* is vyāpti. An example of a five-membered nyāya is:

> Pratijñā: The hill has fire.
> Hetu: For it has smoke.
> Udāharan□a: (Wherever there is smoke, there is fire), as in the kitchen.
> Upanaya: This is such a case (smoke on the hill).
> Nigamana: Therefore it is so, i.e., the hill has fire.

So, the question arises: Is there vyāpti in Aristotelian logic? Matilal would answer there is a corresponding concept of vyāpti, namely, A-relation. In the theory of syllogism, categorical sentences are classified into four groups: A, E, I, and O. An A-type sentence claims that a class α is fully included in another class β. In venn diagram:



According to Strawson (Matilal (1998, 152)), the best interpretation of the relation between the subject and predicate of an A-sentence is as follows:

$$\alpha\bar{\beta} = 0 \;.\; \alpha \neq 0 \;.\; \bar{\beta} \neq 0$$

While comparing vyāpti (pervasion) with A-relation, Matilal says:

> "…both non-deviation and pervasion are much stricter relations compared to the A- relation." (Matilal, (1998, 153))

Let us examine this view. To do that, we have to define vyāpti or pervasion. Non-deviation is a concept very close to vyāpti. To define non-deviation we have to define deviation first. If *h*D*s* means the relation of deviation between hetu and sadhya, then, according to Matilal:

$$h\mathrm{D}s \text{ iff } h+ \;.\; s- \neq 0$$

Here *h*+ means the presence-range (sapaks□a) of hetu, i.e., those locations where hetu is present. And s- refers to the absence-range (bipaks□a) of sadhya, i.e., those locations where hetu is present but sādhya is absent. The opposite concept of deviation is non-deviation (*h*N*s*). Matilal expresses its definition in this way:

$$h\mathrm{N}s \text{ iff } h+ \;.\; s- = 0$$

As an example of deviation relation, let us look at the following Navya-nyāya inference expressed in a shortened form:

"The hill has smoke, because it has fire."

In the above inference, smoke is sādhya, and fire hetu. Smoke has the relation of deviation with fire, since there are places where fire is present, but smoke is absent, e.g. hot iron.

Non-deviation and vyāpti are very close concepts. So long as the absence range of sādhya is not empty, vyāpti is synonymous with non-deviation. The absence-range of sādhya cannot be empty, since the concept of the absence-range of sādhya has been used in the definition of non-deviation. *Nameability*, and *knowability* are examples of sādhya with empty absence-range.

If we accept the definition of non-deviation as the definition of vyāpti, then it will not cover the following inference:

"It is nameable, because it is knowable."

That is, the vyāpti relation between 'nameability' and 'knowability' is not covered by the definition of non-deviation. The following modification will do better:

$$s\mathrm{V}h \text{ iff } s+ \;.\; h+ \neq 0 \;.\; \text{if } (t- \;.\; h+ \neq 0), \text{ then } t \neq s$$

Thus, there will be a vyāpti relation between sādhya and hetu if and only if there is at least one location where both hetu and sādhya are present, and if there is no common element between the absence-range of *t* and the presence-range of *h*, then *t* is not identical with the sādhya.

The previous definition of vyāpti is more powerful than that of non-deviation. But partially locatable properties (e.g. physical contact) create new problem. A man sitting on a chair is partially located on it, because some parts of his body are touching the chair and while others are not. Thus, there are terms with intersecting presence-range and absence-range. That is why; a more sophisticated definition of vyāpti is needed:

*s*V*h*iff *s*+ . *h*+ ≠ 0 andif (t+.t-=0 andh+.t- ≠ 0), thent ≠ s. (Matilal, (1998, 151-152))

We can consider the definition of non-deviation as the primary definition of vyāpti, and the last two definitions are made by adding new conditions. Thus, the primary definition is less strict than the other two. Matilal claimed that this primary definition of vyāpti is stricter than A-relation of Aristotle. But I will try to show this is not the case.

Matilal shows the conditions of non-deviation in the following way:

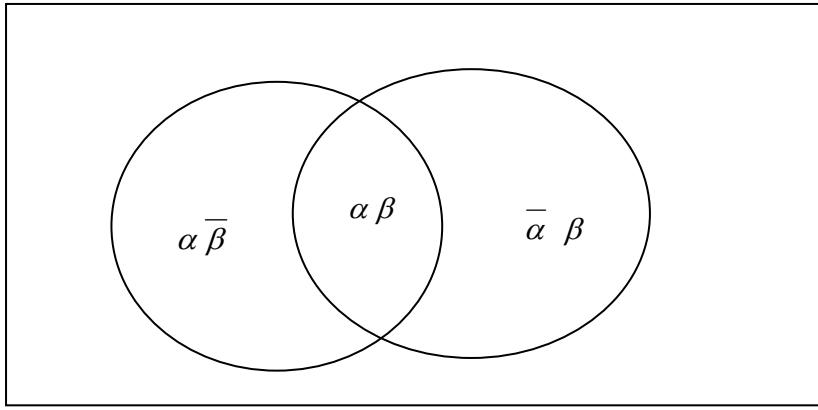
*h*N*s* (*h*+. *s*- = 0). *h*+ ≠ 0 . *s*- ≠ 0 . s+ ≠ 0

The following table shows the corresponding signs related to non-deviation and A-relation:

Table: 1

Non-deviation	A-relation
h+	α
s+	β
h+. *s*+	αβ
h+. *s*-	$\alpha\bar{\beta}$
h-	$\bar{\alpha}$
s-	$\bar{\beta}$

To make the conditions of A-relation clearer we will use a venn diagram representing different classes related to A-sentence:



As mentioned above, an A-sentence presupposes the following three conditions while claiming that all αs are included in β:

$$\alpha\overline{\beta} = 0$$
$$\alpha \neq 0$$
$$\overline{\beta} \neq 0$$

But if $\alpha \neq 0$, then $\beta \neq 0$ since all αs are included in β. That is, the conditions above imply a fourth condition:

$$\beta \neq 0$$

From table-1, it is clear that $\beta \neq 0$ corresponds to the last condition of *h*Ns. But Matilal considered A-relation stricter as he believed in the absence of this fourth condition. We can conclude that non-deviation is not stricter than A-relation, although each of the other two definitions of vyāpti is stricter.

Hetvābhāsa and Fallacies

We will now focus on another difference between nyāya and syllogism. And this is about fallacies involved in them. Aristotelian theory of syllogism recognizes six fallacies:

(1) Fallacy of four terms
(2) Fallacy of undistributed middle
(3) Fallacy of illicit major or minor
(4) Fallacy of exclusive premises
(5) Fallacy of drawing an affirmative conclusion from a negative premise. (Copi & Cohen, (2005, 241))

All of these are formal fallacies, i.e., they depend on the formal structure of syllogisms. If we change the contents of a valid syllogism keeping its form unchanged, the new syllogism will still be valid. For example:

(Inf A-1) All men are mortal
Socrates is a man
Therefore, Socrates is mortal

Inf A-1 is a valid syllogism with mood AAA and figure 1. Now, if we change the terms keeping the mood and figure unchanged we will get a new syllogism:

(Inf A-1) All Bangladeshis are immortal
Plato is a Bangladeshi
Therefore, Plato is immortal.

All of the sentences of this syllogism are false, but the syllogism itself is valid. We have changed the terms and truth-values of the sentences, but the new argument is still valid. From this it is evident that the validity of Aristotelian syllogisms depends only on their logical forms.

On the other hand, Navya- naiyāyika term for fallacy is *hetvābhāsa*. *Hetvābhāsa* stemmed from the words *hetu* and *abhāsa*. *Hetu* is one of the three terms of nyāya, and *abhāsa* means *suggestion* or *hint*. A hetvābhāsa occurs when a term of an inference is such that it seems like a hetu (suggest a hetu), although it is not a genuine hetu. In Navya-nyāya logic, the resultant cognition of the process of anumāna is called *anumiti*. When a true cognition hampers the occurring of an anumiti, a hetvabhāsa takes place. Bina Gupta (1980, 145) showed that these obstacles of anumiti are epistemological conditions. Hetvābhāsas have nothing to do with logical form, rather they are connected to the real world. Suppose a person has a true cognition of a particular hill that has no smoke on. This cognition would work as an obstacle to the arising of the cognition expressed in the sentence: 'There is smoke on the hill'. Thus the inference 'the hill has smoke, because it has fire' is infected with a hetvābhāsa.

Navya-naiyaikas named five fallacies: *Savyabhicāra,Viruddha, Satpratipaks□a, Asiddha,* and *Bādhita*. Let us look at the stock example again:

"The hill has fire, because it has smoke."

This is an inference universally accepted as completely free from fallacies. By changing the terms and keeping the form unchanged we get:

"The fire has coldness, it has substaceness."

The above inference is not free from fallacies and the particular fallacy occurred here is bādhita. This fallacy occurs when the absence, not presence, of sādhya in paks□a is known by a medium (of knowledge) other than anumāna. The presence of heat, that is, the absence of coldness in fire can be known by perception. So the above inference is an example of bādhita.

From the discussion above, it is obvious that hetvābhāsas are not formal fallacies. Bina Gupta (1980) claimed that both of the above inferences are valid in form, and the unchanged form of them help us to characterize the Navya-nyāya fallacies as informal. She claimed Navya-naiyaikas have recognized the validity of these inferences. But this claim seems unacceptable. We have seen in the example of five-membered nyāya that the third member contains a particular instance. This shows the inductive character of nyāya; although it has deductive character as well (the conclusion follows with certainty). Hence we cannot classify a nyāya as valid or invalid.

In sum, there are important distinctions between nyāya and syllogism. The sentences of a nyāya express cognitions, whereas those of a syllogism express propositions. We have shown that sometimes confusion between cognition and proposition arises because of the differences in the ontological presuppositions of Aristotelian and Navya-nyāya logic. We have found vyāpti as another important distinguishing feature of nyāya, and, against Matilal, proved it, when it is identical with non-deviation, not to be stricter than Aristotelian A-relation. Lastly, unlike syllogistic fallacies, *hetvābhāsa* are showed not to be formal fallacies. Also, I have argued that a navya cannot be categorized as valid or invalid. But this is not true for a syllogism.

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