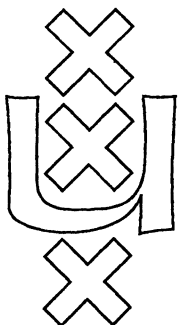


Institute for Language, Logic and Information

SEMANTICS AND COMPARATIVE LOGIC

Arthur Nieuwendijk

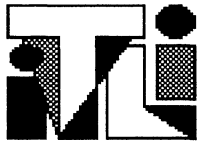
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order predicate logic (FPL). This tradition, the motivations of which have a strong nominalistic flavour, takes arguments formulated in some language or other as its sole concern. The relation of “logical consequence” is looked upon as a relation between sentences, and is given a semantic explication in terms of truth in models, a syntactic explication in terms of proof or deducibility, and both kinds of analyses are tied together by a completeness theorem. Very basic to this approach is the delimitation of a set of certain linguistic items, the so-called “logical constants”, consisting of “and”, “or”, “not”, “implies”, “some”, “every”, and, occasionally, “identity”. In the tradition of Ideal Language Philosophy it is claimed that logic is nothing but the study of the properties of these logical constants and, furthermore, that anything that cannot be defined in terms of these is outside the scope of logic.

Obviously, an adherent of Ideal Language Philosophy will not accept my distinction of the two assumptions mentioned above. For him they naturally merge into one. The question as to the formalization of Navyanyāya logic, he would say, simply boils down to the question as to which extent Navyanyāya logic can be translated into the language of first order predicate logic. The task to which he appoints himself thus, is, as I see it, really twofold. At first he will try to locate or, if necessary, generate within the language of FPL those expressions into which certain technical devices employed by the Navyanyāya logicians are to be translated. He then proceeds to subject the translated concepts to the calculus of classical logic in order to see whether the results he yields thereby are accepted by the Navyanyāya logicians. In doing so, he will find out that this is not always the case, and so he will have to face a serious problem. Keeping with his view he has no other alternative than to declare those elements of the Navyanyāya theory of inference that obstruct the alleged acceptance of certain classical principles to be logically “unjustified” or “superfluous”. As I will point out later in more detail, this is exactly what happens whenever the Navyanyāya discernment of three kinds of inferences, or the Navyanyāya scheme of inference is analyzed within the framework of FPL.

1.2 Extending the scope of logic

In current Western logic it is more and more acknowledged that there are a lot of phenomena apparently exhibiting patterns of systematic relationships which just cannot be analyzed adequately within the framework of FPL. This has given rise to a new, and in some respects radically different, ap-

Semantics and Comparative Logic

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1 Towards a formal interpretation of Navya-nyāya logic

1.1 Logic and language

Current Western-oriented interpretations of Navyanyāya logic have in common that they all, in some way or other, call upon technical devices derived from Western classical logic in order to clarify the basic concepts of Navyanyāya logic. Underlying this method there is, of course, the assumption that it is possible to formalize Navyanyāya logic and that such a formalization can add to an illumination and understanding of the most important features of Navyanyāya logic in general, and to an insight in the techniques for logical analysis as developed by the Navyanyāya logicians in particular. This assumption, I urge, ought to be distinguished carefully from the assumption that the logical framework within which a formalization of Navyanyāya logic should take place is already known and available. I insist on this distinction for, although I do not dispute the possibility and, eventually, the fruitfulness of the use of devices taken from Western formal logic for a clarification of Navyanyāya logic, I believe that the question as to which logical framework is most suitable for this purpose is still to be decided on.

It seems to me that the failure of recognizing the distinction between these two very different assumptions has given rise to a misunderstanding of some of the basic tenets of Navyanyāya logic, rather than to a clarification of the same. It should be noted, however, that what I consider to be an uncritical attitude towards deviant logics is believed by others to have a firm philosophical foundation. I am referring to a Western tradition known under the name “Ideal Language Philosophy”, according to which there is one and only one logic, where “logic” is to be understood as extensional first

proach to logic. Underlying this new approach is, what some have called, the “common sense view of logic”. It seeks to establish a conception of “logic” by entering first into the ordinary usage of the words “logic”, “inference”, and “meaning”. The usage of these words, it is stated, defines a natural subject matter that is broader than logic presently studied. Next to this it is noticed that in ordinary usage the meaning of the word “logic” is not unequivocal, that is to say, it is acknowledged that speaking of, for example, “the logic of believing”, or “the logic of perception”, generally does not amount to the same. This has given cause to the assumption that the different concepts on the basis of which, for example, human beings are able to communicate with each other, to obtain scientific results, to experience the world in daily life and to organize these experiences in a systematic way, all have their own logic. Under this view inference is just one of the means available to human beings to organize and to gain knowledge about their world. Inference then, must be looked upon as having its own logic, too. An analysis of inference taking the “common sense view of logic” as its starting point will try to explicate this logic in contrast with, and, at the same time, in connection with the logic of other concepts governing human life, as, for example, perception.

To speak about “inference having a logic of its own” will sound like begging the question to the proponents of logical nominalism, for what else can logic be about if it is not about the rules and principles in terms of which the soundness and validity of certain inferences can be accounted for? Indirectly, this question brings up another, as it suggests, one that is to be thought of as being already answered; What is logic all about?

This paper has its ultimate motivations, first of all in the conviction that the answer to this rather important question provided with by logical nominalism is not the only one possible, but most of all in the conception that the way in which this issue is given its solution does have consequences for the properties of the logical calculus emanating from it. In short then, this paper originated from the opinion that an answer to the question “What is logic about?” does matter and it can be looked upon as an attempt to illustrate this point.

Studying Navyanyāya has given rise to the thought that, in contrast with FPL, Navyanyāya logic is not about language. To face this possibility, however, is not to say that an understanding of this logic can go without an understanding of the closely related notions of inference and meaning. But it does carry with it the claim that for an understanding of these notions we should not limit ourselves to language. This, in fact, is one of the basic

claims of what has become known as *situation semantics*, and it vindicates the methodological choice for a comparison of Navyanyāya logic with situation semantics, rather than with FPL. It follows from the extended notion of meaning held in situation semantics that inference is looked upon not as the correct application of appropriate rules operating on syntactical structures, but as “an activity that attempts to use facts about the world to extract additional information, information implicit in the facts.”¹ A sound inference, it is argued, does not need language at all, a conviction that is unmistakably on a par with the Navyanyāya conception of inference.

The framework offered by situation semantics can be seen as an attempt to develop the common sense view of logic. It seeks to develop accounts of information and inference that do not presuppose language. Speaking in a more general fashion, it is intended to give an over-all theory of meaning within which a theory of meaning for human languages can be developed as a special case. It is also intended to provide with the means for representing mental states and to allow for an understanding of the meaning of these. Before outlining the starting points of situation semantics in more detail, I will concentrate on the notion of *jñāna*. I will provide with an interpretation of this notion as a preliminary to a comparison of Navyanyāya logic and situation semantics with respect to the representation of mental states and the role assigned to these in the analysis of inference. Next to this I will focus my attention to the notion of *vyāpti*, in particular to the conditions on the grounds of which the acceptance of a vyāpti-relation is justified. Finally, I will turn to the inference scheme as maintained by the Navyanaiyāyikas, thereby proposing an interpretation for which I will call upon some insights and devices derived from a situation semantical framework.

2 Representing the mental

2.1 jñāna

A main feature of the Navyanyāya analysis of human knowledge can be traced back at least as far as Vātsyāyana’s commentary on the Nyāyasūtra’s, where it is plainly stated that “cognitions of several things appear one after another.” To support his claim Vātsyāyana appeals to a pre-theoretical intuition: “it cannot be denied, since it is directly perceptible by each man

¹Barwise [1989] p. 39.

for himself”.² These remarks state explicitly what unmistakable underlies the Navyanyāya approach to knowledge implicitly; human cognition is analyzed and described in terms of successive “cognitions”, called *jñāna* or *buddhi*.³

From an ontological point of view, a *jñāna* is subsumed under the category called *guṇa*. As such I take a *jñāna* to be a non-repeatable, momentary entity.⁴ Being a *guṇa* a *jñāna* is a particular, a unique characteristic of exactly that entity that possesses it, for as long as it lasts. Although a *jñāna* shares these characteristics with other *guṇa*’s, it also has a distinctive which it does not share at all; typical of a *jñāna* is its property of having no other locus than the substance *ātman*.⁵ Since, to a certain extent, this substance can be looked upon as a constituent of the individual, internal reality, I will consider a *jñāna* as, what I will call, an “epistemic event”. I want to state explicitly that the word “epistemic” is meant to indicate nothing more than that a *jñāna* has *ātman* as its only substance, and that the word “event” should be taken only as an expression of its non-repeatable, momentary character.⁶

The same intuition, perhaps, that reveals the successive occurrence of *jñāna*’s or mental states, also tells us that the way in which they do so, generally, is not arbitrarily, but exhibits certain regularities. An awareness of there being smoke at a particular place, for example, is normally followed by the awareness of there being fire, too. The Navyanyāya theory of inference is an attempt to account for just this kind of regularities. Stated in this way it seems obvious that, since the Navyanyāya theory of inference seeks to account for certain regularities in the successive appearances of *jñāna*’s, the relation of entailment holding between the set of premisses and the conclusion of a valid inference really is to be conceived as a relation between *jñāna*’s. Although I do not think that this is so obvious as it might seem, the thought of it naturally gives rise to two related questions. If *jñāna*’s are taken as the constituents of an inference, and if, consequently, the relation of entailment is construed as a relation between these *mental* entities, then

²See *Nyāyabhāṣya* under *Nyāyasūtra* 3.2.56 - 3.2.58.

³*Tarkasaṃgraha* 34.

⁴Cf. Potter [1954], Potter[1957a], and Matilal [1986].

⁵*Tarkasaṃgraha* 17.

⁶The reason for this remark is that I have not, no more than Matilal has, found any evidence for believing that the Navyanaiyāyikas made an explicit distinction between “intern” and “extern”, or “mental” and “physical” as it is common practice in Western philosophy ever since Descartes (cf. Matilal [1986], p. 128). It is noteworthy, furthermore, that in situation semantics this distinction also is hard to seek.

it might be put forward that entailment is constituted by the psychological mechanisms being laborious in a cognitive agent. In short, it might be retorted that a psychological interpretation of Navyanyāya logic is justified.⁷

The other question connects to the possibility of objective knowledge. The conception of cognition as being analyzable in terms of *non-repeatable, momentary* entities brings with it that the “epistemological given” cannot be seen apart from the knowing subject in which, nor from the moment at which it occurs. As a consequence, knowledge becomes a highly subjective matter. The question is, then, how it is possible to achieve the generality demanded for by philosophical analyses, in other words, how is it possible to gain insight in knowledge in general?⁸

Both questions, as I see it, have their origin in laying too much stress on the ontological status of jñāna’s; the former question relates to the “mental” character of a jñāna, while the latter focuses only on its being non-repeatable and momentary. This is not to say that both questions are unimportant, but only that they are rooted in a one-sided portrayal. I myself think that it is possible to interpret a jñāna so as to do justice to its ontological distinctives, while at the same time the alleged generality can be preserved without resorting to psychological mechanisms. In order to spell this out more fully I will borrow some devices from situation semantics. As a preliminary then, a global discussion of this theory must be brought up.

2.2 Situation semantics on mental representations

As I have stated earlier situation semantics aims at a general theory of meaning within which a theory of meaning for human languages can be developed as a special case. Consequently, the proposed conception of “meaning” is not limited to language. Typical of situation semantics is a strong commitment to a form of realism, that is to say, to the claim that meanings do not reside in the head nor in some Platonic realm, but are constructions out of real things. The theory also allows for a representation of mental phenomena. Mental states are conceived as (real) states reflecting the way the world is. They thus contain information about the agent’s environment and it is claimed that they can therefore be adequately characterized by the information they contain. Then, just as linguistic meanings are, the infor-

⁷Such an interpretation is proposed in Mohanty [1985]

⁸Considerations along these lines persuade Mullatti to interpret a jñāna as a proposition in a Fregean sense of the word. The interpretation of “jñāna” as I propose it is also meant to be a criticism of this conception.

mational content of mental states is taken to be a construction out of real things.

2.2.1 Basic assumptions of the theory

The *primitives* of the theory are individual particulars. Included are ordinary things but also situations (including events) and spatio-temporal locations. Properties (or 1-ary relations) and (n -ary) relations are also taken as primitives.⁹

Situation semantics is rather liberal in its choice of primitives. FPL, in contrast, does not take properties and relations as basic, but as sets of n -tuples of individuals. The admission of so many primitives has its roots in the observation that anything humans systematically use is an invariant across situations and as such can easily become, upon human reflection, objectified, and so be treated as a thing in its own right.¹⁰ Thus, in situation semantics everything that is used can be objectified and talked about. Relations are freely and frequently used, and so relations too can be objectified and treated as objects of the theory. Relations are very important in situation semantics; they are said to be the “glue” that hold things together, the primary facts that go to make up reality. This brings me to the second assumption:

- (2) There is a single world W , the real world having no concrete alternatives, that determines the basic facts as to what particulars stand in what relations.

Each relation comes with a set of argument places, roles that can be filled to get a basic state of affairs. The relation of “holding”, for instance, comes with 3 argument roles to be filled by the spatio-temporal location l , the holder a , and the thing b hold by a at l . What becomes clear from this is that, generally, a n -ary relation comes with a set of $n+1$ argument places one of which to be filled by a spatio-temporal location.¹¹ This is only generally

⁹This assumption, and the other ones to be discussed in this paragraph can be found listed in Barwise [1989], p. 81. For their representation I have taken some minor, mainly typographical, liberties.

¹⁰This view is also justified by referring to the ease with which we can nominalize in natural language.

¹¹The conception of a relation as accompanied by roles to be filled does, to a certain extent, remind of the Navyanyāya view of relations as coming with a “limitor” (*avacchedaka*) and a “determiner” (*nirūpaka*), since both can be looked upon as naming argument

true, since situation semantics also allows for unlocated relations, as we shall see.

- (3) Legitimate assertions are about the world or portions thereof. These portions are *situations*. To each particular situation s there corresponds a set of *facts*, the facts that hold in s . In general, the set of facts associated with a given situation may be a proper subset of all the facts of W .

A situation is conceived of as a part of reality that can be comprehended as whole in its own right. This, however, is not to say that a situation can be comprehended as totally independent of other parts of the world. In fact, a very important feature of situations is that they always, in some way or other, interact with other things (including other situations), or, what amounts to the same, they have properties or relate to other things. It should be noted, furthermore, that, since a situation comprises a spatio-temporal location, it is viewed as a momentary, non-repeatable object.

Situations are taken to be the primary semantic objects. Since these are conceived of as being parts of bigger situations, i.e. they stand in the relation *is a part of* holding between situations, there is given to an important characteristic of situation semantics in which it rather deviates from FPL. This feature is commonly referred to by the notion of *partiality*. It should be mentioned, to be sure, that partiality can come to light for two different reasons. Partiality in, what I call, the semantic sense of the word sets in whenever a theory employs partial functions, functions that do not return a result for every argument in the domain. A partial semantics, then, is one making use of an interpretation function that does not assign to every statement one of the two definite truth-values “true” or “false”. Partiality in this sense, for example, is encountered in theories that seek to account for presuppositions semantically. In the ontological sense of the word partiality means that the theory under consideration takes partial objects as its primary semantic objects. So, situation semantics is partial in the ontological sense of the word. But, since taking recourse to partial objects always brings with it the employment of partial functions, situation semantics is partial

places. It should be noted also that, in contrast, Navyanyāya does not allow for relations with three or more arguments; these are always reformulated in terms of (complexes of) 2-ary relations. Navyanyāya, furthermore, does not assign a spatio-temporal as an additional role to a relation, although, as it seems to me, the term of the relation that can be conceived of as the *adhikaraṇa* does not rarely imply a fixation at a real spatial location.

in the first sense of the word, too. The converse, though, does not hold. That is to say, the use of partial functions does not need to go together with taking partial object into consideration.

Due to partiality situation semantics exhibits some features in which it radically differs from FPL, a logic that is based on a so-called “total” semantics; i.e. a semantics on the basis of which every statement is assigned a definite truth-value and that does not take partial objects into account. Two hallmarks I want to touch upon here concern the law of the excluded middle and, what is sometimes called, the question as to the persistence of statements.

Turning to partial objects has as its direct consequence that the law of the excluded middle is not longer tenable. For, although it may be the case that every total world satisfies “ $R(a) \vee \neg R(a)$ ”, it does not follow that a given part of the world should do so, too. It is important to realize that under the view I am discussing the question whether a certain statement holds in the actual world, that is to say, whether it describes a state of affairs that holds in some real situation, is answered not by taking the total world into account, but *by reference to a given situation s* , the situation under consideration. This situation, of course, might be the whole world, but this certainly does not go without saying, as it does in FPL. Now, if the situation under consideration is not the total world but a part thereof, then it is to be acknowledged that this situation possibly does not provide with sufficient information to decide whether a described state of affairs holds in s or not. A situation s , for instance, represented by, say, “in s : at l : Sitting, John, chair; yes” does not provide with the information on the basis of which it can be decided whether the state of affairs described by “John reads the newspaper” holds in s or not.

The question as to the *persistence* of statements also is one that naturally arises within any semantical framework based on partial objects like situations. It amounts to the question whether a statement having some truth-value with respect to a given situation s will have the same truth-value when a bigger situation s' such that s is a part of s' is taken into consideration. If so, the statement is called persistent. An example of a statement that is not persistent is: “All the workers have gone on strike”. This statement being true, perhaps, with respect to a particular factory, will turn into a false statement if other factories are also taken into account.

Notwithstanding the fact that situations are really non-repeatable, momentary entities, it is also acknowledged that different situations can exhibit common features or, so-called, invariants across situations. This is captured

by allowing for the assignment of properties to situations:

- (4) Just as there are properties and relations among other particulars, there are properties of, and relations between situations and other particulars. The property of a situation is called a *type of situation*. Since these properties are not extensional it is not supposed that two distinct types of situations will be types of distinct real situations. Neither it is supposed that every type of situation is the type of some real situation.

A type of situation is obtained by abstracting from a number of constituents of a situation. It is used in order to capture the invariants across situations. Among these invariants, it is acknowledged, there are not just objects and relations, but also congeries of these. Take, for example, a situation s in which John reads the newspaper. By abstracting from all the argument places the type of situation S is obtained, a type that can be expressed verbally by “someone reads something at some spatio-temporal location”. It is, to be sure, also possible to obtain other types of situations, for example S' expressed by “someone reads a newspaper at some spatio-temporal location”. It is said that the situation s is of type S or, what amounts to the same, that s has the property of being of type S or that s exemplifies S . A type of situation can also be viewed as an abstract object reflecting the internal structure of the situation that is of that type. The notion of a type of situation plays a key role in the conception of meaning put forward in situation semantics. It is claimed that meaning resides in systematic relations of a special sort between different types of situations. These relations are called constraints and it is in terms of these that the meaning of the primary semantic objects is determined.

In situation semantics “being meaningful” amounts to “containing information”. A situation s can contain information about another situation s' only if there is a systematic relation C that holds between situations sharing some configuration of uniformities with s and situations that share some other configuration of uniformities with s' .¹² That is to say, a situation is meaningful, only if it exemplifies a type of situation that is systematically related to another type of situation.

The theory of constraints, i.e. systematic relations between types of situations, as it is developed within situation semantics cannot be seen apart from the intention to formulate a thoroughgoing realistic theory of meaning.

¹²Barwise and Perry [1983], p. 12.

Keeping with its aspiration the theory claims that constraints, and consequently meanings, are actually nothing but regularities in the world. The fact, furthermore, that such regularities obtain is itself a fact among other facts: facts like these are (parts of) situations.

Being a fact among other facts, a constraint is basically the state of affairs that two types of situations stand in the primitive relation of *involvement* at the universal location l_u . In recent developments, however, this relation is conceived of as being unlocated, a conception I will adopt, too.¹³ Symbolically I will represent a simple constraint C as: $C := \langle \langle \text{involves}, S, S' \rangle \text{yes} \rangle$, or simply as: $C := S \Rightarrow S'$.

Linguistic as well as non-linguistic events are said to be meaningful if they have the property of conveying information about, or “involving”, other parts of reality obtaining in the world. The information conveyed by events is accessible for an agent by means of an *attunement* to the constraints that obtain in the world. That is to say, an attunement to the systematic relation between the types of situations S and S' is what allows an agent to pick up the information that is contained in a situation s , given that s is of type S . One of the examples occasionally used resorts to the types of situations S and S' , where $S := \langle \text{at } l \langle \text{being smoky}, a \rangle \text{yes} \rangle$, and $S' := \langle \text{at } l \langle \text{being fire}, a \rangle \text{yes} \rangle$, and a constraint C having S and S' as its constituents: $C := S \Rightarrow S'$. It is said that on the basis of an attunement to C an agent is allowed to extract the information that there is fire in some situation s' from a given situation s being of type S , that is, a situation in which there is smoke.

What has become clear from all this is that systematic relations between types of situations, constraints, are what allow one situation to contain information about another situation and, hence, to be meaningful. These constraints are also called *type-meanings*. An attunement to such constraints is what allows an agent to soundly infer from the one thing being the case to the other thing being the case. In other words, type-meaning is what allows an event of a particular type to have *situation-meaning*. So, a given situation s in which there is smoke has a particular situation-meaning that it is of type S , and, given an attunement to the constraint C mentioned

¹³In the context of situation semantics “unlocated” means primarily “universally located” and is, thus, not to be confused with the Navyanyāya notion of “aprasiddha” for this notion, rendered as “unlocatable”, amounts to “being nowhere locatable”. It should be noted, furthermore, that situation semantics also allows for constraints that do not hold universally, but only “regionally”. I will not discuss these, since vyāpti-relations holding only regionally are, as far as I know, not acknowledged in Navyanyāya logic.

above, that type of situation is known to involve there being a situation s' of another type S' , a situation in which there is fire. Succinctly, then, this can be expressed by saying that “smoke ‘means’ fire”.

Given these basic assumptions on the basis of which a general theory of meaning is formulated, the meaning of linguistic items can be developed as a special case taking recourse to the next assumption:

- (5) The chief semantic value to be associated with a declarative sentence P is its meaning, a relation $U_p \Rightarrow D_p$ between the type U_p of the situation where P is assertively uttered and the type D_p of the situation thereby described. A legitimate assertive utterance u of type U_p is true if the situation s_u that u is about is of type D_p . The information content of the utterance u is that s_u is of type D_p .

Since I am primarily concerned with the relation between logic and semantics, and since in situation semantics linguistic meaning is conceived of only as a special case of a general semantics the basic assumptions of which are outlined above, I will not discuss assumption (5). Instead, I want to turn my attention to the question as to the representation of the mental as it is put forward in situation semantics.

Faithful to its realistic outlook, the theory commits itself to the existence of real mental states. In fact, mental states are conceived of as just being events among the various other states of affairs and events in the world. Mental states, furthermore, are taken to be representational, that is to say, as representing the way the world is. Now, since the world consists of situations, mental states are taken to be mental representations of situations and, consequently, it is claimed that they can be described by the same means employed in the analysis of situations.

Just as other events, mental states are meaningful, for they are systematically linked to other situations, external and internal. One could also say that mental states have an informational content, thereby recalling that the basic intuition about the informational content I_s of an event s is that it is information about something besides s . In connection to the question regarding the informational content it is to be noted that mental states differ from other situations in one important aspect, for the former are representations, while the latter are not. As a distinctive, representations have the property of being usable in different situations getting at quite different contents in these circumstances.¹⁴

¹⁴This in contrast to a view of representations as having an intrinsic content, independent of circumstances.

Since mental states are taken to be representational, they are classified in terms of types of situations, and hence in terms of (constructions out of) real things. So, types of situations play a double role, since they are used to classify what is seen as well as how it is seen. In this way the theory is loyal not only to its realistic background, but also to common sense. For it is said that by this method justice is done to the common sense picture of the mental that there are different ways of seeing the same thing. The type of situation S classifying the cognitive state an individual a is in at a location l is connected to the world by a setting, a list of individuals that fill in the argument roles of S , thereby relating the mental state to the particular object that is cognized, and entering the circumstances that, to a certain extent, contribute to the informational content of that particular mental state.

2.3 jñāna's and situations

In Navyanyāya literature jñāna's are discussed by taking resource to certain verbal expressions, usually sentences, which are “marked” by means of the word “iti” immediately following after such an expression. In contexts like these the word “iti” having many meanings is usually translated into quotation marks. So, what we have are jñāna's on the one hand, and “quoted” sentences by which jñāna's are talked about on the other. This being the case it will not come as a surprise that in FPL-based approaches to Navyanyāya logic the notion of jñāna is interpreted by establishing some direct relation between a jñāna and the sentence by which it is talked about. Hence, since FPL is solely concerned with sentences and their meanings, a jñāna is not rarely taken to be, in some way or other, the meaning of the sentence associated with it.¹⁵ But what reasons are there for this conception? Are jñāna's meanings of sentences? I myself am not at all convinced that they are and to express this opinion I will outline an interpretation according to which they are not.

In its essence my suggestion comes down to the idea of taking jñāna's not as entities that *are* meanings, but as entities that *have* meanings. From this the reasons I had for taking resource to situation semantics as a methodological choice can be readily seen. For situation semantics not only adheres itself to a form of realism that in many respects turns out to be on a par with the backgrounds of Navyanyāya logic, but it also provides the means

¹⁵It is, for example, not uncommon to take a jñāna as a proposition in the Fregean sense of the word.

which suit my purposes well. The major shift of focus I propose, then, is to take jñāna's to be entities that, just as linguistic entities, have meanings, and to assume that the meanings of both kinds of entities are constructions out of real things. It should be noted that under this conception the means by which the meaning of a linguistic expression is analyzed coincide with those by which the meaning of a jñāna is estimated. This, however, is not to say that jñāna's are meanings of sentences.

At first sight, perhaps, it may sound odd to seek for the meaning of a jñāna. But it should be realized that I take "meaning" in a very particular sense of the word. For I look at meaning as providing a relation between two events obtaining in the actual world. That is to say, I retain to a relational account of "meaning".

In Navyanyāya to have a cognition always means to have a cognition of something. Subsequently, a jñāna is characterized by the property of being related to some object or other (saviṣayakatva).¹⁶ In the language of Navyanyāya, this aspect of a jñāna is captured by saying that, roughly, the cognized object possesses the property *viṣayatā*, a so-called relational abstractum meaning something like "being the object of [*x*]", a property that is determined (nirūpita) by the cognition by which that very object is cognized. Or, the other way round, it is said that the cognition has the property *viṣayitā*, perhaps to be rendered as "having [*x*] as its object", which is determined by the particular object that is cognized. The cognition of an object taken as the presence in a certain cognitive agent at a fixed moment of an epistemic event being related to the object cognized by *viṣayatā* or, depending on the line of approach, *viṣayitā*, presents that object together with one or more distinguishing attributes.¹⁷ In Navyanyāya, then, the cognition of an object is conceived of as being of a qualitative nature, a conception that is reflected in the way a jñāna is analyzed. For its description breaks up into a qualificandum (*viśeṣya*), a qualifier (*viśeṣaṇa* or *prakāra*), and a relation between both (*viśeṣya-viśeṣaṇa-saṃbandha*).

In order to be able to determine the value of the "pseudo-variables" just mentioned with respect to a given jñāna resource is taken to the assumption that it is possible to associate the jñāna under consideration with a linguistic expression.¹⁸ Keeping with my view, the "criteria of association"

¹⁶ Compare Matilal [1968], §§2, 3.

¹⁷ That is to say, the cognition relates to an object by being the determiner of the complex property *viśiṣṭa-viṣayatā* (qualified object-ness), a property that is made up of the *viṣayatā*'s resident in the several entities of which the cognized object is composed.

¹⁸ It has to be noted that only those jñāna's which have a relational structure are allowed

is not that the jñāna is the meaning of the expression, but that the jñāna and the expression associated with it have the same meaning. That is to say, a jñāna can be associated with a certain expression if and only if that expression relates to exactly the same object from which the jñāna derives its content. The relation between an expression φ and its denotation is established by stating that the denotation (*śakya*) has the property of “being the denotation of” (*śakyatā*), a relational abstractum that is thought of as being determined by the expression φ taken as an entity in its own right. From a methodological point of view it can be remarked, leaving aside all kinds of technicalities, that the relation between a cognition and its object is fixed along lines very similar to those followed by the entrenchment of the relation between an expression and its denotation. In both cases, furthermore, the object possessing the property *viśayatā* or *śakyatā* is taken to be a real object obtaining in the actual world. Taking this as a starting point, the general idea underlying my “criteria of association” could be formulated in terms more familiar to the language used in Navyanyāya, perhaps, by saying that an expression φ can be associated with a jñāna σ if and only if φ determines a *śakyatā* resident in an object, which object also possesses the property *viśayatā* being determined by σ .

The syntactical structure of the associated expression contributes to the analysis of a jñāna, for, to a certain extent, it is taken as a guideline for determining which entities are qualifiers of which other entities. This, however, is not to say that the meaning of the sentence is derived solely from its syntactical analysis. As I see it, in Navyanyāya the meaning of an indicative sentence is the object described by the sentence, and this object has, in fact, a much more complicated structure than one would suspect by taking only the syntactical structure into consideration. So, to explicate the meaning of a sentence fully, the object referred to has to be submitted to an ontological analysis. The expression “[This] mountain possesses fire” (*parvato vahnimān*), for example, describes a complex object that ontologically falls apart into the particulars ‘mountain’ and ‘fire’, the generics ‘mountain-ness’ and ‘fire-ness’, a relation between ‘mountain’ and ‘mountain-ness’ as well as a relation between ‘fire’ and ‘fire-ness’, and a relation between ‘mountain’ and ‘fire’.¹⁹ These constituents including the relations are conceived of as real things and they all contribute to the meaning of the sentence “[This]

for to be associated with a verbal expression. jñāna’s having a non-relation structure, however, fall outside the scope of this paper, so I will not discuss these.

¹⁹Even this is a simplified representation.

mountain possesses fire”.

Now, if this exposition is acceptable as a general depiction, as I think it is, and recalling the basic traits of situation semantics, it is not very difficult to interpret the notion of a *jñāna* in a rather straightforward fashion. All that is needed is to assign to a *jñāna* a “structural content” as an constituent of its total content. I call this part of its whole content “structural”, because it must be such that it is usable with respect to different objects. Since a *jñāna* derives its content from the particular object it is related to by *viṣayatā*, and since that object, though being momentary, also exemplifies “invariants across different objects”, it seems obvious to view the structural content of a *jñāna* as consisting of those entities which different actual objects have in common; i.e. the generic entities. So, I take the structural content of a *jñāna* to be a construction out of real generic entities which are obtained by abstracting from their various instantiations. In fact, I take the structural content of a *jñāna* to be just what in situation semantics is called a *type of situation*.

The “type of situation” is what different *jñāna*’s might have in common. From a different angle, however, there are no two *jñāna*’s that are the same, for they are conceived of as momentary, non-repeatable entities, tied to the cognitive agent in which as well as the time at which they occur, and because they are restrained to the particular object from which they borrow their content. The latter is clearly brought forward by the analysis of the object a *jñāna* is related to, for this object comprises not only generic entities, but also the particular entities that exemplify these generics with respect to a certain time and place. In other words, the analysis of the relevant object not only presents the structural content of a *jñāna*, but it also reveals the real particulars filling in the argument roles that come with the “type of situation” classifying the *jñāna*. In this way, then, a *jñāna* can be conceived of as tied up to reality, to the particular object that is cognized by someone, somewhere and somewhen. Under the interpretation I propose, to summarize, the notion of a *jñāna* comprises four aspects: a spatio-temporal location, a cognizing agent, a structure or type of situation, and a set of particulars filling in the argument roles of the type of situation. Leaving aside the variables for the spatio-temporal location and the cognizing agent, a cognitive state is simply a pair $\langle S, f \rangle$, where S is a type of situation, i.e. a construction out of a certain number of uniformities across situations, and f is a function from the argument roles of S to the real individuals obtaining in the actual world.

To conclude this paragraph, I want to touch upon the question as to the

“validity” of a cognition frequently raised in Navyanyāya. It is said that to have a cognition is one thing, but to have a cognition that is *pramā*, i.e. “correct”, is something different, for not all cognitions are correct. An epistemic event is held to be correct if it is “in accordance with its object”, that is to say, if it is *yathārtha*. A remarkable aspect of this conception is that the question as to the correctness of some *jñāna* is answered by taking into account only the object that is taken to be related to the cognition by *viṣayatā*. The cognition “[This] is silver”, for example, is said to be *pramā* with respect to silver, but *apramā* with respect to nacre. In other words, the correctness of a cognitive state $\langle S, f \rangle$ can only be determined with respect to a particular setting f . This setting is not the whole world, but only a part thereof consisting of exactly those particulars singled out by f , particulars which exemplify certain generic entities. The question as to the correctness of a cognitive state, then, boils down to the question whether the particulars fixed by f instantiate the very same generics as are comprised by S . In a way this does remind of the lines in accordance with which the question whether a state of affairs holds or not is settled on in situation semantics. For this theory takes the question whether a state of affairs holds or not, primarily to be the question whether a state of affairs holds or not *in a given situation*. The question is decided on not by taking the whole world into account, but with respect to a part of the world. Consequently, different answers will be given, when different situations are taken into account.

The latter rather quick comparison is meant to mean nothing more than it says. That is to say, I do not contend that it does provide sufficient arguments on the basis of which it can be decided that Navyanyāya logic itself took recourse to partial objects. This, however, is mainly a philological question which, as far as my opinion is concerned, ought to be answered by spelling out in detail what such a partial object would look like, thereby resorting to the concepts maintained by the Navyanaiyāyikas only. In recent Western logic partial objects come in many colours and, consequently, an unequivocal conception of the notion of a partial object cannot be derived from it. In situation semantics, too, the notion of a situation is, to a certain extent, unclear and liable to modifications. This, however, is not to say that partiality itself is a clouded notion, for it is certainly possible to get a clear sight at the general features of a logic based on a partial semantics, no matter what exactly it is that is taken to be a partial object. Since, for the time being, I am unable to provide with a precise notion of the partial object as it, perhaps, has been resorted to by Navyanyāya logicians, I will consider the thought that Navyanyāya logic is partial in the ontological sense of the

word to be a working hypothesis only. A fruitful one, I think, especially with regard to a reconstruction of Navyanyāya logic in terms of Western logical devices, but nevertheless a hypothesis. The question whether Navyanyāya logic is partial in the semantic sense of the word, however, is altogether a different one liable to decisive arguments as will come up in the next paragraph.

3 Vyāpti

In Navyanyāya logic an inference is conceived as a mental activity, a process falling apart in several phases, that can be analyzed in terms of a succession of certain jñāna's or mental states. An inference sets out on the cognition of the presence of, as I call it, an indicating property (hetu), "indicator" for short, at a particular place at some particular moment (pakṣa), given that the conditions which surround the taking of an entity as the pakṣa are met. Finally, an inference results in the coming into being of an epistemic event representing the fact that the pakṣa also possesses the probandum or, literally, the "thing to be inferred" (sādhya). Before the conclusion can be reached however, there are two other phases to be passed through, phases I will indicate as "recognition of the relevant vyāpti-relation" and "consideration", respectively. The several phases which constitute an inference are described by Annambhaṭṭa as follows:

T1 A conclusion is an epistemic event to which cause is given by a consideration. A consideration is an epistemic event [having as its content that] the property of the pakṣa is qualified by vyāpti. An epistemic event the content of which is "that mountain possesses smoke-pervaded-by-fire" is an example of a consideration. The conclusion proceeding from this [consideration] is an epistemic event [with the content] "[That] mountain possesses fire". Vyāpti is an invariable going-together [in this case] referred to by: "Wherever there is smoke, there is fire". The presence of a pervaded [object] on a mountain, etc., is a property of the pakṣa. ²⁰

²⁰ parāmarśa-janyaṃ jñānam anumitiḥ | vyāpti-viśiṣṭa-pakṣa-dharmatā-jñānaṃ parāmarśaḥ | yathā vahni-vyāpya-dhūmavān ayaṃ parvata iti jñānam parāmarśaḥ | taj-janyaṃ parvato vahnimān iti jñānam anumitiḥ | yatra yatra dhūmas tatra-agnir-iti sāhacarya-niyamo vyāptiḥ | vyāpyasya parvatādi-vṛttitvaṃ pakṣa-dharmatā || *Tarkasaṃgraha* 44.

The difference between the expressions “Wherever there is smoke, there is fire” describing the second step, and “This mountain possesses smoke-pervaded-by-fire” describing the third step, does remind of the distinction, made in situation semantics, between situation-meaning and type-meaning. Type-meaning is what allows a situation of a particular type to have meaning, i.e. situation-meaning. According to situation semantics, attunement to type-meaning is what permits an agent to infer soundly what a particular situation means, given that that situation is of the first situation-type involved in the type-meaning. Following this line of thoughts, then, an attunement to the type-meaning expressible by “Wherever there is smoke, there is fire” is what allows an agent to decide that the cognition of a particular smoky place contains the information that there is fire. I will take up this distinction again in the next paragraph and relate it to an alternative interpretation of the Navyanyāya scheme of inference. For now, I want to focus my attention to *vyāpti* in order to get some grip on the role this relation is assigned to in the Navyanyāya analysis of inference.

A first glance at *vyāpti* reveals this relation as the relation of “going invariably together” or “invariable concomitance” as it is usually rendered, leaving us with the notions “invariable” (*niyata*) and “concomitance” (*sahacāra*). An object goes together with another object if there is a locus that both have in common (*sāmānādhikaraṇya*). The notion “related to the same locus”, taken in isolation, is ambiguous.²¹ It can be taken to mean that two entities have exactly the same loci, that all the loci of one entity are also loci of the other, or that two entities have at least one locus in common. The latter is what is usually meant by “*sāmānādhikaraṇya*”. Conceived of in this sense, the notion “related to the same locus” expresses a symmetrical relation, one that holds between ‘smoke’ and ‘fire’, but also between ‘fire’ and ‘smoke’. Given two entities that have at least one locus in common, it is said that the first of these stands to the second either in a *vyāpti*-relation, or in the relation of deviation (*vyabhicāra*), the converse of a *vyāpti*-relation. The latter being the case whenever there is a locus possessing the first, but not the second entity. Putting things together, then *vyāpti* might be determined as “a going-together that is not deviation”. A definition of *vyāpti* having this purport is given by Viśvanātha:

²¹Compare Goekoop [1967], p. 6. Another notion frequently used is “*aikādhikaraṇya*”. I am not sure whether this notion is ambiguous in the same way “*sāmānādhikaraṇya*” is, or that it should be taken to mean “related to (at least one) common locus” only. This question though has little importance for the problems at hand.

T2 Vyāpti [obtains if] the indicator has a locus in common with the probandum, [and provided that this probandum] is not the counterpositive of an absence resident [in a locus] possessing the indicator.²²

This definition consists of two conditions of which the first one states that there must be a “going-together” of the indicator and the probandum. Indirectly, the second one poses a restriction on the locus of the indicator; it must not be a locus that possesses an absence having the probandum as its counterpositive (pratiyogi). In other words, it must not be a locus that possesses the indicator, but lacks the probandum. The second condition seeks to account for the invariable character of the concomitance. A discussion of the function and import of the first condition will be taken up later.

3.1 Grasping vyāpti

An inference is conceived of by the Navyanaiyāyikas as one of the four available instruments to gain knowledge about what is, in fact, the case. Using some Western terminology this amounts to the demand that an inference not only must be valid, but, in addition, that it must be sound, too.²³ Consequently, the acceptability of the premisses to be used in order to infer a conclusion, i.e. to give cause to an epistemic event reflecting the way (a part of) the world really is, has to be ascertained previously. From this it can be understood that in Navyanyāya literature there is not only attention for the definition of vyāpti, but also for the grounds on the basis of which the acceptance of a vyāpti-relation is justified.

At first the knowledge of a vyāpti-relation is led back by Annaṃbhaṭṭa to a repeated observation of a going-together as can be read from *Tarkasaṃgraha* 45. In the *Dīpikā*, however, he points out that this view is inadequate; even if the going-together of smoke and fire is observed a hundred times, then still it cannot be excluded that there is a locus having smoke but lacking fire. How is it possible, he addresses himself, to grasp the vyāpti-relation

²²hetuman-niṣṭha-viraha-apratyoginā sādhyena hetor aikādhikaraṇyaṃ vyāptir || *Bhāṣā-Pariccheda* 69. Annaṃbhaṭṭa gives a similar definition in *Tarkadīpikā* 44: hetu-samānādhikaraṇa-atyantābhāva- apratiyogi-sādhyā-sāmānādhikaraṇyaṃ vyāptiḥ ||

²³In FPL a distinction is made between valid inferences and sound inferences. A sound inference is a valid inference the premisses of which are all true. So, the set of sound inferences is a subset of the set of valid inferences. This distinction, as it seems to me, is not acceptable to a Navyanyāya logic, for, since it excludes unsound premisses, it is quite unthinkable that it would allow for valid inferences having unsound premisses.

in which smoke stands to fire, while it is impossible to observe all cases of smoke and fire?²⁴

This question takes a particular course if it is looked upon in connection with the Navyanyāya ontology of the whole according to which a whole is not the same entity as, and is therefore to be discerned from, the sum of its parts. So, even if it would be possible to observe all instances of smoke and fire, the conclusion that smoke goes together with fire *in general* would still be impossible, since smoke in general, the generic entity smoke-ness, is not the same as the sum of all the instances of smoke.

Realizing this characteristic of Navyanyāya ontology Annaṃbhaṭṭa concludes that correct knowledge of a vyāpti-relation is not obtained, nor can be obtained, by generalizing from particular instances. Instead it is stated that knowledge of vyāpti arises from a so-called “extraordinary perception” (sāmānyalakṣaṇā pratyāsatti), a form of perception that gives rise to the perception of a certain generic entity, and that follows immediately after the normal perception (laukikapratyakṣa) of the entity exemplifying the generic entity at hand.²⁵ So, according to Annaṃbhaṭṭa vyāpti is a relation between *generic* entities. In addition to this he clearly states that knowledge of vyāpti, i.e. knowledge of the invariable going-together of two generic entities, is not the same as the knowledge of the going-together of all instances of these generic entities. The latter being restricted to those and only those that are omniscient.

Knowledge of a vyāpti-relation between two generic entities *X* and *Y* is what allows an agent, to make use of some terms borrowed from situation semantics, to infer soundly that a situation being of type *X* contains the information that there is a situation of type *Y*. One could also say that knowledge of this kind in some way gives direction to what is to be expected. In other words, confronted with a situation of type *X*, one may expect that a situation exemplifying *Y* can be found there, too.

The notion underlying *vyāpti* is “being related to the same locus”. Strictly speaking, I think, this notion offers the possibility to consider two entities appearing in the same locus one after another as two entities being related to the same locus. This possibility, however, is blocked by the Navyanyāya epistemology. To know two entities as being related to the same locus presupposes the presence at a certain moment of a complex object comprising both entities. For it is only then that the corresponding epistemic event

²⁴ *Tarkadīpikā* 45

²⁵ See *Tarkasaṃgraha* 42.

and, consequently, the knowledge of these two entities as being related to the same locus, can be said to have its proper cause. The perception of two entities appearing one after another in the same locus, I think, would be analyzed by the Navyanaiyāyikas in terms of two successive epistemic events each having its own object. Following this line of thoughts the first perception would be analyzed as a *jñāna* that derives its content from a complex object containing an exemplification of *X* but lacking an instantiation of *Y*. But with respect to an assumed *vyāpti*-relation between *X* and *Y*, this is what is called a cognition of deviation of *X* and *Y*, and as such it rules out the very acceptability of the *vyāpti*-relation:

T3 Apprehension of *vyāpti* [obtains if] there is a cognition of a going-together of the indicator and the probandum and [provided that] a cognition of [their] deviation is lacking.²⁶

So, it is to be concluded that knowledge of a *vyāpti*-relation, i.e. the generic knowledge of a systematic relation between two generic entities *X* and *Y*, implies that both entities are to be instantiated simultaneously.

Fragment T3 states the conditions the satisfaction of which justifies the knowledge of a *vyāpti*-relation. It displays some remarkable similarities with the definition of *vyāpti* as represented in T2. A difference to be noted though, is that T3, in contrast with T2, leaves ample room for an interpretation according to which the correctness of the knowledge of a *vyāpti*-relation is *relative with respect to the total amount of knowledge available to a particular agent at a given moment*. Take, for example, someone who never saw fire anywhere but in a kitchen. On the basis of T3 this person would be justified in accepting that “Wherever there is fire, there is smoke”, since he possesses the knowledge of a locus that fire and smoke have in common and he does not know of a locus that possesses fire but lacks smoke. However, since the relation expressed by “Wherever there is fire, there is smoke” is not accepted as a genuine *vyāpti*-relation it has to be settled that the absence of a cognition of deviation is a necessary indeed, yet not a sufficient condition for the correctness of the apprehension of *vyāpti*.

Not being a sufficient condition, a fulfilment of the requirement that there must not be a cognition of deviation allows one to conclude, strictly speaking, that the *vyāpti*-relation under consideration is “not false”. Or, what amounts to the same, given that the requirement is met, there is no

²⁶ *vyāptes grāhakaṃ hetu-sādhyā-sahacāra-darśanaṃ vyabhicāra-darśana-abhāvas ca | Maṇikaṇa, Vyāptigrahopāya-prakaraṇa. Sarma (1960), pp. 34-35.*

evidence on the basis of which it can be concluded that the vyāpti-relation is false. This, however, is not to say that the vyāpti-relation is “true”, for the amount of knowledge justifying the conclusion that a vyāpti-relation is “not false” might grow into a knowledge-state on the basis of which it turns out to be “false”. It is, of course, also possible that the knowledge grows into evidence on the basis of which the relation can be said to be “true”. In the remainder of this paper I will capture this aspect by saying that a vyāpti-relation that is “not false” is *assertable*. The notion of “being assertable” opposites “being unassertable” and ought to be distinguished from both “being true” and “being false”.

What we have then, is, in fact, an intuitionistic conception of negation, according to which “not not p ” is taken to mean that there is no evidence for concluding that p is false, and, furthermore, that the lack of evidence for “not p ” is not the same as evidence for “ p ”. I have resorted to this conception, for, as it turns out, the Navyanaiyāyikas were quite aware of the insufficiency of the criteria of non-deviation. That is to say, they took resource to some auxiliary devices, notably *tarka* and *upādhi*, in order to obtain more certainty with regard to a vyāpti-relation that is “not false”. Without going into details, *tarka* can be conceived of as a means by which it is pointed out that the rejection of a vyāpti-relation is in conflict with other assumptions already adopted. *Tarka*, then, can be looked upon as a device for extending the evidence on the basis of which a vyāpti-relation is “not false” by taking some previously ascertained assumption into consideration, in such a way that the evidence develops into evidence on the basis of which the vyāpti-relation must be “true”. The discovery of an *upādhi*, on the other hand, that is to say, the detection of an entity that is present whenever the probandum is, but that is not always present whenever the indicator is, does turn the vyāpti-relation into a false one, or, as I want to present it, the evidence grows into evidence on the grounds of which a stated vyāpti-relation can definitely said to be “false”.

3.2 Contraposition

In Navyanyāya a distinction is made between “positive-vyāpti” (*anvaya-vyāpti*) and “negative-vyāpti” (*vyatireka-vyāpti*). As can be read from the *Tarkasaṃgraha*, this distinction relates to the kind of entities involved: “A vyāpti-relation between an indicator and a probandum is positive-vyāpti. A

vyāpti-relation between the absences of these is negative-vyāpti.”²⁷ Given the vyāpti-relation “Wherever there is smoke, there is fire”, Annambhaṭṭa’s formulation does not give us any clues as to the question whether the negative vyāpti-relation is to be taken as “Wherever there is absence of smoke, there is absence of fire”, or as “Wherever there is absence of fire, there is absence of smoke”, since negative entities are involved in both expressions. But, since negative vyāpti-relations have the same characteristic (anugama) as positive vyāpti-relations, we know that they also have to fulfil the criteria of non-deviation. Hence, we can conclude that only “Wherever there is absence of fire, there is absence of smoke” expresses a genuine negative vyāpti-relation.

The distinction between positive and negative vyāpti-relations has given several authors cause to assume that the law of contraposition, at least partly, has been recognized in Navyanyāya logic.²⁸ Commonly, this claim is supported by resorting to the expressions “Wherever there is smoke, there is fire” and “Wherever there is absence of fire, there is absence of smoke”. These expressions are translated in the language of FPL thereby yielding something like “ $\forall x(Rx \rightarrow Vx)$ ”, and “ $\forall x(\neg Vx \rightarrow \neg Rx)$ ”, respectively. Next to this it is noticed that according to the law of contraposition holding in FPL the expressions “ $\forall x(Rx \rightarrow Vx)$ ” and “ $\forall x(\neg Vx \rightarrow \neg Rx)$ ” are logically equivalent; i.e. they have the same truth-value under every interpretation of their letters. Hence, it is stated that, since the logical calculus of FPL applied to the expression “ $\forall x(Rx \rightarrow Vx)$ ” yields the logically equivalent expression “ $\forall x(\neg Vx \rightarrow \neg Rx)$ ”, and since Navyanyāya logic accepts “Wherever there is smoke, there is fire”, as well as “Wherever there is absence of fire, there is absence of smoke” as expressions of genuine vyāpti-relations, the same results are obtained both in FPL as in Navyanyāya logic. And this is taken to be evidential of the claim that, to a certain extent, the same principles underlying FPL are respected in Navyanyāya logic, too.

This contention, and in particular the lines of reasoning according to which it is established, should be submitted to a critical examination, especially since I believe that it misses a point. For to claim that the law of contraposition is a part of Navyanyāya logic amounts to claiming, in the first place, that in Navyanyāya logic the expressions “ $\forall x(Rx \rightarrow Vx)$ ” and “ $\forall x(\neg Vx \rightarrow \neg Rx)$ ” have the same truth-value under every interpretation of

²⁷hetu-sādhyayor vyāptir anvaya-vyāptiḥ tad-abhāvayor vyāptir vyatireka-vyāptiḥ | *Tarkadīpikā* 48. See also *Bhāṣa-Pariccheda* 142-143.

²⁸Mullatti (1977), p. 77, Staal (1962a), p. 640.

their letters, and secondly, that the *truth conditions* of the one expression are the same as the truth conditions of the other. Of these two sub-claims, only the first has been stated explicitly and the question as to the acceptance of the law of contraposition in Navyanyāya logic is taken to be the question whether this claim is justified.

It has not gone unnoticed, though, that already this claim runs into obvious difficulties, for there are certain inferences in the context of which it is not allowed to make use of the contrapositive of a vyāpti-relation in order to derive the desired conclusion. These inferences are named *kevala-anvayī* and *kevala-vyatirekī*, two notions that I will render as “only-positive” and “only-negative”, respectively. An only-negative inference is one the conclusion of which follows on the cognition that the absence of the indicator is the term of a vyāpti-relation having the absence of the probandum as its subject, although there is no cognition of a going-together of the indicator and the probandum [in a locus different from the pakṣa].²⁹ A stock example of an only-negative inference is, stated elliptically: “Water has no smell because it differs from what is not different from earth.” In order to derive the conclusion that water has no smell, use is made of the vyāpti-relation “Whatever differs from what is different [from earth], has no smell”. To this the Navyanaiyāyikas would not object, though they would disapprove of an inference that employs the contrapositive vyāpti-relation “Whatever has smell, that does not differ from what is not different from earth”. The reason for this is that, since ‘earth’ is ontologically conceived of as the one and only substance that possesses ‘smell’ (*gandhavatī*), the going-together of ‘smell’ and the property of ‘being different from what differs [from earth]’ can only be illustrated by reference to the locus ‘earth’. Hence, we run into the difficulty that in order to infer that earth possesses smell, it is impossible to give an example of a locus that differs from the pakṣa ‘earth’ and that, at the same time, possesses ‘smell’ as well as the property ‘being different from what differs [from earth]’. The inference breaks down on the requirement that the example cited in the third step of the inference-for-another should involve a locus that is different from the pakṣa and turns into a circular reasoning.

The reason for excluding the contrapositive of a vyāpti-relation figuring in an only-positive inference is altogether a different one. An only-positive

²⁹kevala-vyatireki tad-ucyate, yatra sādhyā-sādhana-sāmānādhikaraṇyāgrahe ‘pi sādhyā-abhāvaṃ prati hetvābhāvasya vyāpakatāgrahādanumitiḥ | *Mañikāṇa*, Sarma [1960] p. 42.

inference is described as one involving a probandum that is not the counter-positive of a (constant) absence.³⁰ That is to say, the absence of the probandum does not occur in the pakṣa, nor in any locus that is different from the pakṣa. An example of this kind of inference is given by: “[The] pot is nameable, because it is knowable, like a cloth.” To reach the conclusion that the pakṣa ‘pot’ is nameable resource is taken to the vyāpti-relation “Whatever is knowable, is nameable”. This relation is unproblematic, but its counterpositive is. The expression “Whatever is not nameable, is not knowable” states a systematic relation between ‘absence of nameability’ and ‘absence of knowability’, both of which are conceived of as *aprasiddha*; i.e. “hypothetical” or “unlocatable”, entities. It has been noticed that the Navyanaiyāyikas exclude *aprasiddha* terms from philosophical and logical discourse and that this feature of Navyanyāya logic gives cause to the exclusion of a vyāpti-relation like “Whatever is not nameable, is not knowable”. This, of course, I do not dispute, though I do think that there is little more to say about this matter, in particular when it is related to the conditions that are imposed on the grasping of a vyāpti-relation (vyāpti-graha). So, let me dwell on this subject a little longer.

3.2.1 The presupposition of a vyāpti-relation

To accept a vyāpti-relation, i.e. to know that it is not false, one has to know of a locus that the indicator and the probandum have in common, and one must not know of a locus that possesses the indicator but lacks the probandum (see T3). But with regard to an unlocatable entity the cognition of a locus possessing that entity together with any other entity whatsoever is impossible, since there is no locus that possesses that entity. Hence, knowledge of a vyāpti-relation between, say, ‘absence of nameability’ and ‘absence of knowability’ is totally unsupported. That is to say, there is nothing in reality that can be looked upon as the proper cause of the jñāna under consideration. The point I want to make is that, as I see it, the *primary* reason for excluding a relation like “Whatever is not nameable, is not knowable” is not that ‘absence of nameability’ and ‘absence of knowability’ are *aprasiddha* entities, but that a locus possessing both entities is lacking. This notwithstanding, of course, that from the fact that ‘absence of nameability’ is unlocatable it obviously follows that there can be found no locus possessing that entity, let alone that there can be found a locus that it shares with another entity.

³⁰ atyantābhāvāpratiyogisādhyakṣaṃ kevalānvayi | *Maṇikaṇa*, Sarma [1960], p. 40.

The reason I have for seeking the motivation for excluding certain vyāpti-relations primarily in the lack of a common locus, rather than in the occurrence of terms denoting unlocatable entities, is that the former has a slightly broader scope than the latter. Suppose, for example, that the second condition of T3 is fulfilled, but the first is not. In that case, there is no cognition of deviation (fulfillment second condition), i.e. there is no cognition of a locus possessing the indicator, but lacking the probandum, and, since the first condition is not satisfied, there is no cognition of a locus possessing the indicator as well as the probandum. In short, then, there is no cognition of the indicator *with* the probandum, nor is there a cognition of the indicator *without* the probandum. It seems to me that, consequently, there can be no cognition of the indicator at all, for the cognition of an entity presents that entity either with, or without some other entity. From this it follows that the indicator is *possibly* an unlocatable entity. Now, since unlocatable entities are excluded without exception, it seems reasonable to assume that Navyanyāya logicians would not allow for vyāpti-relations involving a *possible unlocatable* indicator either.

Suppose, to continue, that neither the first, nor the second condition is satisfied. Then there is no cognition of a going-together of the indicator and the probandum. But, although there is no cognition of deviation either, likewise this does not seem to suffice for accepting the alleged vyāpti-relation. For vyāpti is going-together without deviation, and the question whether a going-together is deviation or not seems rather pointless if there is no going-together at all. On the basis of these considerations, then, I propose to take the expression “There is a locus that the indicator and the probandum have in common” to be the *presupposition* of a vyāpti-relation, such that a vyāpti-relation the presupposition of which is not satisfied is neither true, nor false, that is, *unassertable*, thereby ascribing Navyanyāya logic a partial semantics. It turns out that the presupposition of a vyāpti-relation as I have stated it explicitly amounts to the first condition of the definition of vyāpti represented in T2. This also offers a possibility to relate the fragments T2 and T3 in a more intrinsic way. While the first criteria of definition T2 states the presupposition of a vyāpti-relation explicitly, the first criteria of T3 states the condition the satisfaction of which assures that the presupposition is fulfilled: given a *cognition* of a locus where the indicator goes together with the probandum, the presupposition “There is a locus that the indicator and probandum have in common” is true. The latter, since it is a tenet of the Navyanyāya “logic” of perception that to have a cognition normally ‘means’ that the object cognized obtains. That

is to say, it is assumed that there are systematic relations between mental representations or, as I have called them, structural contents of *jñāna*'s, and actual objects exemplifying these structural contents. Without going into details, it can be readily seen that precisely this feature of Navyanyāya epistemology provides with well-motivated reasons for a semantical account of presuppositions and hence for a partial semantics.

3.2.2 Truth-conditions

Returning to the central issue of this paragraph, the question whether contraposition is a law of Navyanyāya logic seems to have a negative answer, since contraposition is not allowed in the context of an only-negative or an only-positive inference. That is to say, the expressions " $\forall x(Rx \rightarrow Vx)$ " and " $\forall x(\neg Vx \rightarrow \neg Rx)$ " do not have the same truth-value under every interpretation of their letters. Contrary to what one would expect, perhaps, this aspect of Navyanyāya logic has not given cause to the rejection of the claim that the law of contraposition is a part of Navyanyāya logic, but, instead, to another misrepresentation concerning the conception of, what occasionally is called, the *restrictions* on the law of contraposition.³¹ It says that contraposition is a principle accepted in Navyanyāya logic, except under certain interpretations of *hetu* and *sādhya*; i.e. those interpretations that give rise to an only-positive, or an only-negative inference. However, most interpretations give cause to another type of inference, called *anvaya-vyatirekī* (positive-negative). With respect to this type of inference it is claimed that the law of contraposition is, indeed, accepted.

A stock example of a positive-negative inference is: "There is fire on the mountain, because there is smoke". The relevant *vyāpti*-relation is: "Wherever there is smoke, there is fire". This relation as well as its contrapositive "Wherever there is absence of fire, there is absence of smoke" are accepted by the Navyanyāya logicians. However, to claim that within the context of positive-negative inferences the law of contraposition is valid, as I have pointed out, does amount not only to the claim that the expressions " $\forall x(Rx \rightarrow Vx)$ " and " $\forall x(\neg Vx \rightarrow \neg Rx)$ " have the same truth-values under every interpretation of their letters, but also that these expressions have the same *truth conditions*. While the former, perhaps, may be the case with respect to positive-negative inferences, the latter is clearly not, as can be readily seen from the following.

³¹See, for example, Mullatti [1977], p. 78-79.

In case I know that “Wherever there is x , there is y ” is true, I know that there is a locus where x goes together with y . The knowledge that “Wherever there is absence of y , there is absence of x ”, on the other hand, presupposes that the knowledge of a locus possessing both ‘absence of x ’ and absence of y ’ has been ascertained previously. Obviously, the fact that I know of a locus possessing both x and y , does not imply that I also know of a locus possessing both the absence of y and the absence of x . So, since I can conclude to “Wherever there is x , there is y ” in case I know of a locus possessing both x and y , and given the absence of a cognition of deviation, the very knowledge on the basis of which I can do so, does not allow me to conclude to “Wherever there is absence of y , there is absence of x ”, for knowing that there is locus that x and y have in common, and knowing that there is a locus that the absences of x and y have in common, is just not the same thing. It has to be concluded, then, that, since they have different presuppositions, the vyāpti-relations “Wherever there is smoke, there is fire”, and “Wherever there is absence of fire, there is absence of smoke” have different truth-conditions. That is to say, I am not allowed to conclude that “Wherever there is absence of fire, there is absence of smoke” is true as soon as I know that “Wherever there is smoke, there is fire” is true. Consequently, the law of contraposition is not applicable, not even in the context of a positive-negative inference. But then, this is just what one would expect of a logic based on a partial semantics.

4 A logic of inference

4.1 Generic instantiation

The distinction between a non-verbal type of inference, the “inference-for-oneself” (svārtha), and a verbal type of inference, the “inference-for-another” (parārtha) is typical of the Navyanyāya theory of inference having no analogue in the history of Western logic. A feature that can be taken as a support for the thesis that the Navyanyāya theory of inference is better approached going from a general theory of meaning that takes us outside the realm of sentences and relations between sentences of any language, natural or formal. A general sketch of such a theory has been given in § 2.2. An interpretation of the Navyanyāya scheme based on this theory will be developed in the course of this paragraph. For now, I want to focus my attention to the inference scheme as it is described by Aṅṅambhaṭṭa among others, and to the problems that arise whenever this scheme is interpreted

taking the Western classical framework as a starting point. These problems I subsume under the heading “generic instantiation”.

Aṅṅambhaṭṭa tells us that the inference-for-another is to be used by anyone who wants to convince someone else of a conclusion already established by means of an inference-for-oneself. An inference-for-another consists of five steps, or verbal expressions, of which the following is a standard example:³²

- (1) [That] mountain possesses fire.
- (2) Because it possesses smoke.
- (3) Wherever there is smoke, there is fire, like [in] a kitchen.
- (4) And that [mountain] is similar [to a kitchen].
- (5) Therefore, it is so [as stated under (1)]

When this inference scheme is looked upon from the perspective of Western classical logic it is most obvious to reduce it to the inference: “Wherever there is smoke, there is fire. There is smoke on the mountain. Therefore, there is fire on the mountain.” This inference exemplifies the scheme: $\forall x(Sx \rightarrow Vx), Sa \rightarrow Va, Sa / Va$, a scheme that is valid on the basis of the rules of inference *universal instantiation* and *modus ponens*. For reasons of notational convenience I will not speak of universal instantiation and modus ponens, but I will make use of the notion “generic instantiation”, which I will take to mean the successive application of universal instantiation and modus ponens.

Within a classical framework the inference as described by Aṅṅambhaṭṭa then, is considered to be valid, because it can be reduced to an inference that exemplifies a scheme which is valid on the basis of generic instantiation. Although in this way the legitimacy of the Navyanyāya inference somehow can be accounted for, it immediately becomes clear that this approach leaves no room whatsoever for a logical account for the alleged necessity of both the example, “kitchen” in the case at hand, and the fourth step as a whole. So, what we have here is an inference that, from a classical point of view, is clearly valid, but, due to the example and step 4, that does not have the form of a valid argument on traditional logical grounds. As far as classical logic concerns, then, both are to be looked upon as being outside the scope of logic.

³² *Tarkasaṃgraha* 45

My objection to this way of approaching Navyanyāya inferences is mainly of a methodological nature. It aims at the -tacit- assumption that Navyanyāya inferences are valid solely on the basis of the inference-rule generic instantiation. Under this assumption one is overlooking the possibility that under certain circumstances the application of the rule generic instantiation could be liable to limitations, or even is not allowed at all. With respect to this it is significant to note that Western classical logic makes no use of a notion of subject matter, of what in particular an argument is about. As a consequence, in a classical analysis of inferences all that is specific of an argument is lost leaving nothing but underlying logical forms on the one hand, and general rules to operate on these forms on the other. This, as it seems to me, really is the heart of the matter, especially since it is unmistakable that subject matter, embodied in the notion of pakṣa, plays a very important role in Navyanyāya logic.

Since the evidence seems to be otherwise, I have no reason whatsoever to believe that from a Navyanyāya point of view the example as well as step 4 are logically superfluous. The task I appoint to a formal interpretation of Navyanyāya logic, then, is that it does justice to this outlook, that is to say, a formal interpretation of Navyanyāya logic should be able to justify logically both the example and step 4. In what follows I will indicate the starting points on the basis of which such an interpretation, perhaps, could be achieved.

4.2 Inference and subject matter

Validity depends on the semantic content of the entities which are taken to be the constituents of an inference. Generally speaking, this is characteristic not only of FPL, but also of situation semantics. In fact, it is a basic starting point of every logical theory. This being so, the question arises as to what features account for the differences between logical theories taking the same precept as their basic principle. Recalling what has been under discussion earlier (see §§ 1, 2), it will not come as a surprise that this question boils down to the one asking for a precise notion of what is held to be the semantic content of the entities making up an inference.

In FPL the semantic content of the (linguistic) entities constituting an inference is derived by resorting solely to the forms of the expressions involved. The language used is designed for stating these forms explicitly and provides with symbolic representations from which the semantic content of the expressions represented can be derived straightforwardly. In other

words, the semantic content of an expression is contributed to by its (syntactical) form only, or, to bring the matter to a head, its semantic content being totally independent of circumstances is not indexical. Subsequently, the language of FPL consisting of devices for generating symbolic representations and rules for manipulating these can be called a *direct language*. A direct language, then, is one in which the validity of an inference of S from S', \dots, S'' can be determined by taking into consideration the representations of S', \dots, S'' and S only.

A radically different conception is put forward in situation semantics. The disparity proceeds from an assumption taken as very basic in situation semantics, an assumption that is quite incompatible with the nominalistic basis of FPL resorted to in Ideal Language Philosophy. It says that, in general, the semantic content of a representation depends not only on the features of the representation itself, but also on the circumstances in which it arises. This holds, it is said, for linguistic expressions as well as mental events, because both are conceived of as representations in their own right. Since the validity of an inference depends on the semantic content of the representations involved, and since the semantic content of a representation in turn depends on the circumstances in which it occurs, it follows that a valid inference also depends on the embedding circumstances. What we have, then, is a so-called *situated inference*; i.e. a conception of inference that enters into the agent's physical embedding in the world. As a consequence, the language used in situation semantics is not a directly, but a contextually interpreted language. That is to say, the expressions of this *semantically situated language* have meanings in contexts only. A semantically situated language carries with it a rather different notion of validity, because it is a language in which whether or not an inference of S from $S' \dots S''$ is valid depends on the relation between the contents $I(S', c'), \dots, I(S'', c'')$, and hence can depend on the embedding circumstances $c' \dots c''$ and c in which the representations occur.³³

Taking resource to a semantically situated language, it has to be acknowledged that the same representation, i.e. a construction out of generic entities in case of mental representations, can be a part of, or, what amounts to the same, can contribute to, different contents. Since the relation of entailment is a relation between semantic contents, it follows that a representation S' can be part of a content I' on the basis of which it is allowed to infer the conclusion S , while the very same representation occurring in

³³Compare Barwise [1989], p. 146.

different circumstances can contribute to another content I'' that does not allow at all for the inference of S . Hence, what is needed is some kind of mechanism for capturing the parameters which, just like the representation itself, contribute to the semantic content and, thus, impose restrictions on the information conveyed by the particular situation s' represented by S' , information about something besides s' .

Now, let us suppose that the language used by the Navyanaiyāyikas is not a directly interpreted, but a semantically situated language and try to reconstruct the Navyanyāya scheme of inference in accordance with the requirements set forwards by this language. The inference-for-another, as Annambhaṭṭa describes it, sets in with a formulation of what exactly is to be inferred. The second step provides with the reason on the basis of which this can be done. It is important to note that the statement by which the reason is presented has a very specific subject matter. It is not about there being smoke somewhere, but it is about a particular place possessing smoke at a particular time. That is to say, the statement of the reason is about the *pakṣa*. From the perspective of a semantically situated language the first two steps taken together can be reconstructed as stating that there is a particular situation comprising a particular property ('smoke'), which situation contains the information that there obtains a different situation which has another property, notably 'fire'.³⁴ When I, furthermore, assume that the Navyanyāya logicians did not presuppose that the one who had to be convinced did possess any of knowledge relevant with respect to the inference of the conclusion, then the remainder of the inference can be looked upon, in the first place, as providing with the means to convince the other that this particular situation, indeed, does contain the information stated in the first step, and secondly, as furnishing with a reason on the basis of which it can be decided that there are no decisive arguments to suppose that this particular situation does not allow for extracting that very information after all. In a semantically situated language the latter requirement immediately proceeds from the role assigned to the circumstances with respect to semantic contents and hence from the importance attached to subject matter. It is just one of the typical differences between a directly interpreted and a situated language.

³⁴Note that in situation semantics the notion of a situation has little to do with the notion of (occupying) a spatio-temporal location. That is to say, the theory allows for different situations occupying the same spatio-temporal location. Compare assumption 4 mentioned in § 2.2.1.

4.2.1 The example

A basic tenet of situation semantics is that systematic relations between types of situations are what allow one situation to contain information about another situation. In order to be able to recognize a situation s as meaningful, that is, as conveying information about another situation, an agent has to be attuned to a constraint, or type-meaning, comprising the type of the particular situation s and another type of situation. For it is claimed that only an attunement to a type-meaning is what allows an agent to conceive of a particular situation as having a situation-meaning. Applying this tenet to the Navyanyāya scheme of inference, it can be said that in order to convince someone that a particular situation (pakṣa) containing ‘smoke’ has the situation-meaning that there also obtains a situation having a particular fire as its constituent, one has to draw his attention to the type-meaning “Wherever there is smoke, there is fire”. Note that under the interpretation I propose an expression of a vyāpti-relation is interpreted as an expression of a type-meaning. Keeping with this view it is, furthermore, possible to translate “vyāpti” as “involvement”, “vyāpya” as “[what] involves”, and “vyāpaka” as “[what] is involved”.³⁵

So, the statement of the type-meaning “Wherever there is smoke, there is fire” provides the one to be convinced with the means to assign a situation-meaning to the pakṣa, the situation under consideration. But, as I have pointed out above, it is required that the vyāpti-relation resorted to is assertable. That is, its presupposition must be satisfied. The example can well be thought of to serve this purpose. By giving an example, i.e., a locus that the indicator and the probandum have in common and that is known as such by philosophers as well as laymen, evidence is provided with on the basis of which it can be said that there is a locus having both the indicator and the probandum, and, consequently, that the assertability of the vyāpti-relation at hand is assured, and hence its usability, is allowed for.

4.2.2 The example and the similarity

By expressing a vyāpti-relation or type-meaning the assertability of which is ascertained the first desideratum of a situated inference is met. Given an awareness of the type-meaning “Wherever there is smoke, there is fire” the

³⁵So, “smoke is pervaded by fire”, can be written as “smoke involves fire” and, the other way round, “fire pervades smoke” can be rendered as “fire is involved by smoke”. These translations are obviously not philologically motivated, but they follow from the perspective of interpretation I have chosen.

meaning of a particular situation containing smoke can be determined. But then we run into the second requirement according to which there must not be any reasons on the basis of which the attribution of this very information to the situation under consideration is blocked. Whether there are such reasons or not, is a question that can only be answered by taking resource to the circumstances embedding this particular situation, the pakṣa, and, occasionally, to those embedding the process of inference taken as a (complex) situation in its own right. According to the interpretation under discussion, it is at this point that the example comes into play for a second time. This time, though, in connection with the similarity put forward in the fourth step.

The similarity pointed out in step four takes two terms the first of these, as I see it, being the pakṣa and the other provided with by the example. The question, then, is: What does the similarity amounts to? That is to say, in which respect is the pakṣa similar to the example? And, furthermore, it must be asked in which way the knowledge of this similarity contributes to the validity of the inference of the conclusion.

In Navyanyāya it is said that there are two kinds of examples called *sapakṣa* and *vipakṣa*, respectively. A *sapakṣa* example is an example of a locus with respect to which the presence of the probandum has been ascertained.³⁶ A *vipakṣa* example on the other hand is an example of a locus with respect to which the absence of the probandum has been ascertained.³⁷ As to the probandum 'fire' a lake is said to be a *vipakṣa* example, i.e., a locus where the probandum definitely does not occur, and a kitchen is viewed as a *sapakṣa* example, because it is a locus where fire does occur. So, the similarity between a mountain and a kitchen could be taken as amounting to the statement that a mountain, just like a kitchen, is a locus that does not possess a constant absence having fire as its counterpositive. That is to say, the mountain is a locus with respect to which the presence of fire is not excluded. That is, as I take it to be, the presence of fire on the mountain is *possible*.

The notion of being a locus where the presence of the probandum is possible, however, can be understood in two different ways. It can be taken to mean that it is not true that the presence of the probandum is impossible because of the physical nature of the pakṣa itself. This, at least, is a necessary condition a pakṣa has to meet in order to be a possible locus of the

³⁶ niścita-sādhya-vān sapakṣaḥ || *Tarkasaṃgraha* 50.

³⁷ niścita-sādhya-abhāvavān vipakṣaḥ || *Tarkasaṃgraha* 51.

probandum. But is it also a sufficient condition? In other words, is a pakṣa being a possible locus of the probandum as far as its own physical nature concerns, always a locus where the presence of the probandum is possible?

Given the framework from which a semantically situated language proceeds, this question has to be answered negatively, for it has to be acknowledged that the circumstances can be such that the presence of the probandum is precluded, not by the physical nature of the pakṣa, but by the presence of other aspects constituting the circumstances in which the pakṣa is embedded. With respect to this it is significant to note that Udayana, for example, while discussing causality, reaches the conclusion that the coming into being of an effect is not only dependent on the presence of the relevant causes, but also on the absence of “blockades” (pratibandhaka) which prevent the effect from originating.³⁸ Taking this contention into account, what we have then, is that in order to be a locus where the probandum is possible a pakṣa must be such that (1) the presence of the probandum is not precluded by its own physical nature, and (2) it must not be a locus (which is a part of a situation) containing “blockades” preventing the presence of the probandum.

The knowledge that with respect to a certain time the pakṣa meets the two requirements mentioned above surely is relevant to the validity of the inference of the conclusion, for the conclusion to be reached is not that the probandum obtains somewhere, but that the probandum is present at the pakṣa. Especially, since in Navyanyāya it is claimed that the ultimate criteria for establishing the validity of an inference is given by the action to which the conclusion leads. That is to say, a conclusion, taken as a (mental) representation of what is in fact the case, is valid if the action resulting from it is successful. This, again, is a reason for resorting to a semantically situated language in order to reconstruct Navyanyāya logic, for to claim that an inference is valid if the action it leads to is successful, cannot go without taking into consideration the circumstances in which the pakṣa is embedded and which, thus, contribute to the semantic content of the pakṣa, the situation under consideration. Since these circumstances are built up out of contingent aspects, it follows that the information conveyed by the pakṣa is also contingent and will vary under different circumstances. Hence, the same representation will contribute to different contents and, consequently, it will give rise to different inferences.

All this amounts to saying that the systematic relations between types of situations S and S' are an attunement to which allows an agent, given a

³⁸See *Nyāyakusumāñjali* I, 10, and the supplemental commentary.

situation s of type S , to infer that there also obtains another situation of type S' , are conditional on certain background conditions B , conditions that are, or are not, met by the environment. If the circumstances do not meet these conditions, then the systematic relation itself loses its significance with respect to a situation embedded in those circumstances. That is to say, the situation-meaning one would normally assign to that situation on the basis of an acquaintance with the relevant type-meaning cannot be obtained under those particular circumstances.

By this the starting points, as I believe, from which a symbolic reconstruction of Navyanyāya logic should proceed are given. They come down, to summarize, to the assumption that the Navyanyāya scheme of inference provides with the means for recognizing the meaning of the situation under consideration, the pakṣa, by pointing out the relevant vyāpti-relation (a type-meaning: $S \Rightarrow S' \mid B$) as well as an example by which the assertability of this relation is assured. And, furthermore, to the view that the scheme also provides with a device, i.e. the similarity between the pakṣa and the example, by which it is indicated that there are no reasons for believing that the situation under consideration does not have the situation-meaning one would expect solely on the basis of an acquaintance with the type-meaning. Under my interpretation I take the latter to be the statement that the same background conditions B in which the example is thought of to be embedded also obtain in (the environment of) the pakṣa.³⁹

The question as to how exactly a symbolic reconstruction of Navyanyāya logic proceeding from these starting points will look like is one I will not answer here. To this topic there are several other questions which will have to be taken up first and which will take us outside the scope of Navyanyāya logic and thereby outside the scope of this paper.

³⁹There are, of course, many parameters figuring in the background which can influence the validity of the application of a general rule in order to reach a conclusion. I have mentioned only two, notably the physical nature of the pakṣa, and the presence of blockades. The elaborate treatises on the definition of vyāpti, however, bring several other parameters in light as, for example, the relations that are in play.

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