A Semiotic Interpretation of Indian Logic

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Matilal's constant endeavour to make ancient Indian philosophy a living tradition has significantly influenced many philosophers. One way to do what Matilal so effectively did is to take the traditions outside their strict historical and cultural boundaries, and engage them in a dialogue with other, new philosophical traditions. This paper attempts to do something similar with a generally ignored theme in Indian logic, the theme of semiotics. One of Matilal's essays on Indian logic has the word semiotics in its title but he does not seem to have explored this relation in detail.¹

This paper argues that Indian logic can be usefully interpreted through the concerns of semiotics, a tradition that has a long history in western thought. At one level, the connection is obvious. The centrality of the idea of "sign" as the most significant entity in Indian logic must alert us to the potential semiotic world of this logic. By tracing the concerns of Indian logic along the contours of semiotics we can understand this logic not necessarily in terms of formal logic or in contrast to Aristotelian logic but in entirely new terms. Both the early Nyāya as well as the Buddhist systems were essentially engaged with questions of signs and their interpretation, Western traditions too have engaged seriously with the relation between signs and logic. Moving from Aristotle to Augustine and then on to Bacon, Ockham, Leibniz and later on to Peirce, we notice a sustained engagement with the idea of sign and its relation to logic by these thinkers. These attempts to understand logic through semiotics share some striking similarities with ancient Indian logic, including the emphasis placed by both Indian and western traditions on epistemology and cognition as part of the logical enterprise.

When Indian logical systems were available to the scholars in the West, the earliest and most common responses to them were dismissive in nature.² There are two issues that were influential in such responses to Indian logic. The claim that Indian logic was not logic was based on the observation that the use of empirical examples as part of the deductive structure negated the

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¹In his [24], Matilal has a short essay on the semiotic conception in Indian logic, all of which is part of the material in his paper [26]. Unfortunately, he does not expand on the possible semiotic interpretation of Indian logic.

²For a brief summary of such responses, cf. [14, pp. 13-15].
universality associated with logic and that the logical process was described in terms of cognition and cognitive episodes. Keeping the empirical as an element of the logical seemingly went against the basic tenet of western logic and understanding the logical in terms of cognition suggested that the distinction between the psychological and the logical—a distinction around which some of the most influential debates on logic have occurred—had not been accomplished in Indian logic. Matilal and Mohanty have responded effectively to the charge of psychologising.\(^3\) I have elsewhere discussed a different interpretation of the use of the example as exemplifying a particular structure of scientific explanation, namely, the deductive-nomological model of scientific explanation [36, pp. 194–208].

There are typically two different ways of responding to the charge that Indian logic is not logic at all. One is to understand what the structure of Indian logic really is and the other is to approach the problem from the perspectives of western logic. There has been much written from the former perspective and Matilal has been instrumental in generating a nuanced understanding of Indian logical systems. The latter approach is more problematic. Where such an approach exists, it largely consists in trying to rewrite Indian logic in formal terms.\(^4\) Matilal has himself illustrated this possibility but such rewriting only generates more questions, particularly as to what such a rewriting accomplishes. If we grant that we can rewrite statements in Indian logic in formal terms with formal operations defined on them does it mean that Indian logic is formal? Or could it be that there is something in Indian logic that resists such formalisation?

What I shall do in this paper is to approach Indian logic from a specific western perspective. I shall not do this by attempting to show how Indian logical systems can be formalised and/or rewritten in symbolic form. There are two distinct strands in my approach in this paper. One, I shall illustrate how western logic, particularly in medieval times, shared a conceptual space with Indian logic, especially as far as the relations between logic and empiricism, as well as with cognition, are concerned. Two, I shall draw upon the semiotic understanding of logic in the West in order to exhibit the similarities with Indian logic.

Modern logic is fundamentally concerned with symbols and the actions performed on them. Although Indian logic was not traditionally presented in terms of symbolic writing, there is a fundamental relation between this

\(^3\) Cf. [26, pp. 14–18] and [28, pp. 100–132].

\(^4\) Cf. the papers [7, 5, 25] in [13]. I do not intend to negate the importance of formalization of Indian logic. However, prior to formalisation there is a philosophical problem related to the very nature of symbolic reduction. When seen through the semiotic enterprise, we can see that the problem confronting the Indian logician is precisely the conditions under which a symbol can come to stand for something else. The concluding paragraphs of this paper addresses this issue in more detail.

logic and the notion of a sign/symbol. In fact, as I shall argue later on, the concerns about the nature of the sign dictates the structure of this logic. The relation between logic and sign in the Indian tradition is quite clear. Inferring the presence of fire from seeing smoke is a common example not only in Indian philosophy but also in ancient Greek philosophy. An analysis of inference of fire from seeing smoke is based on the recognition that smoke is a sign that actually indicates the presence of something else. The Indian logicians extend this standing-for relation to include non-material signs. Thus, we have reason (for a particular inference) itself being understood as a sign. This relation between sign and logic matures in the Buddhist formulation as propounded by Dignāga (c. 400–480 AD).\(^5\) In this formulation, the idea of logical sign plays a central role.

Dignāga turns the question of logic into a question of semiotics. Inference by its very nature is related to signs. Thus, logic primarily becomes an attempt to clarify what kinds of valid signs are possible and how justified inferences are possible from consideration of these signs. There is yet another peculiarity in his formulation, and this has to do with the use of “sign”, “reason” and “evidence” as synonyms. Smoke is the sign which indicates the presence of fire. Smoke is the evidence for believing that there is fire and smoke is also the reason for coming to the conclusion that there is fire. Thus, as Matilal notes, sign, reason and evidence are terms that are often used interchangeably in Indian logic [26, p. 5]. 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 [18]. He formulated the “triple nature of the sign”, three conditions which a sign must fulfil in order that it leads to valid inference [26, p. 6].

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.

To summarize the meaning of the above conditions: a sign which is present in a locus signifies another property of the locus. To have a degree of certainty about this signification, we need to find similar cases where the sign and the signified occur and also dissimilar cases. The occurrence of the sign and signified together is seen as illustrating a relation between them, the relation of invariable concomitance or pervasion.

As mentioned earlier, the sign is not only a material sign like smoke. For the Indian logicians, “reason” is also a “sign”. For example, the fact that a pot is produced is reason enough to infer that it is non- eternal. Production is a sign which stands for something else, namely, non- eternality. How

\(^5\) Cf. [26] and [18] for a comprehensive discussion on these topics.
justified are we in believing that this sign ‘being produced’ indeed stands for “non-eternity”? This question is at the heart of Indian logic: how can we be certain that a particular sign indeed stands (and will continue to do so) for a particular signified? Answering this question is the task of logic as far as these logicians were concerned.

This method of formulating logic is essentially concerned with understanding the nature of signs and the relation between a sign and its signified, thus placing Indian logic firmly within the tradition of semiotics. Moreover, viewing logic through the perspective of semiotics negates many of the pseudo-problems afflicting the study of Indian logic: the question as to whether Indian logic is inductive or deductive, the problematic role of the example in Indian “syllogisms”, the claim that Indian logic mixes logic and epistemology, and so on.

Understanding logic through semiotics is not uncommon. In fact, it can be argued that without engaging with semiotics it is impossible to understand the special characteristics of logic, particularly modern logic. Invoking semiotics also allows us to explore the relation between mathematics and logic by analyzing the way symbols are used in both these disciplines [38]. Most importantly, western logic itself has had a long and sustained relation between logic and semiotics, a relation often overlooked in contemporary readings of logic. Thus, to understand the relation between Indian and western logic, it is useful to first begin with the common ground that both of them share — the semiotic impulse.

Sign and logic in western thought

It might not be an exaggeration to claim that the formulation of the idea of signs is common to human thought in all civilizations. The suggestion that humans are fundamentally semiotic animals is perhaps not misplaced. The basic idea of a sign lies in the possibility of something standing for another. Something is signified by a sign and there is also a relation of signification. Words constitute a simple example. A sign can be understood in many ways. For example, Eco points to the following ways: in opposition to *figurae* and *seme*, as difference, as identity, as inferential, as encoding and so on. The inferential model of signs has immediate correlation with logic but the other ways of understanding sign also figure in the way signs are used in logic.

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6 For a discussion on related topics, cf. [8].

7 Cf. [11, Chapter 1]. (In the common usages of sign, including in Matilal’s use of it in reference to Indian logic, the sign is on a par with the signifier. In this paper, in order to maintain continuity with the common usage of “sign”, I use the word sign not only as a relation but also as a signifier.)
gument that logic and ontology cannot be mutually separated is supported by examples not only from the Greek tradition but also the Indian schools, particularly the Nyāya and the Buddhist schools.\footnote{Cf. also [4].}

The relation between logic and ontology, hidden for the most part, is also indicative of the essential connection between logic and semiotics. In the western tradition, it is most clearly seen in the history of the development of logic, particularly as far as the analysis of signs is concerned.

The views of Augustine (354–430 AD) on signs and logic were most influential till medieval times. For Augustine, a sign was “something that shows itself to the senses and something other than itself to the mind [27]”.\footnote{Cf. also [19, 21] for more on Augustine’s theory of signs.} The relationship present in this description is triadic, relating “sign of something to some mind”. Note the explicit invocation of the mind in describing the action of signs, a presence that will manifest itself in different ways over the centuries. Augustine also classified signs into two: natural and given signs.\footnote{Cf. [2], and for references within for Augustine’s theory of signs.}

As an example of the natural sign, he uses the example of smoke and fire. An important contribution of Augustine was in making a distinction between natural signs (those which have in some sense a natural relation between the sign and signified) and conventional signs and yet placing them within a general category of signs. One can see a similar preoccupation among the Indian logicians. For Augustine, signs have a “fundamental epistemic function”. This view of signs has important consequences for our understanding of signs and their relation to logic. Augustine’s view of sign was central to his theory of language that goes back to the earlier Greeks.

It is also interesting to note that a constant ambiguity stalks the notion of sign: there is one understanding of sign as an argument — an enthymematic proposition — and another view of sign as “semiotic object”, a noun or a category that “subsumes nouns and other signs [9]”. It is the role of sign as an argument that was under attack and by the Renaissance one can notice the bringing together of these two descriptions.

One of the most important contributions in the western semiotic tradition is by Roger Bacon (1214–1293 AD).\footnote{E.g., cf. [20].} I mention his work also because of a curious similarity with the Indian logic tradition. Bacon classified signs in different ways such as those signifying through inference, concomitance and consequence. He also classified those signs which do so necessarily as follows: signifying something present, signifying something past and signifying something future. Here are some examples from his classification: from seeing large extremities we infer strength and this is the case of “signifying something present”; from lactation we can infer birth of a child and this is the case of “signifying something past and so on [27]”.

Matilal’s detailed description of the Nyāya classification of signs allows us to note a similarity with Bacon’s three-fold classification. The early Nyāya also had a three-fold classification of signs.\footnote{For more on Indian logic, cf. [23, 42, 16, 30].} The first kind classifies inferences in which the effect is inferred from perceiving the cause [23, p. 30]. The idea of cause in this case is captured in the phrase “as before”. This kind of inference classifies inferences based on a prior nature. An example of this kind is the inference that it will rain because there is a cloud. One infers so because this is known from earlier instances. Here, the inference is of the effect from perception of a presumed cause.

The second kind of inference is based on “rest will be alike”. Matilal notes four different subtypes of inference under this category as classified by the Nyāya school. One example is the inference that all drops of seawater are salty from tasting just one drop of it. The second subtype is the inference of cause from effect and one example is the inference that it has rained because the river is full and flowing swiftly. The third subtype is “remainder”, namely, inference by “elimination of alternatives”. This explains inference which we reach by eliminating other possible alternatives rather than infer “directly”. And finally, the fourth subtype, gives the example of inferring the whole from the part; the example being the inference of a whole cow from seeing only its parts.

The third kind of inference deals with examples such as inference that there is water nearby because wild geese are present; inferring the taste of fruit from seeing its colour; inferring specific taste from specific smell. In all these examples, there is no cause-effect relationship.

Although we notice some similarity between the classifications of Bacon and the Indian schools (including Caraka), we should note that there is a fundamental difference in the reasons that catalysed such a classification. As for Augustine, the primary motivation for Bacon in analyzing signs was to provide “foundations for the semantics of spoken language [27]”. Such does not seem to be the primary motivation for the Indian logicians when they classify and analyse inference through the study of signs.

There are many reasons for this difference in orientation. Primary among them is the fact that complex theories of language were part of all the Indian philosophical schools. In the Indian philosophical traditions, philosophy of language was highly developed right from the beginning.\footnote{E.g., cf. [40, 15].} Thus, Indian logic arose in a culture which already possessed complex philosophies of language. The question of arbitrariness of symbols is one such important issue. The relation between word and object can be natural or arbitrary. In the
Indian systems, both these views are held. Grammarians and Mimāmsakas, for example, held that the word-object relation is fixed. Naiyāyikas and the Buddhists, who are the dominant contributors to logic, argued that the word-object relation is arbitrary.

There were many theories of meaning which were available to the Indian philosophers. In particular, the schools were well aware of the conventionalist theory of meaning. These philosophers were also well aware of the possibility of the arbitrary nature of signs, particularly because of the *apoha* doctrine of language held by the Buddhists, a view that understood meaning as based on difference [26]. Furthermore, this view of language was essential to logic since Dignāga’s formulation draws upon the *apoha* theory [40]. It was also very clear for Indian philosophers such as those belonging to the Nyāya tradition that words function as signs standing for something else. Although Mimāmsakas subscribed to a naturalistic description of words and meaning, the philosophers associated with the logical school, namely, Naiyāyikas and Buddhists, didn’t do so. In fact, I think it is reasonable to argue that the stringent conditions on a valid sign may actually be a reflection of the problems of arbitrary connection between words and what they stand for. Since philosophy of language was one of the pillars of ancient Indian thought, the influence of these theories of language on logic might have succeeded in making the conditions on signs more rigorous than it perhaps otherwise would have been!

**Logic and cognition**

It has been claimed that Indian logic should not be granted the status of logic since it is not propositional in character but episodic in nature. The episodic nature arises from the description of inference through cognitive episodes. Basing logic on cognitive episodes seems at first view to negate the universality and the formal nature of logic, and to explicitly psychologize it. However, the problem is much more complex than it might first seem. One of the best ways of addressing this complexity is actually to analyse western logic’s long engagement with cognition. Given that there was such a tradition in the West, a dismissal of the “logical” status of Indian logic because of its episodic nature might be a bit hasty.

In the western tradition, an enduring relation between cognition and logic can be found. Even in the earlier approaches to the study of signs we can notice the explicit role of the mind. A sign, as we saw earlier with respect to Augustine, is triadic — a sign of something to some mind. The problem of what words refer to also engages with the mental domain — e.g., the view that words stand for mental aspects and not the object. But this explicit reckoning of the mental with respect to signs (and therefore logic) becomes prominent with Ockham and his view of the “mentalization of sign”. As Meier-Oeser notes in [27], with Ockham “sign occupies center state in logic.” Following Ockham, logic was understood to be exclusively concerned with signs. These were primarily mental signs. The idea of mentalization of sign meant that signification is possible only with some kind of intentionality. We should note that such a position was dominantly held following Ockham till the early 16th century. One of the important consequences of this position was that it differentiated between signs so as to identify what was special to logical signs or signs in logic. Not all signs are logical signs. Signs in logic had to stand in a relation of “aptness” — so, a sign has to “be apt to stand for the thing it makes come into cognition” [27].

The similarity in this western view and that in Indian logic must be noted. Because the Indians had complex theories of language which included an understanding of the arbitrary nature of the relation between words and objects, they were aware of the fact that logical signs had to be special in some sense. Thus, they first had to look for ways to choose those signs from a large set of signs and this restricted set was the set of logical signs. One of the defining criterion for this choice was that the signs stand in some apt relation — e.g., the relations of identity and causality. The explicit invocation of the activity of sign in its capacity to make the thing “come into cognition” mirrors the general view of the Indian philosophical schools.

There is an important corollary to understanding logical signs in this manner. Almost all the schools of logic following Ockham recognized the primary role of epistemology in logic. Such an attitude towards logic is well captured by the view that a sign was defined by its “capability to act in an epistemologically efficient way on a cognitive power” [27]. Note the emphasis on both epistemology and cognition as being intrinsic to logic.

It was only later, around the 16th century, that the written sign was freed from its subordination to the vocal sign (cf. [27]). This allowed a direct relation between the mental and the written without being mediated by the spoken. An important consequence of this was that the written sign was generalized without having to be grounded in the spoken, thus leading to the possibility of meaninglessness and arbitrariness of symbols. Such a view proved to be of great influence in the development of both mathematics and logic.

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16For a quaint discussion on psychology and logic, cf. [32]. Dewey [10] summarises different types of logic — one of which is “empirical logic” and another is “psychological logic”! In [3], Bhattacharya offers a sustained discussion of the relation between logic and psychology, including a rebuttal of many common arguments against psychology in relation to logic. The relation between psychology and logic has also become subject matter for cognitive science. Van Lambalgen [41] begins with an analysis of the relation between logic and the psychology of reasoning, and argues that logical reasoning is an explication in contrast to evolutionary explanations.
There is an important difference between symbols and words that needs to be mentioned here. Symbols are not based on the model of language, although they share the nature of arbitrariness with words. Rather, they are concerned with exhibiting two features: one, the distinction between the sign and what it stands for, and two, the possibility of what Leibniz calls *characteristica universalis* which will in some sense remove the arbitrariness in symbolic relations [12, p. 5]. The arbitrary nature of the sign is only in its creation whereas for the Indian logicians the logical sign must have some necessary connection with the signified. In the case of Dharmakirti, for example, the necessary relations are through identity and causal relation.\(^7\) Thus, there is a reason for our recognition of something as a valid sign. The question of validity of signs itself is quite special to Indian logicians, one which immediately negates arbitrary signs. The basic point is that while there can 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. Since their logic was responsive to the concerns of language, arbitrary signs, for example, linguistic symbols, were already accepted into the system of signifiers. The synonymous use of sign, reason and evidence also points to the problem of viewing signs as being completely arbitrary.

Arbitrary symbols in certain Indian traditions are exemplified by words. But the idea of a symbol as discussed by Leibniz and others is somewhat different from the arbitrary nature of words. However, the idea of arbitrary symbol has an expanded interpretation, one which can be analysed by distinguishing between arbitrary symbols which can be both like words and not-words, implying thereby that there is a notion of symbol which differentiates between word-symbol and non-word-symbol. Arbitrary symbols can be classified in two ways with respect to meaning. Words, although arbitrary, are filled with meaning. Symbols, as used in logic and mathematics, do not have an associated semantic world like the words.\(^8\) So the relevant question that we need to consider is whether we can have symbols which are arbitrary but do not carry a space of meaning with them. It is important to note that the *meaninglessness* of symbols is important to make a transition into the logical and mathematical symbolic domain, and that this mode of arbitrary symbolisation is different from the arbitrary nature of linguistic words as signs.

\(^7\) Dharmakirti was a Buddhist logician after Dignāga (mentioned in the earlier part of this paper). Dharmakirti formulated three types of inferences — those based on identity, causality and non-perception. For more on this, cf. [26, 36, 31].

\(^8\) This is so even for those like Boole who thought that symbols once created have fixed meaning. The problem is that meaning in these symbols is not similar to meaning in words. In fact, the potentiality of symbols to take on a variety of roles and meaning is what makes the use of arbitrary symbols so appealing.

From some of the defining characteristics of western logic till the 16th century — the importance of signs in logic, the attempt to isolate a subgroup of signs which exemplified a logical character, the relation of logic to cognition which is made explicit through the relation of sign to cognition, an epistemological component essential to logic — it is clear that western logic had a very different conception of logic than is usually propounded these days. That these characteristics are also manifested in Indian logic must be cause for some further reflection on the true nature of Indian logic.

**Peirce and Indian logic**

The development of modern logic with its new found freedom through written symbols meant that cognition and epistemology as part of the activity of logic were no longer explicitly acknowledged. But logic's direct relation to signs was recaptured by Peirce in his influential analysis of logic. Peirce's claim that "logic is nothing else than the general theory of signs" is an important statement relating logic and the larger symbolic world. There are various issues that arise from Peirce's detailed classification of signs. In particular, it allows us to consider some interesting comparative issues between Peirce and the Buddhist logicians, Dignāga and Dharmakirti. Buchler in his introduction to Peirce's work notes that Peirce's path-breaking contribution is his "conception of logic as the philosophy of communication, or theory of signs [29, p. xiii]". He also says that the "conception of logic as semiotic opens broad, new possibilities". Arguably, we can well understand the aims of Indian logic alongside the approach towards logic and signs by Peirce. Peirce's ideas about signs share a common conceptual space with Dignāga and other Indian logicians. Therefore, it seems reasonable to claim that the ancient and medieval Indian logicians who based their logic on the nature of signs understood the essence of logic primarily as what in the western tradition came to be called as semiotics.

Peirce offered a very detailed classification of signs. Peirce begins by defining sign, in a way similar to Dignāga, as "something which stands to somebody or something in some respect or capacity". There are three elements to a sign: the creation of another sign in the mind, the sign standing for an object, and the presence of an idea in reference to which the sign stands for the object. The second element of the sign, namely its capacity to stand for some other object, is what Peirce calls logic. Thus, "logic proper is the formal science of the conditions of the truth of representations [29, p. 99]." There are three types of sign for Peirce, what he calls "three trichotomies". The better known classification of signs by Peirce are the three types of sign under the second trichotomy. These three types are the icon, index and symbol. This extremely short summary does no justice to
Peirce’s rich ideas about sign. I mention these points here only in order to ground a different, semiotic interpretation of Indian logic.

To motivate such a comparative study, consider one simple example. We have already seen Dignāga’s formulation of the triple condition of logical sign. Is this formulation an indication of the possibility of logic as semiotics? Firstly, Dignāga and Peirce are both interested in valid logical conclusions and judgements. Both of them see the sign as the path towards judgements of the logical kind. Both of them have a broad view of signs, ranging from material signifiers such as smoke to words and concepts. As a theory of signs, Peirce’s classification is much more detailed whereas as a theory of logical sign, Dignāga’s conditions do more than Peirce’s analysis. For example, Peirce’s idea of similarity as used in iconic signs is ambiguous whereas this is exactly what the similarity condition in Dignāga’s theory tries to answer. In Indian logic, the sign is used synonymously with reason and evidence. The idea of reason is already inherent in the meaning of a sign since a sign is a sign of something else and it is conceivable that there is a reason for this connection. The question for the Indian logicians consisted in knowing whether the sign “really” stood for the thing which it was supposed to stand for. Therefore, this involved understanding the reason why one sign comes to stand for another. This could be psychological (by seeing concomitance, for example) or social (linguistic conventions, for instance), yet part of the doubt about inference comes from doubt about the origins of the relation between sign and the signified object. The conditions of similarity and dissimilarity are also attempts to clarify this relation as well as understand the original impulse for making the connection in the first place.

Dharmakīrti’s three types of inference, the ones based on identity, causality and non-perception, can be seen as a classification that explains why some signs come to stand for another. Identity is based on similarity and is actually a more comprehensive definition of icon as compared to Peirce. When we say that an oak tree is a tree, our inference is based on a perception of some similarities. In general, it would seem that our “perception” or inference of universals, such as say cowhood, is based on recognition of similar characteristics and therefore signs in such an inference function as icons. 19

The causal type, with smoke and fire as example, is illustrative of indexical signs. Smoke is an index, which refers to a fire in that location. Smoke and fire are associated through contiguity, and smoke obeys all the characteristics of an index which Peirce describes as follows:

First, that they have no significant resemblance to their objects; second, that they refer to individuals, single units, single collections of

19Cf. [39] for an interesting and extended analysis of icons.

units, or single continua; third, that they direct the attention to their objects by blind compulsion [29, p. 108].

Causal signs are just one type of indexical signs. The question is whether Dharmakīrti’s second type can be extended to indexicals in general rather than being restricted only to causal signs? Or equivalently whether Peirce’s large set of indexical signs need to be pared only to causal ones?

The above discussion about Peirce and other semioticians is only to highlight the importance of re-looking at Indian logic through other frameworks. The dominant mode of understanding Indian logic in comparison to “formal logic” has led to needless debates about its status as logic. A fresh look at the Indian logical systems through the semiotic prism illustrates in what sense it is logical and equally importantly in what sense logic is concerned with semiotics.

In [17], Gerow attempts a comparative study of Peirce in the context of Indian philosophy. Firstly, he finds in Mimamsa the closest similarity with Peirce’s classification of icon, index and symbol. His discussion focuses more on issues of language, and in particular, the questions concerning word, reference and meaning. But the real distinction he finds is in the idea of the symbol as formulated by Peirce. Gerow’s question is: “where is the Indian ‘symbol’?” The fundamental point about the symbol lies in the role of the “interpretant” (in Peirce’s sense) who interprets the symbol. Drawing from poetics, Gerow suggests that the dhvani can function in the role of the Peircean symbol although there are problems in such an interpretation. However, what is surprising is that Gerow does not engage with the formulations of Indian logic (and related theories of language, especially since Nyaya and Buddhists have a different take on language as compared to the Mimamsakas) to explore this relationship. The discussion in this paper is one way to approach this comparative study.

I should like to suggest here that the semiotic reading of Indian logic necessitates a more careful look at the meaning of a symbol, particularly as it is used in symbolic logic and mathematics. It is the case that there is a lack of philosophical clarity on the meaning and use of symbols in logic. Indeed, there is a great need to actually understand the exact role of symbols and symbolic manipulation that are so central to modern logics. A similar question can be addressed to mathematics. In recent times, there has been more sustained effort in trying to understand the use of symbols in mathematics, which includes analyzing specific writing strategies of symbols in mathematics which have deep epistemological consequences. 20

Let me conclude with one such reflection on the nature of the symbol. As mentioned earlier, a primary concern of the Indian logician was about the

20Cf. [35, 33, 34] for a more detailed discussion on this topic.
relation of necessity, both logical and "contingent" necessity. Arbitrary symbolization — here I mean choosing something to arbitrarily stand for another such as choosing A to stand for "men" — is not of much interest to these logicians because words in language do that job anyway. (In this context, we need to ask what really differentiates A from "men" as linguistic markers.) Moreover, the question is: what in the nature of symbols resists the creation of meaning that is not based on convention? That is, is it possible that an arbitrary symbol — through use or through knowledge — becomes a "natural" sign? And if so, then how do we analyse this new character of the symbol?

Let me illustrate this shift from the arbitrary to the "natural" with a simple example from mathematics. Mathematics is essentially concerned with symbolic manipulation of various kinds. However, the way mathematics uses its symbols should point us to a more complex definition of a symbol. For example, the way mathematics writes its symbols — what I have elsewhere referred to as "alphabetization" — indicates how meaning is encoded into the symbols themselves [35]. Furthermore, it is often the case that symbols lose their arbitrary sense and get associated with specific meanings — that is, they get "naturalized". From being arbitrary symbols they become "necessary" signs. Applied mathematics is filled with such shifts in meaning. In physics, it is often the case that one discovers physical properties merely by finding an appropriate pattern in the mathematical description. For example, whenever a term of the form $ab^2$ is found in an equation there is an interpretative possibility that a stands for the mass based on a prior meaning of kinetic energy which is symbolized in a similar way [35, 37].

Once the shift away from the arbitrary to the necessary happens, then it is the task of the logician to discover rules that will validate this necessary relation. Dignaga’s conditions are precisely an attempt to do this. The universality of his rules can be noted when we compare his formulation to how experimental interpretations are done in modern physics. Experimental physics has an essential engagement with inferences. In a typical experiment, what the experimenter sees are a set of signs from which she has to infer the existence of some entity or property. For example, the presence of the electron can be inferred only through certain signs. These signs necessarily correspond to certain properties or entities — such a necessary connection between sign and signified is essential for science to be effective. And such a necessary relation is given by an appropriate scientific

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21 In using "contingent" necessity I am following Armstrong’s use of this term in the context of scientific laws. Cf. [1]. It is possible and fruitful to understand one of the most important terms in Indian logic — $vyāpti$ — in terms of contingent necessity and in terms of a lawlike structure.

theory. We can now understand Dignaga’s three conditions for a logical sign as exemplifying the experimental ideal of replicability and the importance of null-experiments [36]. At the foundational level, the concerns of Indian logic and that of modern science are related to each other through this semiotic enterprise. Thus, the semiotic reading of Indian logic not only allows a dialogue with contemporary philosophy but it also poses a new set of questions to modern logic, particularly on the nature of the symbol.

Bibliography


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