THE NAVYA-NYĀYA THEORY OF INFERENCE

by

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ABSTRACT

This dissertation is an attempt to represent the Navya-nyāya (Nn) theory of inference in terms of a contemporary conceptual framework. There exist similar studies by able modern scholars, but these are either piecemeal, or, when comprehensive, rely mainly on traditional (western) logic. The present attempt is both relatively more comprehensive, and employs notions from contemporary logic.

Since the Nn theory of inference is couched in terms of cognitions rather than sentences, an effort is made to clarify the notion of *cognition*. It is argued that a cognition is an abstract and ontologically independent entity much in the fashion of the Fregean proposition, and that primarily it, as distinct from its linguistic vehicle, is the bearer of truth-values. The semantic model set up by the Navya-naiyāyikas (NNs) for a cognition is considered, and its inadequacy brought out with reference not only to universal cognitions, but also to certain modes of expression generally accepted as synonymous. These modes of expression also serve, in part, to bring out the inadequacy of the linguistic criteria that the NNs implicitly use for individuating cognitions. A further defect of the Nn semantic model is that it requires that *n*-adic predicates be reducible to monadic ones, a requirement that can hardly be fulfilled. Partly in the course of their search for a principle of individuating cognitions, the NNs bring in three notions, namely, *expectancy*, *competency*, and *proximity*. Of these, *expectancy* is viewed as a

syntactic property, and compared to a certain communication theoretic model for linguistic structure employing a finite state Markov process. *Competency* is sought to be understood with reference to Ryle's theory of category mistake, and, in the process, the difficulties of the thesis that unexampled (non-referring) terms lack competency are pointed out. *Proximity* is regarded primarily as an attempt at introducing some kind of word-order, especially into the shorter sentences of Sanskrit (which, strictly speaking, i.e., from a grammatical standpoint, have no rigid order).

Next, the Nn definition of inference--that inference is the instrumental cause of the conclusion--is examined, and the usual way of understanding it in a psychological sense is shown to be unsatisfactory. Inference is viewed as a set of cognitions such that the conclusion is a logical consequence of the set of the remaining cognitions. A case is made for understanding the term 'cause' in the above definition in a logical sense to mean an inference-form. It is shown that, on such an understanding, inference for oneself and inference for others collapse into one, and that both have exactly the same number of cognitions, namely, four, as elements. The resulting discrepancy between the number of sentences and the number of cognitions in inference is accounted for by means of non-logical considerations. The nature of each of the four elements is explained with particular emphasis on the second element, *pervasion*. The representations by Staal and Berg of the Nn definition of *pervasion* are considered and rejected, and a much simpler representation proposed. It is pointed out that the Nn distinction between positive

and contrapositive pervasions involves a recognition, with certain reservations, of the (complete) law of contraposition. The third element of inference, 'consideration', is shown to be superfluous, and Schayer's interpretation of it erroneous. It is argued that the elliptical expressions used to express the third and the fourth elements are intelligible only in relation to the early stages of Nyāya when the concept of pervasion as a member of inference had not yet evolved, and that they cease to be intelligible in relation to the later stages when pervasion is included as an element. This fact is used to point out the untenability of the suggestion that the Nn syllogism is really the Aristotelian argument from example.

The paradoxes of relativising pervasion to the inference containing it are brought out, and the theory of confirmation implicit in the Nn account of pervasion is fully reconstructed with special reference to Hempel and Goodman. The Nn account of another (non-syllogistic) form of inference is considered, and Staal's representation of it shown to be wrong. Finally, it is observed that the NNs do not call in question the formal validity of an inference, and that, for them, a fallacy is necessarily 'material'. It is also maintained that the customary view that the Nn notion of *accident* is a means of converting an unsound inference into a sound one is mistaken, and that the true function of an *accident* is to show up the falsity of a pervasion.

TABLE OF CONTENTS

		Page
CONVENTIONS AND ABBREVIATIONS		vii
CHAPTER		
0	INTRODUCTION	1
I	COGNITION AND SENTENCE (I)	26
II	COGNITION AND SENTENCE (II)	55
III	WHAT IS INFERENCE?	98
IV	THE ELEMENTS OF INFERENCE	126
V	A RECONSTRUCTION OF THE NAVYA-NYĀYA THEORY OF CONFIRMATION	172
VI	FORMS AND FALLACIES OF INFERENCE	211
CHRONOLOGICAL CHART OF AUTHORS		233
BIBLIOGRAPHY		236

LIST OF TABLES

TABLE		Page
1	Confirmatory Status of Observation Reports	195

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CONVENTIONS AND ABBREVIATIONS

The following conventions and devices are adopted in this thesis:

A. Translation I try to translate all Sanskrit words and passages as literally as possible. But frequently, considerations of preserving the original sense and/or English usage make it necessary to supply words which are not literal translations of anything in the original. Words thus supplied are enclosed either in square brackets or in round ones. Those in square brackets are necessary for understanding the sense of the given passage and have no counterparts in the original. Those in round brackets are explanatory in character, whether or not there is anything in the original corresponding to them; often, they also mitigate the damage done to English usage by a literal translation.

I translate all Sanskrit passages except those the paraphrases or free renderings of which appear in the body of the thesis. In the latter cases, usually the Sanskrit passages alone are cited in footnotes.

B. Italics As is customary, I set all Sanskrit expressions and passages (except proper names and their derivatives) in italics. I also use italics (1) for purposes of emphasis; and (2) for indicating in certain cases (e.g., qualifier, qualificand, pervader,

pervadend, probans, probandum, etc.) that I am talking, not of the italicised expression, but of the entity to which it refers.

C. Quotes Quotes are used (1) to form names of expressions (i.e., to mention them) whether in English or in Sanskrit; (2) to indicate that a certain sentence or a passage (but not a word or a phrase) enclosed in quotes is a translation of a Sanskrit sentence or a passage; (3) to indicate that the enclosed expression is used in a rather unusual way; and (4) to show that a certain sentence or passage in English is taken from a foreign source.

Generally, double quotes are used for sentences and passages, while single quotes are used for other expressions (e.g., words).

D. Vertical strokes When a sentence in Sanskrit or English is bounded by vertical strokes, it means that I am talking about the cognition expressed by that sentence, and not about that sentence itself. When the expression 'conclusion' (or 'inferential conclusion') is bounded by vertical strokes (i.e., '|conclusion|'), it serves as a translation of *'anumiti'*. The same expression without the strokes translates *'nigamana'*. *Anumiti* is a cognition; but *nigamana* is a sentence.

E. Transfer of logical terminology from sentences to cognitions Many terms which, according to contemporary logical usage are applicable to sentences, I use also in talking about cognitions so as to keep as closely as possible to the Nn mode of thinking.

Examples are: 'atomic', 'universal', 'truth-functional', 'positive', 'contrapositive', etc.

F. References References except in the case of abbreviations, are by name of the author, year of publication and page number. When there is more than one publication by the same author in a single year, they are numbered 'a', 'b', 'c', etc. and the year of publication is followed by one of these letters. The details about the works referred to are found in the Bibliography.

In the case of abbreviations, the mode of reference is different, and is indicated in G below.

G. Abbreviations

1. Titles of Books

a) Athalye = Athalye and Bodas 1930. References are to page numbers.

b) *BP* = *Bhāṣā-paricchedа* by Viśvanātha Nyāyapañcānana. Included in Jere 1933 and in Mādhavānanda 1954.*

c) *NB* = *Nyāya-bodhinī* by Govardhana. Included in Athalye and Bodas 1930.*

d) *NK* = *Nyāya-kośa*. See Jhalkikar 1928. References are by word-entries.

e) *NBh* = *Nyāya-bhāṣya* by Vatsyāyana. See (f) below.

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*References are by either sections or passages commenting on sections.

f) *NS* = *Nyāya-sūtra* by Gautama. Included in Viśvanātha's *Vṛtti* along with Vātsyāyana's *Nyāya-bhāṣya*. Ānandāśrama edition 1922.*

g) *SM* = *Siddhānta-muktāvalī* by Viśvanātha Nyāyapañcānana. Included in Jere 1933 along with *BP*.*

h) *TC* = *Tattva-cintāmaṇi* by Gaṅgeśa. The first two sections (*Anumiti-nirūpaṇa* and *Vyāpti-vāda*) of part two (*Anumāna-khaṇḍa*) are included in Goekoop 1967. References to these sections are by parts and lines. References to other portions of *TC* are indicated at appropriate places.

i) *TD* = *Tarka-dīpikā* by Annaṃbhaṭṭa. Included in Athalye and Bodas 1930.*

j) *TS* = *Tarka-saṃgraha* by Annaṃbhaṭṭa. Included in Athalye and Bodas 1930.*

2. Other Expressions

a) *IO* = Inference for others (*parārthānumāna*).

b) *IS* = Inference for oneself (*svārthānumāna*).

c) NN = Navya-naiyāyika.

d) Nn = Navya-nyāya.

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*References are by either sections or passages commenting on sections.

CHAPTER 0

INTRODUCTION

§ 0.1 During its long intellectual history extending over a period of two millenia, India has produced and nourished several schools of philosophy. These schools are usually divided into two broad groups, the heterodox (*nāstika*) and the orthodox (*āstika*),[1] on the basis of whether they accept the authority of the Vedas, the basic scriptures of Brahmanism. The former comprises Jainism, Buddhism and materialism (Cārvāka or Lokāyata *darśana*). The latter consists of six schools (*ṣaḍ-darśana*), namely, Nyāya, Vaiśeṣika, Sāṃkhya, Yoga, Mīmāṃsā (or Pūrva-mīmāṃsā or Karma-mīmāṃsā) and Vedānta (or Uttara-mīmāṃsā or Brahma-mīmāṃsā). Among these, it is the Nyāya school which is devoted mostly to logic, epistemology and methodology. Reflection on logical subjects first began in this school, though other schools also soon developed their own views as a result of an exchange of ideas between the different schools. But in course of time, the principal logical views (as also the style and terminology) of the Nyāya school won over those of the rest and became the stock in trade of all Indian schools of philosophy. This is especially true of the views that were developed

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[1] It is to be noted that in this context the words '*āstika*' and '*nāstika*' have nothing to do with belief in the existence of God (Chatterjee and Datta 1950:5).

in the last phase of the Nyāya school, extending approximately from the 13th to the 18th century. This phase of the Nyāya school is roughly called the Navya-nyāya (Nn) (new or modern Nyāya) (§ 0.13); a follower of Navya-nyāya is called a Navya-naiyāyika (NN). A Naiyāyika is a follower of the Nyāya school in general whether new or old.

§ 0.2 The present thesis is an attempt to understand mainly the Navya-nyāya theory of inference in terms of current western concepts. There have been, of course, attempts before to set Indian logic, including Navya-nyāya logic, in the contemporary conceptual framework, and by very able authors, such as Athalye (1930), Suali (1913),[2] Vidyabhusana (1921), Keith (1921), Sen (1924), Randle (1930) and Stcherbatsky (1962a). Despite their deep learning and wide scholarship both in Sanskrit and western philosophy, these authors inevitably suffer from a drawback. They knew only the traditional Aristotelian logic for the simple reason that the modern researches, which have revolutionised logic after nearly two thousand years of stagnation, were yet in the process of crystalisation and had not had their impact on Indologists. The importance of approaching Indian logic from the standpoint of more recent developments in logic was first stressed especially by Schayer (1933a). The first

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[2] Suali bases his account of the Nyāya system, as I do, on the syncretic (Nyāya-Vaiśeṣika) works. He also gives a long historical introduction. See Randle 1930:380.

Besides the works of these authors, there are also numerous histories of Indian philosophy like those of Radhakrishnan (1926, 1927) and Hiriyanna (1932), and specialised treatises like those of Chatterjee (1950) and Datta (1960).

significant step in this direction was taken by Ingalls. Ingalls' pioneering work (1951), by pointing out specific problems where techniques of modern mathematical logic need to be applied, has done a great service to the study of Indian logic. It created a new interest in the area, and it is perhaps because of Ingalls more than any other single person that Indian logic has in recent times received the attention of such competent contemporary logicians as Bocheński (1961), Staal[3] (and his students McDermott (1969) and Goekoop (1967)) and Jan Berg (1963, 1970). Bocheński was the first modern historian of logic to include an independent chapter on Indian logic. Since 1958, Staal has produced a series of able articles which have done much to clarify the notions of Indian logic. In addition to the work of these logicians, the work of Matilal[3] has been very helpful in elucidating the intricate concepts of Navya-nyāya logic. Another significant contributor to the study of Indian logic is Potter.[3] Both Potter and Matilal were students of Ingalls, and their work is naturally highly influenced by him.[4]

In spite of the good work done by these authors, however, there is still no treatment of the Navya-nyāya theory of inference as a whole

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[3]See Bibliography.

[4]Potter has also recently launched on an ambitious project of compiling an exhaustive encyclopaedia of Indian philosophies running over several volumes. The bulky first volume is already out and is completely devoted to bibliography. It is the first systematic attempt at compiling a comprehensive bibliography of all available philosophical literature bearing on every school of Indian philosophy. It fills an acutely felt need.

that can be said to be even modestly comprehensive. Staal, Goekoop and Berg deal with select topics in that theory, and their work therefore, tends by its very nature to be piecemeal. My thesis hopes to remedy this situation to some extent.

There are, of course, different ways in which a purpose like mine can be achieved. One may, for instance, give an historical account of the subject either by taking each NN and examining his views on inference, or by taking each topic in the Navya-nyāya theory of inference and examining the views on it of different NNs. Or, one may concentrate mainly on some specific text or texts and try to make sense of the account of inference given there in terms of the contemporary idiom. I have opted for the latter course. What are the texts I have chosen and why I have chosen them are questions to which I provide answers below ($ 0.16).

$ 0.3 Accordingly, I begin, in the remainder of this Chapter, by presenting an historical and metaphysical perspective to the Navya-nyāya theory of inference. In Chapters I and II, after considering the basic concept of cognition, I turn to a consideration of the nature of a sentence, which according to the NNs is the vehicle of a cognition. In Chapter II, I also try to point out why the NNs, though primarily concerned in their logic with cognitions rather than with sentences, yet devote so much attention to a consideration of the nature of a sentence. I then proceed in subsequent Chapters to a direct treatment of inference. Chapter III deals with the nature of inference and Chapter IV examines

the nature of the different elements of inference. In Chapter V, I try to reconstruct the Nn theory of confirmation. The first part of Chapter VI is devoted to an account of the different forms of inference recognised by the NNs; the second part discusses certain aspects of the Nn theory of fallacies.

$ 0.4 Formal logic in India officially begins with the appearance of the *Nyāya-sūtra* (*NS*)[5] of Gautama (not to be confused with Gautama, the Buddha) at about 200 A.D. For, it is in the *NS* that the subject of inference, including the five-membered syllogism, is for the first time discussed. True, of the sixteen topics (*padārtha*)[6] that the *NS* deals with, only two directly bear on inference,[7] and the rest are all dialectical in character.[8] Even those two topics are disposed of summarily compared to the rest. Not only in terms of space, but also in terms of quality, the discussion of inference leaves much to be desired. There is, for instance, no mention of pervasion[9] (*vyāpti*) as a component in a

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[5]The *NS* is so called because of its aphoristic form. '*Sūtra*' means an aphorism.

[6]The word '*padārtha*' in this context does not mean a category as it does in later Nyāya-Vaiśeṣika literature, though it is sometimes translated as such (e.g., Vidyabhusana 1921:54; cp Athalye:73).

[7]These are: means of knowledge (*pramāṇa*) and member (*avayava*).

[8]The *NS* is mainly devoted to a discussion of the sixteen topics, and treats metaphysical questions only incidentally.

[9]A precise explanation of pervasion will be given below ($$ 4.3-19). It is enough now to note that it is something like a universal sentence.

syllogism, and the syllogism remains really an argument from analogy. Nevertheless, a beginning is made in thinking abstractly about arguments, a beginning which eventually expands to greater dimensions especially at the hands of the NNs. Though primarily a text for the Nyāya school, the *NS* had influence far beyond that school: it provided the starting point for subsequent logical thought in other schools as well. It is, therefore, rightly regarded as 'the organon of Indian logic' (Bocheński 1961:417, 425).

$ 0.5 Despite its great importance, the *NS* is not a totally original work. A mass of doctrine recognisably continuous with that embodied in it was already in existence prior to it; Gautama only sharpened and redacted it. When exactly this mass of doctrine itself took shape is not clear, but it is generally believed that it could not have been earlier than the Christian era (Randle 1930:9-17; cf Bocheński 1961:417). At any rate, it in turn had its origin in the methodology of discussion (Ānvīkṣikī) which itself stemmed from the Upaniṣadic speculations about the soul and evolved over a long period of time beginning from about 650 B.C. to about 100 B.C. (Vidyabhusana 1921:4-8; cf Keith 1921:11-13). There is ample evidence of this in the predominantly dialectical nature of the *NS* itself. The period during which the methodology of discussion evolved and flourished is a 'pre-logical' period and works like *Milinda-pañha* and *Kathāvatthu* (both ca 100 B.C.), which belong to this period, exhibit little trace of formal logic.[10] It is then the *NS* that represents

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[10] But compare Bocheński 1961:422-23.

the first phase in the development of Indian logic.

$ 0.6 The second phase spans across a long period of about a millenium from the second century A.D. to the twelfth. This phase is marked by great interaction between especially the Naiyāyikas and the Buddhists, though the Jains also made their contributions. The first two eminent Naiyāyikas of this period are Vātsyāyana (4th century A.D.) whose *Nyāya-bhāṣya* is the earliest extant commentary on the *NS;* and Uddyotakara (7th century A.D.) whose *Nyāya-vārttika* is regarded as 'one of the world's great treatises on logic' (Randle 1930:35). Vātsyāyana's fame rests mainly on the fact that his commentary sets forth the traditional interpretations, current in his time, of the aphorisms of Gautama. His logical achievements are meagre; on matters of logic he makes no advance on Gautama whom he closely follows. Inference for him is still mainly an argument from analogy. Though there is some evidence that he vaguely felt the need for pervasion, he does not yet fully appreciate its importance. Nevertheless, Vātsyāyana deserves a place in the history of Indian logic not only as an able exponent of Gautama's ideas, but also as one who becomes the main target of attacks of the most powerful Buddhist logicians. He himself criticises the logical theories of earlier Buddhist thinkers like Nāgārjuna (ca 200 A.D.) and some followers of the Yogācāra school. But whatever interaction took place between the logical ideas of the Naiyāyaikas and the Buddhists prior to Vātsyāyana is relatively of a rudimentary kind and had not much influence in shaping the subsequent development of logic. It is the interaction that took place following Vātsyāyana that is important.

$ 0.7 After Vātsyāyana, and before the emergence of Uddyotakara in the 7th century, there is an interval of about three centuries during which there does not seem to have been much logical activity in the Nyāya school. However, this interval of relative inactivity within the Nyāya school, curiously enough, overlaps with what is regarded as the golden age of Buddhist logic. During the period from 5th to 7th century A.D., Buddhism produced its greatest logicians, Vasubandhu (5th century A.D.), his illustrious disciple Dignāga (late 5th century A.D.), and Dharmakīrti (7th century A.D.), all belonging to the Yogācāra school (or vijñānavāda, subjective idealism). The vigorous logical activity within the Buddhist camp, carried on during this period mainly against the background of Gautama's logic as interpreted by Vātsyāyana, contributed substantially to the final shape of Indian logic.

$ 0.8 Vasubandhu was an eminent logician but somehow his influence on subsequent logical thought has not been as great as it might have been. He criticises certain logical views of Vātsyāyana, but it is Dignāga who directs a concerted attack on the logic of Vātsyāyana. Though Buddhist logic may be said to begin with Vasubandhu, it is Dignāga who sets it on a relatively systematic and solid foundation. He is undoubtedly one of the greatest logicians of India, and is sometimes regarded 'as the father of medieval logic in India' (Vidyabhusana 1921:270; Hattori 1968:1). He specialised in logic under Vasubandhu and is said to have become an 'original scholar' (*svatantra paṇḍita*). His logical works are: *Ālaṃbana-parīkṣā, Trikāla-parīkṣā, Hetucakrasamarthana (Hetucakraḍamaru),*

Nyāyamukha (Nyāya-praveśa), and *Pramāṇa-samuccchaya* with his own commentary *(Vṛtti)*. The last is his *magnum opus* and incorporates the main ideas of the rest. The Sanskrit original of the book is lost, but two Tibetan translations are available. Dignāga met no opponent of equal stature among the Naiyāyika logicians of his time. Praśastapāda (early 6th century A.D.), a Vaiśeṣika logician of repute, who one would think should have come to the defense of his sister-system against Dignāga, actually falls under Dignāga's influence, and his logic developed in his *Padārtha-dharma-saṃgraha*, an independent commentary on the Vaiśeṣika system, closely resembles that of Dignāga.

$ 0.9 The challenge to Dignāga's logical theory came about a century and a half later in the person of the Naiyāyika logician Uddyotakara who was not only a gifted logician but also a gifted fighter. In the very opening lines of his *Nyāya-vārttika*, a subcommentary on the *NS*, he declares it to be his mission to dispel the misunderstanding (of Gautama's doctrines) spread by 'bad logicians' (*kutārkikas*), and to restore the Nyāya tradition to its pristine glory. As a matter of fact, he failed in this latter objective since in the coming centuries "logic fell into the hands of eclectic logicians and the pure Naiyāyika tradition may perhaps be said to end with Uddyotakara" (Randle 1930:36). But his rejoinders to Buddhists were often effective and were adopted by subsequent Naiyāyikas.

Uddyotakara was answered by Dharmakīrti, who perhaps was his junior contemporary. Dharmakīrti was another powerful Buddhist logician

who wrote seven works on logic. Stcherbatsky (1962a:37) tells us that these have become the fundamental works for the study of logic by Buddhists in Tibet, and, though designed by their author as a commentary on Dignāga's work, have replaced the latter. The principal among them is the voluminous *Pramāṇa-vārttika*. *Pramāṇa-viniścaya* and *Nyāya-bindhu* treat essentially the same topics but more briefly. Dharmakīrti is ably commented upon by Dharmottara (750-810 A.D.).

$ 0.10 After Dharmakīrti, Buddhist logic virtually came to an end in India; it received no new additions of importance at the hands of subsequent Buddhist logicians, though their lineage continued until about the twelfth century. But it found a new home, Tibet, where it flourished for a long time. Most works of Dignāga and Dharmakīrti and their principal commentaries were translated into Tibetan and provided the stimulus for a vast amount of indigenous literature. Almost every monastery in Tibet became a centre for studying Buddhist logic which eventually spread beyond Tibet as far as, and to the whole of, Mongolia. Dignāga's logic was also introduced into China by Hsüan-tsang who studied it during his extensive travels (630-645 A.D.) in India. He carried back two logical works, one of which was Dignāga's *Nyāya-praveśa*, and translated them into Chinese. These translations inspired a considerable amount of indigenous literature. From China Buddhist logic was taken to Japan by a Japanese monk called Dohshoh, who studied it under Hsüan-tsang himself.

$ 0.11 Though Buddhism migrated from the land of its birth, it left a permanent mark on Indian logic. It constrained the Naiyāyikas to recognise at least those weaknesses in their logical theories which did not vitally touch upon their metaphysics, and to adopt the solutions which the Buddhists suggested and which they considered sound. This is true mainly of the third phase of Indian logic but even later Naiyāyikas of this second phase show a more liberal and accommodative spirit as is evidenced, for instance, by the next Naiyāyika of repute, Vācaspati Miśra (950 A.D.). This thinker, though a strong critic of Buddhist logic, is not a purist like Uddyotakara but a versatile eclectic. He is credited with introducing innovations in Nyāya logic and rejuvenating the Nyāya school as a whole, the tradition of which was in its prime at the time of Uddyotakara. The rejuvenation is done in an eclectic fashion with the help of ideas gleaned from Praśastapāda (who is himself highly influenced by Dignāga) and logicians of Buddhist and Mīmāṃsaka schools (Randle 1930:4). He wrote extensively and his works range over the Saṃkhya, Yoga, Mimaṃsa and Vedanta schools. Chief among his works are:

1. *Nyāya-vārttika-tātparya-ṭīkā*, a gloss on Uddyotakara's *Nyāya-varttika;*
2. *Nyāya-kaṇikā*, a gloss on Maṇḍana Miśra's *Vidhi-viveka* (a Mīmāṃsaka work);
3. *Sāṃkhya-tattva-kaumudī*, a work on the Sāṃkhya system;
4. *Tattva-vaiśāradī*, which deals with the Yoga system; and
5. *Bhāmatī*, which is a commentary on Śaṅkara's *Śārīraka-bhāsya (Brahma-sūtra-bhāsya).*

The first two works are almost entirely devoted to refutation of Buddhist theories.

$ 0.12 Vācaspati Miśra is, of course, criticised in turn by Buddhists. For, though Buddhist logic after Darmakīrti was not augmented in any significant way, it continued, as noted above ($0.10), until about the twelfth century to have adherents who mainly expounded the doctrines of their early masters.[11] Vācaspati Miśra is defended by the next, and perhaps the last, great logician of this second phase of Indian logic, namely, Udayana (ca 1050 A.D.). Udayana directs his attack against Kalyāṇarakṣita and Dharmottara, among other Buddhists. He was a prolific writer and his works include:

1. *Nyāya-vārttika-tātparya-ṭīkā-pariśuddhi*, a gloss on Vācaspati Miśra's *Nyāya-vārttika-tātparya-ṭīkā;*
2. *Kiraṇāvali*, a commentary on Prasastapāda's *Bhāṣya;*
3. *Nyāya-kusumāñjalī;*
4. *Ātma-tattva-viveka* or *Bauddhadhikkāra;*
5. *Nyāya-pariśiṣṭa.*

Vācaspati Miśra, though a renovator, yet derives the material for most of his doctrines from earlier writers. He contributes no ideas on logic that are totally new or original. It is with Udayana that new conceptions begin to appear. Hence, Udayana is said to form a bridge

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[11] Among these are Devendrabuddhi (ca 650 A.D.), Jinendrabuddhi (ca 725 A.D.), Śāntarakṣita (749 A.D.), Kamalaśīla (ca 750 A.D.), Dharmottara (ca 775 A.D.), Kalyāṇarakṣita (ca 829 A.D.), Jñānaśrīmitra (ca 1040 A.D.), Ratnākaraśānti (ca 1040 A.D.), and Ratnakīrti (ca 1075 A.D.).

between the old logic comprising the first two phases, and the new logic (Navya-nyāya) comprising the third and the final phase. He deserves notice also regarding another aspect of the development of Indian logic: Nyāya and Vaiśeṣika were from the time of Praśastapāda at least sister-systems. Nyāya relied heavily for its metaphysics on Vaiśeṣika and Vaiśeṣika depended mostly on Nyāya for its logic. But their tradition and lineage of thinkers were distinct. Udayana is the first thinker on record in whom the doctrines of the two schools begin to merge. Śivāditya (late 11th century A.D.) carries this syncretic[12] trend to its culmination, and in his *Sapta-padārthī* presents the ideas of the two schools in one unified whole. In the final phase of Indian logic, the amalgamation is accepted as a matter of course, either implicitly or explicitly, and the individual identity of the two schools is largely lost.

Udayana was preceded in the tenth century by two thinkers whose names deserve mention here. They are the Naiyāyika Jayanta Bhaṭṭa (ca 965 A.D.) whose *Nyāya-mañjarī* is an independent commentary on the *NS*, and Śrīdhara (ca 991 A.D.) whose *Nyāya-kandalī* is a commentary on the *Bhāsya* of Praśastapāda. Both engaged in polemics with Buddhists and criticise especially Dharmottara.

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[12] See fn 0.18 below for the meaning of 'syncretic'.

$ 0.13 The third and the final phase of Indian logic formally begins with the *Tattva-cintāmaṇi (TC)* of Gaṅgeśa (ca 13th century).[13] The transition from Udayana to Gaṅgeśa was presumably gradual and during the intervening period of about 200 years, there might have been several writers who helped this transition. Of many of these not much is known; one of the few of whom something is known is Vallabha (ca 11th century A.D.) about whose work, *Nyāya-līlāvatī*, a primarily Vaiśeṣika work, D.C. Bhattacarya (1958:56) observes: it is 'the only post-Udayana work before Gaṅgeśa to rank among the immortal classics of Neo-logic'.[14] The decisive break with the past, however, comes with Gaṅgeśa, who calls himself a 'new' Naiyāyika.[15]

The *TC* is to the new Nyāya what the *NS* is to the old Nyāya. It is the fundamental text, and the only independent work, of the new Nyāya. Other Nn works comment on it directly or indirectly, or are otherwise derived from it to a great extent (Ingalls 1951:6). It replaced in

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[13]The chronology of the authors mentioned here and elsewhere in this thesis is, in general, uncertain, varying at times by more than a century. The relative chronology, however, is fairly certain. In deciding on the dates of these authors, I have consulted several writers (including Vidyabhusana (1921); Keith (1921); Athalye; Ingalls (1951); D.C. Bhattacarya (1958); Bocheński (1961); Frauwallner (1961); Hattori (1968); Matilal (1968a) and Potter (1970)); but I have not followed any one of them uniformly, though I found Potter (1970) particularly helpful.

[14]Bhattacarya (1958:40, 41) thinks that Navya-nyāya actually begins with Udayana whom he also places between 1050 and 1100 A.D.

[15]The term 'Navya-naiyāyika' is ambiguous. Usually it is applied to all Naiyāyikas beginning with, and including, Gaṅgeśa. I adopt this usage of the term. But, it is also applied sometimes to pre-Gaṅgeśa thinkers like Udayana and sometimes only to Raghunātha and his followers. See Ingalls 1951:5; Keith 1921:40-41; Athalye:lv.

popularity and importance all previous classics on Indian logic, and for centuries became the focus of study by scholars.

The fame of *TC* rests on at least two of its distinctive features. Firstly, it presents an immense contrast to the *NS*. It ignores the dialectical topics on which the *NS* concentrates, and devotes its attention mainly to a treatment of the means of knowledge *(pramāṇa)*. It thus truly deserves the name 'the science of the means of knowledge' *('pramāṇa-śāstra')*, which the Naiyāyikas themselves (old as well as new) often employ. Like Gautama, Gaṅgeśa also accepts four means of knowledge: perception, inference, identification, and testimony (\$\$ 3.4-5). So, the *TC* is divided into four parts, each part being devoted to one means of knowledge. Of these, the part concerning inference is the most important and has been the most influential.

The exclusion of dialectical material to a great extent and the consequent emphasis on the treatment of inference marks an important stage in the development of formal logic in India. In narrowing down his enquiry to the means of knowledge, Gaṅgeśa was influenced by Buddhists. Buddhism was almost extinct in India by his time; and Gaṅgeśa disputes with other schools like Mīmāṃsā and Vedānta. But the interaction of the Naiyāyikas with the Buddhists in the past had undoubtedly its benefits, and these took their first tangible shape in the writings of Gaṅgeśa. The *TC* also discusses questions of metaphysics but only incidentally; however, questions of epistemology, psychology and philosophy of grammar occupy an important position.

Secondly, the *TC* breaks new ground with regard to style and organisation. Compared to earlier works on logic, the *TC* exhibits a better organisation of its topics and its arguments are more compact and bereft of irrelevancies. It shows greater awareness of precision: terms are often carefully defined, and novel technicalities and linquistic devices are used to achieve accuracy. Because of its originality of approach and the degree of precision, the *TC* sets the boundaries for all future logical enquiry (Ingalls 1951:16). Keith (1921:34) observes,

> So well done was the task of presentation that it proved the last work of outstanding merit in the school; those who followed abandoned the study of the *Sūtra* and the commentaries to devote themselves to the minute discussion of the points which were early raised as to the interpretation of the views of Gaṅgeśa and the correctness of his opinion.

The dissection of detail was carried so far that even single sentences like the *vyāptipañcaka* grew into separate works of considerable length.

$ 0.14 Progressively increasing attention to detail by successive commentators working within pre-set boundaries eventually resulted in a forbidding style with complicated linguistic devices but without a corresponding conceptual gain. While Gaṅgeśa himself may be said to have initiated this style, it is his commentators--Jagadīśa Tarkālaṃkāra (ca 1610 A.D.), Mathurānātha Tarkavāgiśa (ca 1600-75) and Gadādhara Bhattācārya (ca 1599-1703), to mention only a few--who carried it to its extreme. It reached its climax in the writings of Gadādhara who, therefore, has been described as the 'prince of Indian schoolmen'. Athalye (L, cf XIII, XLV) eloquently characterises the complexities and cumbersomeness of this style:

> Here we see at one and the same time scholasticism at its climax and true philosophy at its lowest depth. We might wade through volumes of controversial jargon without coming across a single flash of deep thought or real insight into the nature of things. Mere conventionalities and distinctions without a difference are the weapons in this wordy warfare with which one disputant tries to defend his thesis or to vanquish a rival.

Keith (1921:35) observes in the same spirit that the followers of Gaṅgeśa exhibit "a vast mass of perverted ingenuity worthy of the most flourishing days of scholasticism."[16] Especially in Jagadīśa and Gadādhara, not infrequently one encounters long compounds sometimes extending over a whole page.[17]

$ 0.15 A reaction against the excesses of this style set in in the 17th century. Tired of the endless scholastic subtleties, logicians began to look for a mode of presentation that would capture the essentials without sacrificing accuracy. The result was a series of manuals like the *Tarka-saṃgraha (TS)* of Annaṃbhaṭṭa, the *Bhāṣā-pariccheda (BP)* of Viśvanātha, and the *Tarka-kaumudī* of Laugākṣi Bhāskara. These works present in a concise form the logical doctrines of Navya-nyāya along with the metaphysical tenets of the traditional Vaiśeṣika system, which Gaṅgeśa

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[16] The estimate by Athalye and Keith is rather harsh, and is not quite fair to Raghunātha Śiromaṇi (ca 1475-1550 A.D.) who was indeed an original, though iconoclastic, thinker. Nevertheless, it is true in essentials of most other commentators of Gaṅgeśa.

[17] Potter (1957:16-19) tries to justify this style by saying that it represents the Navya-naiyāyika attempt to 'picture the world' in a technical language and that it is comparable to the style of contemporary analytic philosophy. I do not see how such a claim can be justified with reference to the texts, and wish that Potter had elaborated the point with illustrations.

and his commentators had consigned to an insignificant place. They thus carry forward the syncretic tendency initiated by Udayana and first fully carried out by Śivaditya.[18] These manuals are not original works: their value lies in faithfully presenting the principal teachings of the preceding Nn masters. They also often refer to the views of old Naiyāyikas for comparison, but their emphasis, so far as logic and epistemology are concerned, is always on the theories of the NNs. Only in so far as they treat of metaphysical theories as much as logical ones can they be said to be weighted in favour of old Nyāya, although even Gaṅgeśa and his commentators may be said to accept the (Vaiseṣika) metaphysical theories implicitly.[19] These manuals roughly mark the end of the development of Indian logic. The British rule in India which began in 1757 A.D. brought with it its own system of education which gradually eclipsed the indigenous systems of learning.

$ 0.16 Of the three manuals mentioned, *TS* and *BP* are the most well-known and, perhaps, the most reliable. Their value is greatly increased by the fact that the authors themselves have written commentaries on them: *Tarka-dīpikā (TD)* on *TS* and *Siddhānta-muktāvalī (SM)* on *BP*. They are

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[18] Keith (1921:36-41) regards all works that present Vaiśeṣika metaphysics and Nyāya logic as one systematic whole as belonging to 'the syncretist school'. Among these he includes, besides the works of Śivāditya, Annaṃbhaṭṭa, Viśvanātha, and Jagadīśa, also the *Tarka-bhāṣā* of Keśava Miśra (ca 1300 A.D.) and *Tārkika-rakṣā* of Varadarāja (ca 11th century A.D.). See fn 0.19.

[19] In fact, Potter (1957:3) regards *all* Navya-naiyāyikas, (except perhaps Raghunātha) as members of the syncretic school, implying thereby that they all subscribe to the Vaiśeṣika metaphysics. See fn 0.18.

admirably suited to the purpose of my thesis, which, as noted above (§ 0.2), is to seize upon the main ideas of the Navya-nyāya theory of inference and to understand them in terms of the contemporary conceptual framework. I have, therefore, heavily relied on both these manuals, while occasionally making use of other sources. Both are genuine Nn texts. As regards *TS*, this is attested by the fact that tradition regards *TD* as Gādādharī[20] in miniature *(bālagādādharī)*, thus suggesting that it comprises the main ideas of Gadādhara without the extravagances of his scholastic style (Athalye:LXII). Bocheński (1961:439) also thinks that *TS* "contains the essential, and generally accepted doctrines of the 'new' Nyāya school." As for the genuineness of *BP*, Vidyabhusana's words leave no doubt: he says (1921:392), "He (Viśvanātha) was a native of Navadvīpa and an adherent of the Nyāya school of Raghunātha Śiromaṇi." Mādhavānanda (1954:iii) and Satkari Mookerjee (1954:ix) also regard *BP* as a Navya-nyāya text.

In general, I pay more attention to *TS* (and *TD*) than to *BP* (and *SM*). Among the reasons for this are, first, that it is much simpler in style and, second, though more concise, it is much better in organisation and presentation especially regarding inference. It thus combines "brevity, accuracy and lucidity" (Athalye:LXVI). It is not surprising,

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[20] According to Vidyabhusana (1921:481, 482), 'Gādādharī' is the collective name of all of Gadādhara's numerous works including his commentary on Raghunātha's *Tattva-cintāmaṇi-dīdhiti* which is itself a commentary on the *TC*. But lately, it seems to be confined to this last work only. See, for instance, Matilal 1968a:196; Potter 1970:307.

therefore, that it has attracted much more attention both at home and abroad.[21]

$ 0.17 In India logical theory even in its most formal phase, is not altogether free from metaphysics. It will, therefore, be helpful in appreciating the Navya-nyāya theory of inference to have some acquaintance with Navya-nyāya metaphysics.

As remarked before ($$0.12, 0.15), the Navya-nyāya metaphysics is almost wholly borrowed from the traditional Vaiśeṣika system (*SM 2*). It is, therefore, usually designated as 'Nyāya-Vaiśeṣika metaphysics'. It consists of a scheme of seven categories under which are classified all the entities[22] of the universe. These categories, thus, are not of

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[21]This is indicated by the fact that there are at least 35 commentaries and sub-commentaries on *TS* (Vidyabhusana 1921:390-91; Athalye:374-75). I do not know the exact number of commentaries on *BP*, but they are certainly considerably fewer, the two commonly known ones being Dinakarī and Rāmarudrī. Again *BP* is less known to the western public. There have been many more English translations of *TS* than *BP*. See for details Potter 1970:273-76, 304-07.

[22]While the word 'entity' is often used in English philosophical literature to refer only to concrete individual things, it is also used sometimes (e.g., by Quine 1961:11-18; Carnap 1956:22-23) in a much wider sense to include abstract entities as well. This second usage is pretty standard in recent Indological writings. See for instance Ingalls 1951:37; Potter 1957:4, 7; 1954:259; Staal 1960a:116; Aklujkar 1970a: 23-24; and McDermott 1969:*passim*, e.g., 3, 29, 79, 80, 81. McDermott freely talks of unreal entities. I follow this (second) usage of the term: it provides a convenient way of referring to all sorts of things without committing one to accept any definite characterisation of the nature of what is referred to. Thus, to say that the Nyāya-Vaiśeṣika categories are categories of entities leaves the question of the nature of these entities wide open. It is usual to hold that they are mostly the sorts of objects one encounters in experience (Keith 1921:179-81; Hirianna 1932:231). This view seems to be the most natural and is supported at least by the etymology of the word '*padārtha*' which means things referred

linguistic entities. They are: substance (*dravya*), quality[23] (*guṇa*), action (*karma*), universal or generality (*jāti, sāmānya*), particularity (*viśeṣa*), inherence (*samavāya*) and absence (*abhāva*). Of these seven categories, only the members of the first three are said to have existence (in space and time) (*sattā*) (*BP 8*), while the members of the last four lack it. But all except the last are said to have presence (*bhāva*). The last by definition lacks it (*BP 8*; Ingalls 1951:53-54; Keith 1921:180; Athalye:91).

$ 0.18 Substance is perhaps the most important of the seven categories. There are nine kinds of substances: earth (*pṛthivī*), water (*ap*), fire (*tejas*), air (*vāyu*), ether (*ākāśa*), time (*kāla*), space (*dik*), self (*ātman*), and 'mind' (*manas*). Of these, the first five are regarded as elemental

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to by a word (*TD 2*). A category, thus, means a classification of all things having a name (i.e., nameable, and according to the Naiyāyikas, knowable things). The members of categories cannot all be atomic (i.e., have the form of an atom), since only some members of the first category are such, and it is doubtful if the entities of the remaining categories can be so regarded. Potter (1957:4, 5: cf 2, 7) regards the members of all categories as abstract elements (which he, strangely enough, calls 'individuals' while admitting that they may be universals) which "combine in certain prescribed ways to form objects" whether concrete or abstract. Potter himself admits (1957:6-7) that the Vaiśeṣika system does not actually make the metaphysical distinction between 'individuals' and objects but claims that the epistemological distinction made in the Nyāya system between determinate and indeterminate knowledge corresponds to it. I am not convinced that this latter distinction has anything to do with Potter's distinction. Again, it is not clear what according to Potter is the exact relation between atoms and individuals. In one place (1957:2), he gives the impression that they are the same, while in another (1957:12), he definitely implies that they are different.

[23]This is the usual translation of *'guṇa'*. But Potter (1957:13; 1954a:259-64) points out that it leads to the confusion of *guṇa* with *jāti* (universal) since qualities are universals. He suggests 'trope' as an alternative translation.

(bhautika), that is, they are the elements out of which the physical universe is said to be constituted; the first four and *manas* are regarded as limited in space and time *(mūrta)*. *Manas* is not only limited in space and time but also atomic. It is, therefore, very different from the western conception of mind, even though the word *'manas'* is usually translated as 'mind'. To the NN, it is simply an organ, albeit an internal one, of knowledge on the same level as the other organs like eyes and ears. There are an infinite number of 'minds' each eternal and atomic. The other spatio-temporally limited substances--earth, water, fire, air--are, as suggested above, to be taken as classes of observable things bearing the same name. They are also regarded by some (e.g., Potter 1957:4) as atomic, but I think it is mistaken to do so. The Naiyāyikas are concerned, roughly speaking, with two distinct tasks: first, a categorisation of things given in experience of one sort or another and, second, an analysis of the things so categorised. It is only when pursuing the second task that the Naiyāyikas talk of the material substances as atomic. They mean thereby not that these substances have the forms of atoms, but that they are formed out of atoms which are themselves beyond experience. That is, the Naiyāyikas, like the Greeks, subscribe to an atomic theory of the universe.

Self is said to be the substratum of cognition which is said to be one of its qualities. Two kinds of self are recognised: the supreme self which is one, omniscient, and eternal; and empirical self which is eternal and varies from one human body to another. There are, thus, an infinite number of empirical selves. An empirical self has a pervasive

(as against atomic) character; that is, it pervades the whole body it occupies. It has its own 'mind' and partly through 'mind', it acquires all its experiences, internal as well as external.

The other three kinds of substances are ether, time, and space. They are all said to be without parts, infinite, and eternal.

$ 0.19 The remaining categories can be dismissed even more briefly. Qualities and actions do not exist by themselves but are said to inhere in substances. Universals are properties that determine a class. The universal corresponding to a cow, for instance, is cowness. Universals are objective and eternal realities existing independently of mind, and are known directly through a kind of extra-ordinary perception *(sāmānya-lakṣaṇa-pratyāsatti)* ($$ 1.6, 4.17). Inherence is a relation which obtains between pairs like substance and qualities, substance and actions, parts and wholes, and universals and their instances. It is said to be one (i.e., without varieties) and eternal[24] (*TS 8, 79;* Ingalls 1951:75). Particularity is what distinguishes one atom from the rest. Absence does not mean absolute void *(śūnya)* (which is a Buddhist conception and which the Naiyāyikas dismiss as a pseudo-concept), but a relative absence--absence of something somewhere. For the NNs (as also for most old Naiyāyikas), absence is also an independently existing entity, and is said to be of different kinds. For instance, the absence of a pot before

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[24]Inherence is eternal only in the sense that it cannot be destroyed without the entities it relates also being destroyed; it is not absolutely eternal like a universal (or like the supreme self).

it is created is said to be prior absence *(prāgabhāva)*, and that after it is destroyed is called posterior absence *(dhvaṃsābhāva) (TS* 9, 80; *BP* 12-13; Ingalls 1951:54-55; Athalye:99-103, 364-68).[25]

$ 0.20 The nature of the categories outlined here makes it clear that Nn has a thoroughly realist metaphysics. The metaphysics stems from the belief that knowledge necessarily points to an object beyond itself. This belief took shape rather gradually. For instance, there are indications that Kaṇāda (ca 1st century A.D.), the founder of the Vaiśeṣika school, recognises only the first three categories. He definitely regards the categories of universal and particularity as relative to one's intelligence and views inherence merely as a relation between cause and effect (Keith 1921:180-81; Athalye:90). He, thus, does not give to these an objective and independent status, and makes no mention of absence as a category. But the realist tendency underlying the first three categories grew stronger in course of time, and universal, particularity, and inherence were elevated to their categorial status. A further and dramatic step was taken when absence also was recognised as a category. The reasoning behind this recognition was that if Knowledge necessarily transcends itself, the knowledge of absence also must do so and imply the independent existence of absence. The net result is that one finds in Nn rather strong Platonic tendencies (McDermott 1969:53).

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[25]The ontology outlined here is the one usually associated with Nn. There are, however, certain radicals within the NN camp led by Raghunātha who significantly modify it. For a brief account of their modifications, see Potter 1957:10-15.

Some of my later arguments lean heavily on this aspect of the Nn system ($$ 1.6, 1.18-19, 3.6).

In the Nn discussion of logical theory, not only metaphysical, but also psychological considerations intervene frequently. I generally try to separate the logical from the psychological (and the metaphysical) issues and concentrate mainly on the logical.

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For ready reference, a chronological chart of all the traditional authors whose names appear in this thesis is given immediately after Ch VI.

CHAPTER I

COGNITION AND SENTENCE (I)

$ 1.1 Any inquiry into a theory of inference ought to begin with what according to that theory are the elements of inference. For the NNs, these elements are not sentences, but what they call *'jñānas'* (Matilal 1968a:6). It is, therefore, advisable to be as clear as possible about what a *jñāna* is, before considering inference proper.

The word *'jñāna'* is usually translated as 'knowledge'. Not only etymology (Matilal 1968:6 fn 1), but also several contexts of the use of *'jñāna'* seem to favour such a rendering.[1] However, in their explicit discussions of logical and epistemological issues--which are more important for my purpose--the NNs use *'jñāna'* in such a way as to make this rendering inaccurate. In English, the words 'know' and 'knowledge' (and

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[1] Cf Śivāditya's remark,

> *ātmāśrayaḥ prakāśaḥ buddhiḥ*. "*Buddhi* is the light which resides in the self";

and the gloss on it by Jinavardhana (ca 1400-19),

> *ajñānāndhakāra-tiraskāraka sakala-padārtha-prakaśakaḥ pradīpa iva dedīpyamāno yaḥ prakāśaḥ sa buddhiḥ*. "*Buddhi* is that light which, shining brighly like a lamp, dispels the darkness of ignorance and illuminates all objects".

Both cited in Athalye:175.

Buddhi is here regarded as a faculty producing (true) knowledge. But the term *'buddhi'* is generally used in the sense of the product of this faculty, and then it is taken to mean knowledge. *'Jñāna'* being synonymous with *'buddhi'* (fn 1.2) would also be taken to mean knowledge in such cases.

corresponding words in most other languages) are used in such a way that the term 'false knowledge' is contradictory. In other words, where *p* is any sentence and *x* any individual, the conditional, "If *x* knows that *p*, then *p*" is analytic. If *x* claimed to know that *p* and yet it turned out that *p* was false, one would not say in English that *x's* knowledge was false; rather one would say that his claim to know was false or that he did not know, though he thought he knew.

The NNs do not use *jñāna* in this way; for them *jñāna* could be false. They explicitly distinguish between true *(yathārtha)* and false *(ayathārtha) jñāna*.[2] Besides, the terms *'buddhi'* and *'jñāna'* are sometimes used in Nyāya in the sense of process or faculty (fn 1.1), and this aspect of their use is not captured by 'knowledge'. It will not do, therefore, to translate *'jñāna'* as 'knowledge' as Ingalls (1951:34)[3] and Athalye (173) do.

$ 1.2 'Thought' in the Fregean sense of content or product, not the process, of thought (Frege 1892:62) would be an adequate rendering of

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[2] *TS 34* divides *jñānas* into two sorts, namely, apprehension *(anubhava)* and memory *(smṛti)*:

> *sarva-vyavahāra-hetur buddhir jñānām. sa dvividhā smṛtir anubhavaś ca.* "*Buddhi* is the cause of all communication, and it is *jñāna*. It is of two sorts, memory and apprehension".

TS 35 again divides apprehension into two kinds, true and false:

> *sa (=anubhavaḥ) dvividho yathārtho 'yatharthaś ca.* "It (apprehension) is of two sorts, true and false". Cf fn 3.9.

[3] Ingalls is aware of the awkwardness of this translation. He has also gone on record as saying that he holds no brief (other than etymological) for 'knowledge' (Matilal 1968a:6 fn 1).

'jñāna' except for a slight disadvantage: the root 'think' does not always capture the meaning of the corresponding Sanskrit root *'jñā'*. The sentence *"ahaṃ ghataṃ jānāmi"*, for example, cannot be translated very well as "I think a pot". 'Proposition' will have to be ruled out for a similar reason: it does not have a convenient corresponding verb as *'jñāna'* has *'jñā'*; ('purpose' certainly will not do). Further, *'jñāna'* in Sanskrit has two uses, viz., *'jñāna* of' as in *'ghaṭasya jñānam'* ('the *jñāna* of a pot') and *'jñāna* that' as in *'ghaṭo nīla iti jñānam'* ('The *jñāna* that a pot is blue'). 'Proposition' does not have a use corresponding to the former. One can only say 'the proposition that . . . ' but not 'the proposition of . . . '. Moreover, 'thought' and 'proposition', like 'knowledge', do not capture the use of *'jñāna'* in the sense of a process.

$ 1.3 'Cognition' has an advantage in all these respects over 'thought' and 'proposition', and most closely approximates *'jñāna'*. Not only is etymology in its favour (leaving aside 'knowledge', that is) but it also fits almost all the contexts--logical as well as non-logical--in which the NNs use *'jñāna'*. It comes from the root 'cognise' which exactly parallels the Sanskrit root *'jñā'*. *"ahaṃ ghaṭaṃ jānāmi"* for example can be rendered adequately as "I cognise a pot". Besides, corresponding to the two uses of *'jñāna'*, it has the two uses 'cognition that' and 'cognition of'. In the former, 'that' is followed by a sentence while in the latter, 'of' is followed by a name (strictly, a noun-phrase). I shall, therefore, adopt it in preference to the other three terms, with the proviso that it is to be taken usually in a purely non-psychological

sense, i.e., in the sense of something objective which may be 'grasped' by many.

Since I am primarily concerned with the Nn logical theory, the non-logical contexts of the use of *'jñāna'* (where it means a process) are not really important to me, and I could as well have adopted 'thought' or 'proposition' as a translation of *'jñāna'* without any real loss; for, my central preoccupation is with 'cognition' in the sense of 'cognition that'. Only in this sense can a cognition be said to be a bearer of truth-values ($$ 1.7, 1.11), and this sense is equally conveyed by 'proposition' or 'thought'. It is only a general desire to be as faithful as possible to the Nn way of thinking that prompts me to decide in favour of 'cognition'. Needless to say, then, that though I take 'cognition' as the precise equivalent of *'jñāna'*, I regard 'cognition', 'thought' and 'proposition' as synonymous, for all practical purposes. 'Thought' and 'proposition' are, in fact, sometimes used synonymously in logic. For example, Frege's *'Gedanke'* is rendered both as 'thought' (by Max Black in his translation of Frege 1892) and as 'proposition' (by Church 1956:26). Quine also talks of a proposition as 'propositional 'thought'' (1960:208).

$ 1.4 Matilal translates *'jñāna'* as 'cognition particular' rather than as 'cognition'. He says (1968:6, 7),

> Navya-nyāya, like the older Indian systems of logic, deals rather with what it calls *jñāna*, by which it means something close to 'particular instances of cognition'. A *jñāna* is a particular just as a color spot or a tone is a particular. It can very well be viewed as an event.

I do not think Matilal is right. First, a *jñāna*, in so far as it is

regarded as a bearer of truth-value, cannot be viewed as an event,[4] though it is associated with an event in the sense that it can be thought. An event cannot be true or false. Second, even if each cognition is a particular, that is no reason for not using 'cognition' as a general term and translating *jñāna* as 'cognition'. Every man, for example, is a particular man and yet we do not go about talking of man-particulars. Potter, who argues (1954a:259-63; cf 1954b:271-73; 1957:13) that for the NNs qualities *(guṇas)* are particulars, or non-repeatable entities, readily sees this point. He says (1954a:263) that though blue-colour *(nīlarūpam)* is a particular, yet "*'nīlarūpam'* is a general term denoting any single blue-colour inhering in its particular substance".

My term, then, for *'jñāna'* is 'cognition', and it brings out the fact that *'jñāna'* is used in a much wider sense than 'knowledge'.[5]

$ 1.5 My proposal to use 'cognition' synonymously (in logical contexts) with 'proposition' and 'thought' immediately raises the question of the ontological status of cognitions. For Frege, propositions are abstract entities which, though meanings (i.e., in Frege's terms, *Sinn* or sense)

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[4]Cognition would be an event only in the psychological sense of a mental occurrence, a sense in which Matilal, like myself, is not interested.

[5]This wide sense reminds one of Descartes' use of 'thought' *(cogitatio, pensée)*. However, Descartes' use is even wider than the Nn use of 'cognition' in the double sense of including non-cognitive elements and also of referring to mental acts or states. See Kenny 1968:44; and Descartes, *Second Meditation* in Kemp Smith 1958:186. It is, I think, in order to bring out explicitly this width of use of 'thought' and 'think' that Anscombe and Geach (1964:70) translate *'res cogitans'* as 'conscious being' rather than as 'thinking thing' as Kemp Smith does.

of sentences, are yet independent of any sentences in the sense that their existence is not dependent upon that of the sentences of which they are the meanings. That they can be associated with sentences, and that they are known only through language (or that they are known at all) is accidental to their existence. Accordingly, Frege's view of proposition is regarded as Platonic (Church 1956:25 fn 66). There is no doubt that for the NNs cognitions are likewise not sentences (Matilal 1968a:6), but meanings of sentences. However, the crucial question is: Are they independent of particular sentences or of any or all sentences, i.e., of language? This is a very difficult question to decide, since the NNs do not seem to be aware of it, and do not consciously discuss it. But I think the answer is that for the NNs cognitions are, indeed, abstract entities independent of language.

Some support for this answer might at first appear to be forthcoming from the Nn theory of indeterminate cognition *(nirvikalpaka-jñāna)*. An indeterminate cognition is, according to Ingalls (1951:40; cf Radhakrishnan 1927:57; Matilal 1968a:12), linguistically inexpressible, and hence linguistically independent. In so far as every determinate cognition is held to be built upon an indeterminate cognition, this might suggest that all cognitions are linguistically independent.

I am not sure, however, if Ingall's view is correct. It is true that an attempt to interpret the words *'avyapadeśya'* and *'vyavasāyātmaka'* in *NS 1.1.4* eventually led to the distinction between indeterminate and determinate *(savikalpaka)* cognitions, and that *'avyapadeśya'* was interpreted by Vātsyāyana and Uddyotakara as 'not being expressible by words'.

It is also true that Trilocana (9th century A.D.) who was perhaps one of the first Naiyāyikas to comment on the distinction,[6] held that an indeterminate cognition is linguistically inexpressible (Keith 1921:70, 72). But the NNs do not seem to subscribe to this view. In fact, Annaṃbhaṭṭa gives |This is something| *(idaṃ kiṃcit (TS 42))* as an example of an indeterminate cognition, which clearly shows that an indeterminate cognition is linguistically expressible (though it need not be so expressed).[7]

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[6]According to Schmithausen (1970), the oldest evidence for the distinction between determinate and indeterminate cognition is to be found in Vindhyavāsin (not later than 4th century A.D.) and Praśastapāda. Sastri (1964:497), however, thinks that the distinction was first introduced by Dignāga.

[7]The Nn theory of indeterminate cognition is essentially a psychological theory, and has at least two versions. According to one, an indeterminate cognition is merely the cognition of something as undifferentiated from other things. As soon as an object is presented to the senses, what one has is only a bare awareness of its existence *(sattā, bhāva-rūpa, vastu-rūpa-mātra)* without any of its properties. According to another version, an indeterminate cognition also involves the apprehension of properties, although these are not apprehended as belonging to the object in question. That is, on this version, both the object and its properties are first apprehended in isolation in an indeterminate cognition, and subsequently brought together in a determinate cognition. On either version, when properties are apprehended *as belonging to the object*, and the object is differentiated and identified, one is said to have a determinate cognition (e.g., |This is a jar|) (see Convention D for the use of slashes). It is only when the properties are apprehended in relation to the object, that they are called 'qualifiers', and the object is called 'the (chief) qualificand'. Hence, an indeterminate cognition is described as not having the qualifier-qualificand relation *(viśeṣaṇa-viśeṣya-saṃbandhānavagāhi (TD 42;* cf *SM 58))*. Both versions also agree in holding that an indeterminate cognition, unlike a determinate one, can be neither true nor false (cf Matilal 1968a:18), and that corresponding to each determinate cognition, there is an indeterminate cognition from which it is built. There is again a difference of opinion as to how an indeterminate cognition is known: some hold that it is a genuine case of (conscious) perception, while others like Gaṅgeśa and

$ 1.6 I believe, however, that good support for the view that cognitions are abstract entities independent of language is to be found in the Nn theory of universals *(sāmānyas, jātis)*. The NNs hold that corresponding to each class of particulars there is a universal which inheres *(samavetam)* in each of them, and yet is distinct from any one of them. They also hold that a universal is eternal, which means that it is independent of the particulars in which it inheres (and of language). For, if it were dependent on them, it would also be, like them, perishable. A universal is known, according to the NNs, by means of a kind of extra-ordinary perception called 'intuition of universals' *('sāmānya-lakṣaṇa pratyāṣatti')* ($ 4.17). Annaṃbhaṭṭa succinctly states the Nn theory of universals as follows:

> *nityam ekam anekānugataṃ sāmānyam.* "A universal is eternal, one and residing in many". *TS 77* (cf *SM 8*; Athalye:91,209; Keith 1921:93-94; Stcherbatsky 1962a:25,48; Matilal 1968a:38).

The NNs also hold that a cognition is a quality *(guṇa)* of the soul *(TS 73; BP 87-88)*. A quality belongs to the second category in the Nn metaphysical scheme ($ 0.17), and hence cannot be a universal which belongs to the

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Viśvanātha maintain that it is to be inferred. For details see *TS, TD 42; BP, SM 58;* Keith 1921:72-74; Radhakrishnan 1927:57-60; Athalye:215-20; Ingalls 1951:39-40. An explanation of the notions of qualifier and qualificand is to be found in $$ 1.8-10 below.

An adequate discussion of the Nn theory of indeterminate cognition would be too long a diagression from my main purpose. Suffice it to say that I have been unable to make good sense of this theory, nor have I come across a satisfactory treatment of it by modern English writers. I have, therefore, ignored it in the rest of my thesis. It is for this reason that I say below ($ 1.8) that a cognition is necessarily qualificative (i.e., determinate (Matilal 1968a:4)).

fourth. A universal is a repeatable entity in the sense that though one, it occurs in many. A quality, on the other hand, as Potter (1954a:259-63) has effectively argued, is not repeatable in this way according to the NNs, and must be regarded as unique or particular.[8]

Given that a cognition is a particular, and the view about a universal mentioned above, it follows that for each class of cognitions that are particulars, there is a universal. The crucial question is as to what this universal is. I think it is itself a cognition. Such a view, of course, immediately leads to the contradiction that a cognition is both a universal and a particular. The contradiction, however, is only apparent, and can be resolved by noting that the NNs use 'cognition' in two senses, viz., psychological and logical ($$ 1.1-3, 1.11, 3.6, 3.10-16). When a cognition is considered in relation to a thinker, it is a quality of the thinker, and hence a particular. When it is considered in isolation from thinkers, it is a universal. For instance, when several persons think 2 + 2 = 4, the thought of each such person is, according to the NNs, a cognition (in the psychological sense), and is a particular. The thoughts of all such persons put together constitute a class of particulars. Corresponding to this class, the universal is the thought 2 + 2 = 4 considered independently of the thinkers (i.e., |2 + 2 = 4|), which also the NNs regard as a cognition (in the logical sense). As a universal, the cognition |2 + 2 = 4| is an abstract and eternally

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[8]This is a rather peculiar use of the term 'quality', since in English a quality is regarded as a repeatable entity. It is, therefore, desirable to translate *'guṇa'* by some other more adequate term. I cannot think of any, nor am I happy with 'trope' suggested by Potter. See fn 0.23.

existing entity. The distinction between these two uses of a cognition corresponds, on a linguistic plane, to that between a token and a type. The Nn theory of inference would be intelligible only if cognition is taken as a type or a universal, i.e., in its logical sense (\$\$ 1.1-3, 3.10-16). By and large, the NNs themselves use it in that sense in typically logical contexts. These considerations show, I think, that the NNs are, in their ontology of cognitions, in the same camp as Frege is with regard to *Gedanken.*[9]

\$ 1.7 Cognitions thus conceived are, according to the NNs, the true bearers of truth-values. The NNs distinguish between a true cognition *(yathārtha-jñāna)* and a false cognition *(ayathārtha jñāna)* (fns 1.2, 3.9), and have usually cognitions in mind when they talk of truth or falsity. They also talk of *sentences* as being true or false,[10] but in

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[9] McDermott (1969:53) characterises the Nn position as Platonic, although being concerned with a different purpose, she does not go into the reasons for her characterisation. Cf Matilal 1968a:17.

Jayanta Bhaṭṭa *(Nyāya-mañjarī, Pt II, p 100)* explicitly advocates the linguistic independence of cognitions. Although he belongs to the 10th century A.D., and hence according to my classification (\$\$ 0.1, 0.12-13, fn 1.15) must be regarded as an old Naiyāyika, his advocacy shows that the thesis of the independence of cognition was already present in the Nyāya tradition.

[10] *vākyaṃ dvividham. vaidikaṃ laukikaṃ ca. vaidikaṃ īśvaroktatvāt sarvaṃ eva pramāṇam. laukikaṃ tv āptoktaṃ pramāṇam. anyad apramāṇam.* "A sentence is of two kinds, scriptural and mundane (human). A scriptural sentence is always true since it is uttered by God, while a mundane sentence is true when uttered by a reliable person. Any other (mundane) sentence is false". *TS 62.*

a secondary sense. A sentence is true if and only if the cognition it expresses is true. It is not uncommon for the NNs to employ the same terminology indifferently for cognitions or for sentences (cf $ 3.23 and Convention E).

$ 1.8 A cognition is said to be necessarily qualificative (see fn 1.7). That is, it is a complex where something is asserted to be qualified by something else. The constituents of a cognition are said to be qualificand(s) and qualifier(s). That which is qualified *(viśiṣṭa)* is called 'a qualificand' *('viśeṣya'* or *'dharmin')*, and that which qualifies is called 'a qualifier' *('viśeṣaṇa'* or *'dharma')*.[11] A qualificand and a qualifier are not words, but something non-linguistic. For example, in the cognition, |The pot is blue| *(ghaṭo nīlaḥ)*,[12] the qualificand is not the word 'pot', but something to which that word refers.[13] The qualifier

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[11]Ingalls 1951:39-40; Matilal 1966:366, 388; 1968a:11-19; Potter 1957:7; cf *SM 58*.

[12]Potter (1954a:261-63) objects to translating the expression *"ghaṭo nīlaḥ"* as "The pot is blue". He claims that (1) it is not a singular (atomic) sentence at all, since both of the terms are general; and that (2) in fact it is not even an assertion, since it lacks a verb. It is, according to him, an ascript, and functions as a term rather than as a sentence. I find his reasoning unconvincing. An expression like *"ghaṭo nīlaḥ"* can in Sanskrit act either as a descriptive phrase or as a sentence depending on the context. The non-employment of the copula or other finite verbs in the construction of sentences is quite common in good Sanskrit. Again, whether an expression like *"ghaṭo nīlaḥ"* is to be treated as a singular or a general sentence is indicated by the context. There are no articles--definite or indefinite--in Sanskrit, and words of quantification like 'all' *(sarva)* and 'some' *(kecit)* are rarely used. The purpose of quantification is achieved by employing abstract properties (Matilal 1968a:77-81; Ingalls 1951:50, 56). *"ghaṭo nīlaḥ"*, thus, admits of four interpretations: an atomic sentence, a general sentence, a definite description and an indefinite description.

[13]See Convention B.

of this cognition is the quality *blue*, not the word 'blue'. The NNs are quite emphatic on this point (Matilal 1968a:12, 28).[14]

There can be more than one qualifier and more than one qualificand (usually, each in relation to a different entity) in a cognition in which case there will be one chief qualifier (*mukhya viśeṣaṇa*) and one chief qualificand (*mukhya viśeṣya*)[15] A cognition must consist of at least one qualifier and one qualificand.

$ 1.9 One might take objection to the view that qualificands and qualifiers are objects: How can a concrete entity called 'Devadatta' be an element in the cognition, |Devadatta is fat| *(pīno devadattaḥ)*, which is an abstract entity? One, of course, sometimes does say things like "Mary is no longer in my thoughts" and "My mother was in my dream yesterday". But such expressions are illustrative of the figurative or non-literal use of language. They do not mean that Mary or my mother was physically present. They mean rather that the idea or the concept of them was present. Similarly, in the cognition just mentioned, the qualificand cannot be the physical entity *Devadatta*, but the idea or the concept of Devadatta.

It is not clear what the NNs' answer to such an objection would be. The fact remains that they insist that the elements of a cognition

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[14]Modern writers usually contrast Nyāya logic with western logic by saying that the former deals *with objects*, while the latter deals with expressions. Thus, S. Bhattacarya (1955:157) observes, " . . . in Nyāya inference we are not dealing with words or sentences, but with objects of the real world". Similar remarks are to be found in Ingalls 1951:34, 43, 46, 50, 68, 78.

[15]For an example see $ 2.22.

are not concepts, just as they insist that they are not words. For them, the elements are either individuals, properties or relations themselves.

However, it might be pointed out, in attenuation of the Nn position, that the talk of something concrete occurring in something abstract is after all not so odd as it seems, and that it finds favour even with some influential contemporary philosophers. For instance, those who recognise sets believe them to be abstract entities,[16] and yet their members (which may be said to occur in them) may be concrete entities. In fact, a cognition may be regarded as an (unordered) pair whose members are the qualificand and the qualifier.

$ 1.10 Strictly speaking, qualifiers and qualificands are not the only elements of a cognition. The relation or connector *(saṃsarga)* linking a qualifier and a qualificand is also a necessary element, although it does not usually appear in the verbal expression of a cognition (Matilal 1968a:18). The 'contentness'[17] *(viṣayatā)* of a cognition is said to comprise 'qualificandness'[17] *(viśeṣyatā)*, 'qualifierness'[17] *(viśeṣaṇatā* or *prakāratā)* and 'relation-ness' *(saṃsargatā)* (Matilal 1968a:16-17; Potter 1957:7).

A qualifier can qualify its qualificand in varying ways according as the relation linking the two varies. This relation is said to be of

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[16]There is an exception to this: if a unit-class is identified with its only member, as is done by some (fn 6.5), it becomes a physical entity, if its (only) member is such.

[17]See Convention C for the special use of quotes in such cases.

three principal sorts: inherence *(samavāya)*, contact *(saṃyoga)* and peculiar relation or particular qualification *(svarūpa saṃbandha)* (Ingalls 1951:43, 74-75). For example, *potness* is said to qualify, or occur in, *pot* by inherence in the cognition, |The pot has potness| *(ghaṭatva-viśiṣṭo ghaṭaḥ)*; *fire* is said to qualify *mountain* by contact in the cognition, |The mountain has fire| *(parvato vahnimān)*; and *blue colour* is said to qualify *the pot* by particular qualification in the cognition, |The pot is blue| *(nīlo ghaṭaḥ)*. The distinction between inherence and particular qualification is tied up with the distinction between the so-called generic properties or class-characters or universals *(jāti)* on the one hand, and imposed properties *(upādhi)* on the other. This latter distinction roughly corresponds to the Aristotelian distinction between essential and accidental properties.[18]

$ 1.11 The main points I have made so far are these: I choose the term 'cognition' as a translation of *'jñāna'* in preference to 'knowledge', 'thought' and 'proposition'. *'Jñāna'* is used by the NNs in two main senses, namely, (a) in the sense of the process or activity of cognising; and (b) in the sense of the product or content of such activity ($ 1.1). Sense (b) has two sub-cases, (b_1) knowledge or true proposition *(pramā)*; and (b_2) a proposition, true or false. I use 'cognition' mostly in sense (b_2). In this sense (and hence in sense (b_1) as well) a cognition is the sense of the sentences expressing it. It is also an eternal, abstract

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[18] For further discussion on qualificands and qualifiers, see $$ 2.26-31 below. The difficulties of individuating cognitions are discussed in $$ 2.18-20; see also $$ 2.21-25.

entity. Truth-values belong primarily to cognitions, but only secondarily to sentences.

Sense (a) is a psychological sense which I regard as not relevant to my purpose of presenting an account, in contemporary terms, of the Nn theory of inference. Hence, I ignore it.

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$ 1.12 Cognitions are communicable only through language. So, the NNs, though they were primarily concerned with cognitions, were nevertheless led to a study of linguistic structures, especially the sentence and its elements. Linguistic investigations were being carried out by the school of grammarians, which had a long tradition of great thinkers including Pāṇini (ca 400 B.C.), Kātyāyana (ca 300 B.C.), Patañjali (ca 150 B.C.) and Bhartṛhari (ca 450 A.D.). All the same, the NNs (and in fact members of every other Indian school of philosophy) thought the matter of sufficient importance not to be left to the grammarians alone. And they devoted considerable attention to grammatical and linguistic questions.

There was, in fact, an important reason for the NNs' interest in sentences. Though they did not realise it, they were inevitably faced with the problem of individuation of the extralinguistic entities they allowed, namely, cognitions. Lacking any other principle of individuation, they were forced to rely on linguistic considerations. I shall have more to say on this point later ($$ 2.18-20).

Though the declarative sentence as the verbal expression of a cognition was of prime concern for the NNs, yet their account of the nature

of a sentence is quite general and is applicable to non-declarative sentences as well. In fact, quite a few of the illustrative examples are imperative sentences (cf fn 1.19).

$ 1.13 One common Nn definition of a sentence is that it is simply any group of words.[19] As thus defined, a sentence could consist of only nouns, or only non-nouns or a mixture of both nouns and non-nouns; there is no restriction as to the grammatical categories of the components. This means that any nonsensical set of words counts as a sentence. To take an oft-repeated example from Patañjali, the conglomeration of words,

> Ten pomegranates, six cakes, a pond, a goat-skin, a ball of pounded sesame, this is the lower thigh of an unmarried girl, the father of Sphaiyakṛta is emaciated,[20]

would, on this definition, be a sentence. This is an absurd situation and the NNs avoid it by distinguishing between adequate and inadequate sentences and by setting up criteria of adequacy.[21] When the NNs talk of sentences, what they have in mind is usually an adequate sentence.

$ 1.14 There was a controversy between the grammarians and the Naiyāyikas regarding what are the chief components of an (adequate) sentence. The

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[19] *vākyaṃ pada-samūhaḥ yathā gāṃ ānayeti. . . .* "A sentence is a group of words; e.g., 'Bring a (or the) cow . . . '". *TS 59.*

[20] *daśadāḍimāni ṣaḍ apūpaḥ kuṇḍaṃ ajājīnaṃ palala-piṇḍaḥ adharorukaṃ etat kumāryāḥ sphaiyakṛtasya pitā pratiśīna iti (The Vyākaraṇa-mahābhāṣya of Patañjali.* Edited by F. Kielhorn, revised 3rd edition by K. V. Abhyankar; Poona, BORI, Vol I (1962), p 38. Also cited in *NBh* 5.1.10 and Vidyabhusana 1921:117 fn 1).

[21] These are discussed in $$ 2.1-17 below.

grammarians held that the chief component is a finite verb, while the Naiyāyikas maintained that it was a subject-noun (i.e., a word with the nominative case-ending). This controversy is an off-shoot of the semantic controversy about the character of the chief qualificand in a cognition. For the grammarians the chief qualificand was an action *(kriyā, karman)*; for the Naiyāyikas on the other hand it was an ontic (substantive) entity. Since a cognition can only be expressed by a sentence, the grammarians' view meant that the chief qualificand must be expressed by that component of a sentence which signifies action. As most sentences in Sanskrit can be said to contain finite verbs explicitly or implicitly, it is the finite verb which, on this view, generally expresses the chief qualificand. This does not mean, however, that the finite verb is *essential* for a sentence as Matilal (1966:380, cf 377-78) thinks. For there are sentences which, while containing words signifying action, yet do not explicitly contain finite verbs, nor is it possible to supply one (e.g., *"alaṃ krīḍitvā"* "Enough of playing"). In such cases, the chief qualificand is expressed by verbal elements other than finite verbs.

The Naiyāyika view that the chief qualificand is expressed by a subject-noun has indeed the consequence that a subject-noun is a necessary constituent of a sentence. If it is not explicitly present, it must be understood. For instance, in a sentence like *"pidhehi"* ("Shut"), a word with the first-case termination like *'tvam'* ('you') is to be understood. However, the Naiyāyikas have difficulty in accepting this consequence because, they are aware of certain counter-examples (e.g., *"alaṃ krīḍitvā"* mentioned above), and their efforts to deal with them are none too happy.

What emerges from these considerations is that the controversy between the grammarians and the Naiyāyikas is not, nor is it intended to be, about the syntactic characterisation of a sentence. It is primarily a semantic controversy with certain syntactic overtones.[22]

$ 1.15 The view that a sentence is any group of words naturally leads to discussion of the nature of a word. The Nn definition of a word is semantic. Annaṃbhaṭṭa states it thus:

śaktaṃ padam. "A word is that which has *śakti*". *TS 59; SM 81.*

The interpretation of the word *'śakti'* used in this definition presents a problem. The NNs (and other schools of Indian philosophy as well) make a distinction between *śakti* and *artha* (or *padārtha*) (*TS, TD 59; BP, SM 81*). These words are usually taken by modern English writers to mean capacity (or power, potency) for meaning[23] and meaning respectively. But if *śakti* is taken to mean the capacity for meaning, the above definition becomes vacuous: every sign or sound (or conglomeration of them) can, in principle, be said to have the capacity for meaning *as capacity is generally understood in English.* Obviously, the NNs did not want that

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[22]For further details on this controversy, see Matilal 1966:377-81, 388-92; Aklujkar 1970a:95-96; Staal 1967:68; Athalye:330-32. See also $ 2.22.

[23]The NNs also regard *śakti* as the relation of a word to its meaning:

śaktiś ca padena saha padārthasya saṃbandhaḥ (SM 82; cf *TD 59).*

They seem to make no distinction between saying that *śakti* is the capacity for meaning and saying that it is the relation of a word to its meaning.

definition to be vacuous. Whenever the NNs talked of words as having *śakti*, their intention was not to characterise the set of all possible signs or sounds, but only a proper subset of them, namely, the set of those signs or sounds, which as a matter of fact have meaning in a natural language (Sanskrit in this case). *Śakti* then, for the NNs, is coextensive with *artha:* not only every meaningful string has *śakti*, but also no nonsensical string (e.g., *'kacaṭapa'*)[24] has it.[25] Thus, having *śakti* amounts to having *artha*, and Annaṃbhaṭṭa's definition can be rendered by saying that a word is that which *has* meaning (or is

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[24]Kavirāja Viśvanātha (14th century A.D.), *Sāhitya-darpaṇa* Ch II, verse 2ab.

Although Kavirāja Viśvanātha (distinct from the NN Viśvanātha) is a poetician, his view is representative of all schools of Indian philosophy, including the NNs.

[25]This fact shows, I think, that 'the capacity for meaning' is not the right expression with which to translate *'śakti'*. For, that expression suggests the possibility, denied by the NNs, of there being strings which have the capacity for meaning and yet no meaning. Aklujkar thinks that a distinction should be made between actual capacity and potential capacity, and suggests 'actual capacity' as an equivalent of *'śakti'*. However, I do not find Aklujkar's distinction helpful. Whether or not such a distinction could be made with regard to 'capacity' taken as a (human) dispositional word, I do not think it could be made with regard to 'capacity' as applied to inanimate things, and in particular, to words.

It might be argued that there is something like a distinction, even in the case of words, between actual and potential capacity: consider the word 'horrible'; we have the corresponding word 'horrid'. But for the word 'terrible', we do not have a corresponding word 'terrid'. However, if the distinction between actual and potential capacity could be made to apply to expressions, as suggested by this example, it could only be made to do so relative to a generative (i.e., explicit) grammar which yields it as an 'unactualized possible'. The NNs had no such sophisticated grammatical theory in mind.

meaningful).[26] Rendered in this way, the definition is clearly semantic.[27]

$ 1.16 As to what the meaning *(artha)* of a word (or phrase) is, there are several views in the Indian tradition.[28] But the Nn view, known as *jāti-viśiṣṭa-vyakti-vāda*, is that the meaning of a word is the individual as qualified by the universal.[29] By this, of course, the NNs do not mean

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[26]This rendering has the consequence that *artha* and *śakti* coincide; but this consequence does not seem to alarm modern writers. For instance Raja (1963:17-25, 69-70) and Athalye (333-34) use 'the capacity for meaning and 'meaning' indiscriminately as equivalents of *śakti*, and Matilal (1966:379) translates *"śaktaṃ padam"* as (what is) "the meaning-bearing element of a sentence".

[27]The NNs distinguish between primary and derivative meanings of words. The former is called *'abhidheya'* (also *'vācya'*, *'mukhya'*), and the latter *'lakṣya'* (also *'gauṇa'*) (*BP, SM 82; TD 59;* Aklujkar 1971:$ 4.1). My remarks are confined to primary meaning only, since, according to the NNs, *'śakti'* and *'abhidhā'* (from which *'abhidheya'* is derived) are synonymous (*SM 81*; Athalye:337).

Ānandavardhana (ca 9th century A.D.), a non-naiyāyika, developed the theory of *vyaṅgya* (suggestive or metaphorical meaning) which is regarded as the third variety of meaning in addition to *abhidheya* and *lakṣya*. The NNs do not recognise this variety (*SM 81; TD 59;* Athalye:337).

[28]The chief among these, besides the Nn view under consideration, are: *kevala-jāti-vāda* (the view that the (corresponding) univeral alone is the meaning of a word; *kevala-vyakti-vāda* (the view that an individual alone is the meaning); and *apoha-vāda* (the view that the meaning of a word (e.g., 'cow') is the 'opposite' of the 'opposite' (e.g., non-non-cow). For a discussion of these, see Athalye:334-37; G. Sastri 1959:136-71; Sharma 1969:21-43. These theories are not intended to apply to 'indeclinables', i.e., to what in traditional logic are called, roughly, 'syncategormatic words' or what Church (1956:31-39) calls 'improper symbols'. See fn 1.32.

[29]There is a difference of opinion as to what precisely is the Nn position. Athalye (334-36) thinks that it is *kevala-vyakti-vāda*, while G. Sastri (1959:141-42) holds that it is *jāti-viśiṣṭa-vyakti-vāda*. Raja (1963:70-71) thinks that while some NNs advocate *jāti-viśiṣṭa-vyakti-vāda*, others advocate *kevala-vyakti-vāda*. He cites some evidence on either side,

that the meaning of a (general) word is any particular individual. They mean rather that a (general) word is indifferently applicable to any one of a whole class of objects determined by a property. They say, for instance, that the word 'horse' is not applicable to ants or elephants, but only to horses, because only these are determined by the universal, *horseness* (cf Athalye:335; G. Sastri 1959:139). This suggests that what the NNs have in mind when they say that the meaning of a word is an individual is the extension (or reference) of that word. But in so far as the individuals to which a word is applicable are said to be determined by a universal, the word must also have intension (or sense).[30] Thus, a word, according to the NNs, must have both intension and extension

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but the evidence in favour of *kevala-vyakti-vāda* does not seem to me very strong. My account of the Nn position is based on *TD 59* and *SM 81*. While *TD 59* explicitly says that the meaning of a word is an individual as qualified by the universal (alone), *SM 81* holds that the meaning is an individual as qualified by *both* the universal and the form or 'configuration' *(ākrti)*. Thus, *SM 81*, like *NS 2.2.65* makes a distinction between form and universal, and thereby implies that a form is not a universal. But a form is clearly a universal, and perhaps for this reason, the distinction between the two tends to be obliterated in Nn. I have, therefore, understood *SM 81* as advocating *jāti-viśista-vyakti-vāda* only. Raja (1963:70, cf fn 4) also thinks that this is how it should be understood. He says, "the generic shape (i.e., form) is part of the universal and need not be included separately" (cf Datta 1960:270). See Chatterjee 1950:329; Datta 1960:266.

[30]For my limited purpose, I am using 'intension' and 'sense' on the one hand, and 'extension' and 'reference' on the other interchangeably in the sense of Carnap (1956:18-19, 40-41, 21, 23). According to Carnap, singular as well as general words can have intension or extension; but Frege does not talk in his published writings, about the sense or reference of general words. Jackson (1963:84-87) argues that he (Frege) does in his unpublished writings.

(cf Athalye:337).[31] But oddly enough, the NNs also hold that a word has both intension and extension in *all* of its uses. This would mean, for instance, that in a sentence like "Man is mortal" *("manuṣyo martyaḥ")*, the word 'man' would refer[32] not only to extension (i.e., to any arbitrarily chosen man), as it is commonly understood to do, but also *at the same time* to intension (i.e., to the universal *manness*).

$ 1.17 This view of the NNs is open to at least two objections: first, even though a word *may* have both intension and extension, it is not true that it has both of them in each of its uses. In some of its uses, it may have intension alone, and in some others, extension alone (cf Carnap 1956:100-102, 106-11). This is indeed indicated by what the NNs themselves say elsewhere. For instance, in giving a semantic analysis of the sentence, "Man is mortal", they say that the word 'mortal' *('martya')* names a qualifier which is invariably regarded as a property *(mortality*, in this case) ($$ 2.22, 2.27-28). That is, it has only intension. Similarly, the NNs also say that the word 'man' has only extension, though their

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[31] This is true not only of the NNs, but also, *in effect*, of the *kevala-jāti-vādins* and *kevala-vyakti-vādins*. The *kevala-jāti-vādins* hold that intension alone is the (primary) meaning of a word, but allow extension as a secondary meaning (i.e., by 'implication' *(lakṣaṇā, ākṣepa)*). Likewise, the *kevala-vyakti-vādins* hold that the (primary) meaning is extension alone, but allow intension as a secondary meaning. Thus, all the three schools differ only in emphasis as to what constitutes meaning, and accept the same semantic model (i.e., in terms of qualifier and qualificand) for analysing sentences. See Athalye:334-37.

[32] Even though I use the expressions 'refer to', 'express', etc., rather loosely, it should be noted that for the NNs the relation of a word to its meaning *(artha)* is almost always (but not always) the naming relation.

view of what this extension is creates difficulties. There is, thus, some internal conflict in the NNs' semantic views.[33]

Second, the Nn view is applicable only to general words, and is not comprehensive enough to account for other words, in particular for singular terms. An abstract singular term like 'cowness' *('gotva')* names a property, namely, *cowness*, and thus has only intension. It can by no means be said to refer to any particular cow (or the class of cows). A concrete general term like 'mortal', on the other hand, refers to any arbitrary member of the class of mortals, but cannot be said to name anything, though as remarked above, the NNs think that it names the property, *mortality*. A word can have intension without naming anything.[34]

Further, a concrete singular term (e.g., 'Devadatta', 'the man in the white garment' ($ 2.26)) cannot be said to have intension. For, according to the NNs, singleness of an entity *(vyakter abhedhaḥ)* is an 'impediment to universalhood' *(jāti-bādhaka)* (*SM 8;* Athalye:92; Ingalls 1951:42 fn 49). In other words, there can be no universal corresponding to concrete singular terms,[35] and hence no intension[36] (cp Matilal 1968a:119).

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[33] See $$ 2.28-29 for further details.

[34] This shows that the NNs did not distinguish between abstract singular terms and concrete general terms. See Quine 1959:205.

[35] From this, I think that it is legitimate to infer (in extensional terms) that the NNs did not recognise unit-classes. Also, their theory of unexampled terms ($$ 2.8-9) implies that they did not allow the null-class or the null-thing. See fns 3.36 and 6.5.

[36] Terms (whether singular or general) expressing properties that have no instances (i.e., unexampled terms) constitute a special category, and present special problems ($ 2.8-9).

These objections arise mainly because the NNs, as also the other participants in the controversy, did not distinguish between intension and extension (or, sense and reference).[37] The failure to make the distinction led them, as it has led many western philosophers into rather serious difficulties.[38]

$ 1.18 It was noticed earlier ($ 1.6) that universals are, according to the NNs, abstract and independently existing entities; and this evidence was used in showing that cognitions (i.e., senses of sentences) are, for the NNs, ontologically independent entities. The same evidence even more clearly shows that senses of even words and phrases are, for the NNs, ontologically independent. For, the sense (or intension) of a word is simply the universal corresponding to it, and universals are ontologically independent. The sense of the word 'horse', for instance, is, according to the NNs, the universal *horseness*. It occurs in all the horses, and yet is distinct from them: unlike the individual horses, it does not come into, or pass out of, being.

$ 1.19 For the NNs then, as for Frege, word-meanings as well as sentence-meanings are ontologically independent of language. Though independent

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[37]This does not mean that the distinction between sense and reference was not known in the Indian tradition as a whole. Bhartṛhari, for instance, distinguishes between *buddhyartha* or *śabdārtha* (sense) and *vastvartha* (reference), even though unlike the NNs (and Frege) he does not accept the ontological independence of sense (Aklujkar 1970a:98-101). There is also some evidence that the distinction was known even earlier, as early as 1st century A.D., to Śabara, the earliest available commentator on the Mīmaṃsā-sūtra (Aklujkar 1970b:n 15).

[38]For a discussion of the sort of difficulties that can arise from a failure to make the distinction, see Quine 1961:1-19.

of any expressions, they are generally associated with, and are known to us through, expressions. The independence of word-meanings from their linguistic vehicles is also brought out by the Nyāya notion of *viśeṣa* (particularity, ultimate difference). A *viśeṣa* is supposed to be an entity responsible for differentiating atoms (the ultimate constituents of the world) from one another. Yet no *viśeṣa* can have a name: one does not know what an atom (in the Nyāya sense) is like.

It should be emphasised, however, that the similarity of the NNs' approach to meanings to that of Frege regarding their ontological status should not be pressed too far. It should not be taken to suggest that the NNs also held other Fregean views.

$ 1.20 As to how a word comes to have its meaning (*śakti*; see 1.15), the NNs say that it is a matter of convention, divine or human.[39] While the realisation by the NNs that meaning is a matter of convention was an important insight, it had its limitations: a divine convention hardly makes sense, and even where human convention was allowed, it was limited only to some words like proper names (Athalye:333; *SM 81*). The NNs did not see that the meanings of *all* words are conventional, although owing

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[39] The old Naiyāyikas attributed this convention only to God's will, but the NNs maintained that it could also be due to human will:

> *sā (=śakti) cāsmacchabdād ayam artho boddhavya itīśvareccha-rūpā . . . navyas tu īsvareccha na śaktiḥ kintv icchaiva. . . .* "And it (=*śakti*) is of the form of God's will that from this word this meaning is to be understood. . . . The moderns, however, hold that *śakti* is not God's will but any will whatever . . ." *SM 81*, (cf *TD 59;* Athalye:333).

to their interconnections in an immensely complicated system of language, their conventional character may not be apparent.

The conventionalism of the NNs was opposed to the naturalism of the Mīmāṃsakas in this respect. The latter held that *śakti* is natural to, or inherent in, the words themselves.[40] By this what the Mīmāṃsakas presumably meant is that one cannot explain exactly how words came to have their meaning; that as far as our knowledge goes, they have always had their meaning, and that their meaningfulness cannot be traced to any human origin.[41] They could not have meant that a sign or sound has some innate or natural quality in virtue of which it comes to be assigned a certain meaning. If this were so, the same sign or sound would permanently have the same meaning, and there would not be any diversity of languages. Even within the same language there would not be any change in the meaning of words. The naturalism of the Mīmāṃsakas is perhaps due to their belief in the eternity of the Vedas. On such a belief, the same (Vedic) words would always have the same meaning.

The Mīmāṃsā naturalism (or the doctrine of *autpattika śabdārtha-saṃbandha*) is also shared in essentials by grammarians like Bhartṛhari. The latter called it *'anādi-siddha śabdārtha-saṃbandha'* (Aklujkar 1970a: 105-107; 1970b:n 15).

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[40] *autpattikas tu śabdasyārthena saṃbandhaḥ (Mīmāṃsā-sūtra 1.1.5*, cited in Raja 1963:20).

[41] Or could it be that they were trying to say that genetic accounts of how words come to have meanings are not a necessary adjunct to semantics?

$ 1.21 In giving semantic criteria for determining what a word is ($ 1.15), the NNs differed not only from grammarians like Pāṇini, but also from their own founder, Gautama, both of whom gave syntactic criteria: both said that a word is any string having an inflection at the end (Matilal 1966:379).[42] Such syntactic criteria satisfy the condition of descriptive adequacy, and hold, of course, only for highly inflected languages like Sanskrit, in which every word has either a conjugational or declensional (nominal) inflection.[43] For a language like English where not all words have inflections, either exclusively semantic criteria or syntactic criteria of a less interesting sort (such as that of being on a list) would be necessary.

When Gautama and grammarians like Pāṇini claimed to give syntactic criteria for wordhood, what they had in mind was not just the trivial property of being in a certain list of strings of symbols. Such a list was, no doubt, presupposed explicitly or implicitly in that it constituted the domain for their whole enterprise. Given such a domain, these thinkers were looking for a property or properties that would describe exactly that domain. The list presupposed was, of course, not arbitrary; it was determined by a natural (then living) language, namely, Sanskrit. It contained only and all Sanskrit words. It is this fact that

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[42] *te (=varṇāḥ) vibhaktyantāḥ padam (NS 2.2.60).*

sup-tiṅ antaṃ padam (Pāṇini-sūtra 1.4.14).

[43] The case of particles, indeclinables, etc., is accounted for by means of the notion of zero-occurrence (Matilal 1966:379).

makes their investigations valuable: they meet the condition of descriptive adequacy so far as Sanskrit is concerned. The criteria offered by these thinkers, then, are syntactic in a more interesting sense than those that are merely in terms of a list. In this more interesting sense, syntactic criteria are not possible for every language. But in the less interesting sense of being in terms of a list, they *are* possible for every language.

It is important to distinguish in this regard between the two questions: (a) What is it to be a word of a particular language *L*? and (b) What is it to be a word (in general or in any language)? A syntactic definition (at least in the less interesting sense) is possible only if a word is understood as in question (a). For, any particular language has only a finite vocabulary at any given time, and to say that a word of that language is anything that occurs as a member of that vocabulary is indeed to give a structural definition. If a word is understood as in (b), a syntactic definition even in the less interesting sense is not possible for every language: it would involve the impossible task of listing all words of all the infinite number of languages, actual or possible.

Why did the NNs give a semantic definition of a word, when a good syntactic definition was already given by Gautama? It is possible that they thought the two definitions were equally good, and arbitrarily chose the semantic definition. But it is also possible that they thought the founder's definition to be inadequate for two conceivable reasons. First, they might not have realised that that definition presupposed a list.

Without such a presupposition, that definition would allow too much: any nonsensical concatenation of the Sanskrit alphabet would also count as a word, if it had one of the inflections (all of which are listed). A semantic definition would avoid such a difficulty. But a syntactic definition would equally avoid the difficulty if a prior list of strings is granted as the universe of discourse. Second, even though they did realise that Gautama's definition presupposed a list, they might have rightly reasoned that once a list is available, further syntactic characterisation of the items on the list, however interesting and useful in practice, is superfluous in principle so far as the definition of a word is concerned. A theoretically sound syntactic definition is already obtained when a list is prepared.

CHAPTER II

COGNITION AND SENTENCE (II)

§ 2.1 Although semantic criteria are, according to the NNs, relevant for words (§§ 1.15, 1.21), they are not for a sentence defined as any cluster of words (§ 1.13). Similarly, syntactic considerations (in so far as syntax refers to the internal structure of a sentence) also are not relevant to a sentence conceived in this very broad sense. This, as was noticed earlier (§ 1.13) is an absurd situation, and the NNs avoid it by distinguishing between an adequate sentence *(pramāṇa-vākya)* and an inadequate sentence *(apramāṇa-vākya)*. They specify four criteria that an adequate sentence must satisfy, namely, expectancy *(ākāṅkṣā)*, competency *(yogyatā)*, proximity *(āsatti, saṃnidhi)*, and (speaker's) intention *(tātparya)*. Together, these criteria are designed to set apart syntactically and semantically sound (but not necessarily true) sentences from the rest. Thus, a sentence is adequate if and only if it meets these (especially the first three) criteria[1] if and only if it is syntactically

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vākyaṃ dvividhaṃ pramāṇa-vākyam apramāṇa-vākyam ceti. tatra pramāṇa-vākyam ākāṅkṣā-yogyatā-saṃnidhimatāṃ padānāṃ samūhaḥ. . . . apramāṇa-vākyaṃ tu ākāṅkṣādi-rahitaṃ vākyam. "A sentence is of two kinds, adequate and inadequate. An adequate sentence is a group of words which have expectancy, competency and proximity. . . . An inadequate sentence is one which lacks expectancy, etc. *NK s.v. vākyam.*

ākāṅkṣādi-rahitaṃ vākyam apramāṇam. "A sentence which lacks *ākāṅkṣā*,

and semantically sound, but not necessarily true.[2]

These criteria of an adequate sentence are variously described--as requirements (Brough 1953:163), as conditions (Raja 1962:145, 149, 156), and as criteria or properties (Matilal 1966:384). I shall use these expressions indifferently in talking about them, since it makes no significant difference which one I use.

\$ 2.2 Of these four requirements, expectancy *(ākāṅkṣā)* is a syntactic requirement and is alone said to be of real linguistic importance (Brough 1953:163). At any rate, it is agreed by all to be the most important. It is defined as the connection or association of a word with another such that the occurrence of the former without the latter is not enough to complete the syntactical structure of a sentence. Or more literally, the association is such that the occurrence of one word raises in the listener an expectation or desire for the occurrence of another. Unless the expectation is fulfilled, the structure of the

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etc. is inadequate". *TS 61.*

Strictly speaking, expectancy etc., belong to the components of a sentence, it is only derivatively that they are said to belong to a sentence. To say, therefore, that a sentence has them is really to say that it consists of elements which have them.

[2]This is another sense of the expressions *'pramāṇa-vākya'* and *'apramāna-vākya'*. One sense, namely, 'a true sentence' and 'a false sentence' was noted in fn 1.10. The word *'pramāṇa'* also means a means of knowledge (\$\$ 3.4-5).

containing sentence is not complete.[3] For example, in the sentence, "Bring the cow" *("gām ānaya")* the use of the transitive verb 'bring' is said to raise an expectancy for the word 'cow' which serves as its grammatical object; i.e., structurally or syntactically, a transitive verb needs a grammatical object.

One might think that such association between words is merely psychological, accidentally formed in the minds of particular language-users. However, what the Naiyāyikas (and thinkers of other Indian schools as well) had in mind was an objective, i.e., syntactical relation determining the internal structure of a sentence. There is no such relation between the words of the expression, "cow, horse, man, elephant" *("guar aśvaḥ puruṣo hastī" (TS 61))* which, though, is technically a sentence; but the sentence can never be legitimate despite any psychological associations particular individuals might have formed between these words.

$ 2.3 It must be emphasised that what is demanded by expectancy is the completion of the grammatical form or structure of a sentence, not of its meaning. Even if one replaces 'the cow' by 'triangularity' in "Bring the cow", the resulting sentence "Bring triangularity" will still be

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[3] *padasya padāntāra-vyatireka-prayuktānvayānanubhāvakatvam ākāṅkṣā.* "Expectancy consists in a word's not being syntactically connected with the remaining words of a sentence owing to the absence of another word". *TS 60.*

yat-padena vinā yasyānvayānanubhāvakatā bhāvet ākāṅkṣā. BP 84.

This is further expanded in *SM 84* as:

yena padena vinā yat-padasyānvayānanubhāvakatvaṃ tena padena saha tasya ākāṅkṣā. "If a word x cannot become syntactically connected with the rest of the sentence without another word y, then x has expectancy for y".

grammatical--i.e., will have expectancy--though semantically speaking, it will be very odd. Expectancy is thus a syntactic requirement. This is clear from *TS 60* and *SM 84* (fn 2.3) where the word used is not *'artha'* ('meaning') but *'anvaya'* and means sequence, or structure. The syntactic character of expectancy, despite its obvious importance, is not fully realised by, for example, Raja (1963:157) and B. Bhattacharya (1962:129) (among several others) who take *'anvaya'* as 'meaning' and regard expectancy as requiring completion of sense, rather than of structure. Even Matilal (1966:383-84), while believing that expectancy is a syntactic property, yet cites Gaṅgeśa's definition in his support, which either does not do its intended job (if Matilal's translation of it is correct), or Matilal's translation of it does not bring out the spirit of that definition. I am inclined to believe the latter. Gaṅgeśa's definition is:

yasya yena vinā svārthānvayānanubhāvakatvaṃ tasya tatpada saṃnidhānam.

Matilal translates this as, "The accompaniment of a string x with another string y in such a way that x would not generate cognition of *the meaning (śābdabodha* or *anvayabodha)* unless accompanied by y" (italics mine). Thus translated, Gaṅgeśa's definition actually becomes inconsistent with Matilal's point since it makes expectancy a semantic requirement by bringing in the meaning of the whole sentence *(śābdabodha)* (§ 2.18). A more precise translation of it would be, "If the meaning of (a word) x cannot be construed without the presence of (another word) y, then having y near x is expectancy". This translation, like the original, also refers to meaning *(svārtha)*, but the meaning is that of a word, not of the whole

sentence containing it. With this limitation, it is easy to see that the reference to meaning is inessential: what is to be construed is one word, not its meaning, with another. This is indicated by the fact that in the latter half of the translation, only *'y'* not 'the meaning of *y'* occurs. In *TS 60, BP 84* and *SM 84* (fn 2.3), there is no reference to meaning at all but only to syntactical connection *(anvaya)*.

If *'anvaya'* is taken as 'meaning', expectancy no longer remains a purely syntactical requirement as it is, I think, intended to be by the NNs. It would at least partly be semantic and would overlap with competency.

$ 2.4 Syntax, as it is understood today, has two functions: (a) characterisation of the grammatical structure of sentences actually belonging to the corpus of a given language; (b) generation of sentences which do not belong to the corpus (i.e., have not been uttered so far by any native speaker), and yet which have the same structure. The NNs were, perhaps, unaware of the second function. Nevertheless, it is interesting to note, with the second function in mind, that the Nn notion of expectancy has some superficial similarity with a certain communication theoretic model for linguistic structure employing a finite state Markov process. This model is like a machine with a finite number of internal states. Each state is designed to produce a sign. Given the initial state, the machine automatically switches to the second, from the second to the third and so on, until it stops at the final state. When it runs through all its (finite number of) states, the result is a sequence of signs, which

is a sentence. Now, the speaker of a language may be compared to such a machine.

> In producing a sentence, the speaker begins in the initial state, produces the first word of the sentence, thereby switching into a second state which limits the choice of the second word, etc. Each state through which he passes represents the grammatical restrictions that limit the choice of the next word at this point in the utterance. (Chomsky 1957:20).

If the speaker is conceived in this way, then the similarity between the Markov process model and expectancy becomes apparent: in both, given an initial word, the need for a further word is created. This is only a superficial similarity, however. The divergences are too great. First, while the Markov process model determines the next word exactly, expectancy cannot. The next word after 'Bring' may be 'cow' or 'black' or 'broken-horned' and so forth. There is no automatic switching to the next word. Second, the Markov process model is a finite state model, and can be called a finite state grammar. The language it produces is a finite state language. As Chomsky has shown (1957:21-25), such a grammar is inapplicable to English in particular since English is not a finite state language. It is not applicable to Sanskrit either, or presumably to any natural language, for the same reason. Expectancy on the other hand is applicable to such languages.

$ 2.5 Expectancy does not satisfactorily characterise the syntactic requirement of an adequate sentence though the NNs thought it does. It is not general enough to cover all grammatically sound sentences. For instance in the sentence,

(1) *ayaṃ paṭo na raktaḥ* ("This cloth is not red"),

while the first word may be said to arouse an expectancy for the second, neither of them singly, nor both together, can be said to arouse an expectancy for any or all of the rest. This is so because, owing to the peculiarity of Sanskrit, the first two can, by themselves, constitute a syntactically (and semantically) sound sentence. So can the first three.[4] (It may be noted, however, that the English translation of the above Sanskrit sentence does have expectancy). This difficulty cannot be overcome by saying that it is enough for a sentence to be adequate, if at least one of its words has an expectancy for at least one other word; for, in that case, even ungrammatical sentences like *"naro 'yaṃ jalena"* ("This is a man with water") would also count as adequate. Nor can it be overcome by saying that (1) is not really a single (or simple) sentence,[5] but a complex of sentences; or, using Nyāya terminology, that (1) lacks sentence-unity *(eka-vākyatā)*, and the conditions of adequacy apply to single sentences, not to combinations of them. For, on any analysis (1) is a single sentence, although even the first two or the first three words can by themselves form a sentence. This is further reinforced by the Nn view that a sentence is one if it has only one chief

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[4] In fact, any three of the four words constitutes an adequate sentence. So do also the first and the fourth, and the second and the fourth.

[5] 'Single' or 'simple' here means that a sentence does not have other sentences as its parts. In this sense, even general sentences of the form "All men are mortal" and "Some men are honest" as well as atomic sentences can be said to be simple. The NNs do not distinguish between atomic and general sentences (cf §§ 2.23, 2.26-2.31), and regard both as simple.

qualificand. By this criterion (1) does have sentence-unity. That the qualifier is negative does not affect the situation, since for the Naiyāyikas, the absence of a property is itself a property, and is positive in character, like any other property.

Expectancy is a necessary but not a sufficient condition of the adequacy of a sentence. The others, especially competency and proximity, also are equally necessary.

$ 2.6 Competency is defined as the fitness (or compatibility) of the components of a sentence for mutual connection. What is in question is said to be the meanings of these components: there should not be any incompatibility or conflict among them.[6] The stock examples given in this regard are:

(2) *jalena siñcati* (He) wets (the ground) with water.

(3) *agninā siñcati* (He) wets (the ground) with fire.

In (2), the two component words are said to be compatible with regard to their meanings, and so have competency. But in (3), they lack it since the activity of wetting is incompatible with fire. Though both (2) and

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6 *padārthe tatra tadvattā yogyatā parikīrtitā.* "The compatibility of the meaning of a word with that of another is called competency". *BP 83.*

eka-padārthe 'para-padārtha-saṃbandho yogyatā. "The connection of the meaning of a word with that of another is competency". *SM 83.*

arthābādho yogyatā. "Competency is the non-contradiction of meaning". *TS 60.*

(3) are syntactically sound, (2) alone is semantically sound. Thus, competency is a semantic requirement distinct from expectancy which is syntactic.

$ 2.7 What sort of incompatibility is it that is involved in the Nn notion of competency? Is it logical impossibility or factual impossibility? Or, is it just plain factual falsity? It is clear that, for the NNs, lack of competency does not mean factual falsity. They distinguish between true and false cognitions (fns 1.2, 3.9), and the same distinction of course carries over to sentences ($$ 1.7; *TS 59*). A sentence must already be adequate *(pramāṇa-vākya)* in order to be false; that is, it must have competency. But on the same reasoning, sentences expressing physical and logical impossibilities ought to have competency, since they are also falsities. Any definition of an adequate sentence, one would think, has the consequence that if *p* is adequate, so is not-*p*. Yet it is not clear whether the NNs would say that sentences expressing factual or logical impossibilities have competency.[7]

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[7]Aklujkar thinks that the expressions *'pramāṇa-vākya'* and *'apramāṇa-vākya'* mean, not adequate sentence and inadequate sentence, as I hold, but true sentence and non-true sentence. A non-true sentence includes, on his interpretation, false (logically or otherwise) as well as non-sensical sentences (which would be necessarily ungrammatical). His reasons are: (1) Expectancy, competency, and proximity are discussed in the broad context of true cognition *(yathārthānubhava) (TS 36)*, and in the immediate context of testimonial cognition *(śābda-jñāna)*. Hence, they must refer to a true sentence *(śabda)* only. (2) In the immediate context *(TS 59)* of the discussion of expectancy etc., *(TS 61)*, the words *'āpta'* ('speaker of truth') and *'yathārtha'* ('true') occur. (3) The word *'pramāṇa'* is not found as (explicitly) referring to sentences which are syntactically and semantically sound but false. (4) In the discussion immediately following that of expectancy etc., it means *true (TS 62*, cited

$ 2.8 The situation is complicated by the NNs' theory of unexampled *(aprasiddha)* properties and terms. A property is said to be unexampled if it has no instances, and a term is said to be unexampled (non-reffering, vacuous) if it names such a property (Ingalls 1951:34, 61, 81; Matilal 1968a:17, 154-55). The examples cited of such terms are 'barren woman's son' *('vandhyā-suta')*, 'rabbit's horn', *('śaśa-śṛṅga')*, 'sky flower', *('gagana-kusuma')*, etc. These are general terms without extension on the same level with 'unicorn', 'round square', 'green swan', etc. Though the NNs do not consider examples of singular terms without extension like

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in fn 1.10) and hence must have the same sense in *TS 61* also. (5) Competency *(yogyatā)* which is the immediate bone of contention here, is defined as non-invalidation of *artha* (fn 2.6). Whether *artha* is understood as reference (as it more commonly is by the NNs), or as sense, this definition can only mean that a sentence having competency is a true sentence. (6) The only known example of lack of competency (i.e., *"agninā siñcati"* "[He] wets with fire") can be said to be *apramāṇa* (non-true) only on the ground that it is false (in the sense of being physically impossible).

The following considerations show, I think, that Aklujkar is not right: (1) The fact that the discussion of expectancy etc., takes place in the context of true, especially testimonial, cognition does not mean that that discussion is confined to true sentences only. The properties expectancy etc., are explicitly defined quite generally as the determinants of the meaning of a sentence *(vākya,* not *śabda) (TS 60);* and a sentence, unlike *śabda* is not necessarily a true sentence. It is defined just in the preceding verse *(TS 59)* as *any* cluster of words. The words *'āpta' 'yathārtha'* are used in that verse in relation, not to *vākya,* but to *śabda.* (2) The sentences used to illustrate expectancy etc., are chosen arbitrarily and are not stipulated to be true. In fact, expectancy is generally considered to be a syntactic property ($$ 2.2-3), and cannot be confined to true sentences only. This is evident also from the fact that some examples of sentences having expectancy (i.e., *"ghaṭam ānaya"* "Bring a pot" *(SM 84)*) are in the imperative mood, and cannot be said to be either true or false. Since expectancy, competency, and proximity sail in the same boat (cp their definition in *TS 60*), the last two also cannot be confined to true sentences. (3) The NNs already have the true-false *(yathārtha-ayathārtha)* distinction, but never say that a

'the present king of France', 'Pegasus', 'Phoenix', etc., they would presumably treat them also as unexampled. The NNs consider inclusion of *aprasiddha* terms as a flaw in logical reasoning and view the sentences containing them with disfavour.[8] Again, though their examples

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sentence lacks competency merely on the ground that it is false. In fact, all schools of Indian philosophy (including Nn) keep repeating over the centuries the one example, namely, "He wets with fire". This shows, I think, that they were in possession of an interesting, but difficult, idea, and were unable to formulate it clearly. Aklujkar's view (according to which any false sentence would serve to illustrate lack of competency) renders the notion of competency relatively trivial, and leaves unexplained the intriguing fact of the absence of other examples. (4) Secondary sources without exception use 'competency' so as to apply to false sentences as well as to true ones. See, for instance, Athalye:342; Keith 1921:163; Brough 1953:163; Chatterjee 1950:337-38; Datta 1960:310-12; Bhattacarya 1962:128, 139-53; Raja 1963:164-66; Matilal 1966:383; 1968a:19-20. Actually, Raja (1963:165) suggests that, according to Kumarilabhatta (7th century A.D.), a Mīmāṃsaka, a sentence could be false, and yet have competency. Since expectancy etc., were first promulgated by the Mīmāṃsakas, and were later taken over by other schools only with slight changes (Raja 1963:156), it is reasonable to suppose that the NNs also shared Kumarilabhaṭṭa's view in this respect. (5) The definition of competency (as *arthābādha*, or as *padārthe tatra tadvattā* (fn 2.6)) is flexible enough to accommodate my view, and does not particularly favour Aklujkar's.

My conclusion, then, is that when a sentence *(vākya)* is said to be *pramāṇa on the ground that it has the properties, expectancy, etc.*, it cannot mean *true*, but *adequate* in my sense. Even if the NNs do not explicitly say that a false sentence having expectancy etc., can be *pramāṇa*, their use of *'pramāṇa'* and *'apramāṇa'* in connection with expectancy etc., implies that it can be. It is true that in the next verse *(TS 62)*, the word *'pramāṇa'* means *true*. But such ambiguities and inconsistencies, after all, cannot be ruled out in traditional writings (see fn 2.2).

On another point of ambiguity, see fn 3.23.

[8]"Such *aprasiddha* terms were always viewed as suspect in a systematic discourse. If they were parts of a sentence dealing with some logical definition or the like, the whole sentence was ruled out to be *aprasiddha* by Nyāya" (Matilal 1968a:17 fn 34, cf 155; cf Goekoop 1967: 18; Staal 1962b:641).

are compound words, the NNs would perhaps regard even single words without extension as unexampled (cp Matilal 1968a:154-55).

It is not clear from the Nn texts whether the unexampled terms are considered to lack intension as well as extension. However, modern writers on Nyāya tend to regard them as meaningless or lacking competency. Brough (1953:163) remarks, "the second factor *yogyatā*, really involved a judgement on . . . the sense or nonsense of a sentence. . . . Into this category also fall such logical puzzles as the 'round square' . . . ". Raja (1963:165) and Matilal (1968a:20) make a distinction between two sorts of unexampled terms, namely, those expressing inconceivable combinations (e.g., 'a barren woman's son') and those expressing conceivable combinations (e.g., 'a rabbit's horn'). They hold that it is the former that lack competency, and thereby suggest (Raja explicitly, Matilal implicitly) that the latter do have it. However, as far as I know, there is no textual evidence for this two-fold distinction of unexampled terms, (and Raja and Matilal do not cite any). In fact, Potter (1963:66), McDermott (1969:54 fn 18), and Mohanty (1971:199) hold that no such distinction was made in Indian philosophy. If the NNs did indeed treat unexampled terms as meaningless, then all of them must be such.

$ 2.9 That an unexampled term lacks competency (or is meaningless) can be interpreted in two ways. It can be taken to mean either (a) that the compound term as a whole is incompatible with the relevant components of any sentence in which it might occur; or (b) that its elements, which, unlike their combinations, might separately have extension, are mutually incompatible. On either interpretation, the assumption that unexampled

terms are meaningless leads to unacceptable consequences. To begin with interpretation (a), if an unexampled term lacks competency then any sentence containing it must also, as competency has been defined, lack it (fn 2.8). So, not only sentences like "There are rabbits' horns" and "Sons of barren women exist", but also their opposites, "There are no rabbits' horns" and "Sons of barren women do not exist" would have to be meaningless. Yet these latter are generally regarded as true, and there is no reason to believe that the NNs would have regarded them differently. As true sentences, they would, for the NNs, count as semantically sound. The same is true, *mutatis mutandis*, of sentences containing unexampled terms expressing physical impossibilities, e.g., "There are no sky flowers". Thus, interpretation (a) leads to an internal inconsistency. This inconsistency is even worse in the case of interpretation (b). On that interpretation, not only all those sentences in which an unexampled term as a whole occurs, but also all those in which its elements separately occur have to be counted as meaningless. Sentences like "Rabbits have horns", "Rabbits do not have horns", "Barren women have sons", "Barren women have no sons" have all to count as meaningless. Yet, the NNs would regard the first and third as false and the second and fourth as true, though they would not be able to distinguish the type of truth or falsity involved. The first two are factual. The last two are logical; the third reduces to an outright contradiction, and the fourth to a triviality if synonyms are replaced by synonyms. For the NNs, thus, all the four sentences would be semantically sound. Interpretation (b) thus, leads to a more glaring contradiction. Yet, such an interpretation

is suggested by the fact that unexampled terms are said (e.g., by Matilal 1968a:20; Brough 1953:163) to lack competency independent of their possible occurrence in sentences.

Because of these considerations, and in the absence of definite textual evidence, I feel that it is not fair to the NNs to say that they regarded unexampled terms as meaningless or as lacking competency. The view that unexampled terms, whether logical contradictions or other terms without extension, are meaningless, very probably stems from the mistaken belief that meaning is the same as naming. That the two are very different is now common knowledge, thanks to Frege and Quine, among others.

$ 2.10 If the NNs did regard unexampled terms as meaningful (or as having competency), it follows that lack of competency does not mean factual falsity, factual impossibility or logical impossibility. There is also some further, but indirect, evidence for saying that it does not mean any of these. Śālikanātha (ca 1000 A.D.) holds that semantic incompatibility or lack of competency is to be known from experience.[9] This appeal to experience, perhaps, hints that the NNs, despite their

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[9] *Kiṃ punar idaṃ yogyatvaṃ nāma? yat saṃbandhārhatvam. saṃbandhārham iti kathaṃ jñāyate? saṃbandhitvena dṛṣṭatvāt.* "Again, what is this that is called competency? It is fitness for (mutual) connection. How is it known that (something) is fit for connection? From experience of connectedness". From *Vākyārthamātṛkā-vṛtti* in *Prakaraṇa-pañcikā*, cited in Raja 1963:164 fn 2.

Śālikanātha, is a Mimāmsaka, not an NN. But it is essentially an Nn concept that he expounds in these lines.

frequent confusion between intension and extension, had moments of relative clarity when they were vaguely aware of the distinction between the two. Appeal to experience is not needed in matters of intension,[10] but is needed in settling matters of extension. One knows whether the morning star is the same as the morning star *a priori*; but needs experience to know that the morning star is the same as the evening star.[11] The Nyāya appeal to experience would indicate that they were concerned with extension rather than with intension in their account of competency. Yet, as noticed above ($$ 2.7, 2.9), this appeal is not the sort of appeal needed to settle question of factual truth or falsity. What sort is it then?

$ 2.11 I think the sort of incompatibility that the NNs have in mind when they talk about the lack of competency is what is called following Ryle, a category-cross or a category-mistake. Ryle says (1938:75-79) that a category-mistake is an absurdity rather than literal nonsense, since an absurdity is different from a mere sound (or sign) without sense. It is a remark that is somehow out of place when its literal meaning is taken seriously. When one of two expressions cannot replace the other without turning the containing sentences into an absurdity, one has a case of category-difference. The two expressions in question are

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[10]There is, of course, the proviso that one has ultimately to determine the meanings of words by observing the verbal behavior of the language-users concerned.

[11]To say, therefore, that experience is irrelevant for questions of meaning is not to say that it is irrelevant to semantic questions in general.

said to belong to two different categories, in the sense that the objects they refer to belong to distinct categories (Thompson 1967:46). To take an example of a category-mistake (due in part to Ryle 1938: 75-76), when one replaces 'the landlord' by 'Saturday' in "The landlord is in bed", the result "Saturday is in bed" is an absurdity. Other instances of category-mistakes are, "Procrastination drinks quadruplicity", "Green ideas sleep furiously", "Dead linguists smoke buildings", "Virtue is blue" and so on. Saturday is not the sort of thing that can sleep, while the landlord is; so they belong to different types or categories. It also seems to follow from what Ryle says that the actual components of a sentence embodying a category mistake, namely, 'Saturday' and 'bed' belong to different categories. So do 'virtue' and 'blue', 'green' and 'sleep', etc. A category-mistake results if *terms* (and thereby the things signified by them) belonging to different categories are coupled.

Ryle insists that category-mistakes are mistakes concerning primarily extra-linguistic entities rather than expressions. He says (1938:77), " . . . absurdities result from the improper coupling not of expressions but of what the expressions signify, though coupling and mis-coupling of them is effected by operating upon their expressions". This passage seems to show that for Ryle a category-mistake has to do with the incompatibility of extensions of terms, rather than with their intensions. And this is precisely what Śālikanātha's expression *'dṛṣṭatvāt'* seems to convey. The sentence, "He wets with fire" expresses a category-mistake precisely because it combines expressions of

incompatible extensions. Fire and the activity of wetting belong to totally different types. The incompatibility of extensions is known, in a sense, from experience, but an incompatibility of intensions is known independently of experience. True, the Nn definitions of competency employ the notion of *artha* (lit. 'meaning') but *'artha'* for the NNs can mean either intension or extension (\$ 1.16-17). In the present context *'artha'* is better taken as 'extension' because of the difficulties, already noticed, of taking it as 'intension'. Besides, there is a sense in which a sentence containing a category-mistake can be said to lack meaning: the categories are said to set limits to cognitive meaning. Thus, Thompson (1967:46) observes,

> Philosophical categories are classes, genera or types supposed to mark necessary divisions within our conceptual scheme, divisions that we must recognise if we are to make literal sense in our discourse about the world.

\$ 2.12 The view that unexampled terms are meaningful means that contradictory terms are meaningful. Even if one wanted to regard the latter as meaningless, one would have to grant that their meaninglessness is due to an incompatibility of intensions rather than of the categories signified by its component words. The words, 'round' and 'square' do not signify entities belonging to different categories: the same sort of things can be either round or square, though not both. Rather, their sense is such that they cannot go together. Thus, even on the meaninglessness of contradictory terms, there would still be a distinction between them and expressions expressing category-mistakes. The Nn notion of *yogyatā* forbids only the latter (cp \$2.8).

$ 2.13 The theory of categories has, of course, its own difficulties, the chief one being that there is no criterion or identifying, or at least differentiating, a category. Smart (1953) for example, has argued that on Ryle's test of category-difference, almost anything (and the corresponding expression) can be assigned to a different category. "The seat of the chair is hard" results in an absurdity when 'chair' is replaced by 'table'. Should we not then say that chairs and tables belong to different categories? Similarly, integers which are generally regarded as belonging to the same type, can be shown on Ryle's test to belong to different types (categories). Similar remarks are made by Anscombe (Anscombe & Geach 1963:15). However, my purpose is not to examine the adequacy of the theory of categories, but to point out that in their theory of competency, the NNs were trying to do the same sort of thing that Ryle was trying to do, whatever exactly that was.

$ 2.14 Proximity is the third requirement of an adequate sentence, and is defined as the contiguity (temporal when uttered, spatial when written) between words.[12] It is said, for instance, that the words *'gām'* ('cow'),*'ānaya'* ('bring') etc., when uttered at intervals of three

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saṃnidhānaṃ tu padasyāsattir ucyate. "Proximity is the contiguity of a word". *BP 83.*

padānām avilambenoccāraṇaṃ saṃnidhiḥ. "Proximity is the utterance of words without an interval". *TS 60.*

The second definition, literally speaking, applies only to uttered sentences, but is obviously intended to cover written sentences as well. Annaṃbhaṭṭa is here following the early Indian view that written language is derived from the spoken language, that the latter enjoys primacy, and that any remark that applies to the latter applies *ipso facto* to the former.

hours each cannot constituate an adequate sentence *(TS 61)*. However, thus understood, proximity ceases to be a condition of an adequate sentence, and becomes a condition of any sentence at all. For, a sentence is defined as any group of words ($ 1.13), and to form a group, words must already satisfy the condition of proximity. The NNs do not seem to be aware of this difficulty, but they do also interpret proximity in another way which avoids this difficulty, and is much more interesting. On this interpretation, the condition of proximity forbids the spatial or temporal separation of the components of a sentence by the intervention of irrelevant words. For instance, the word-complex, *"girir bhuktam agnimān devadattena"* ("The hill has been eaten has fire by Devadatta" *SM 83*) is said to lack proximity, because the words *'girir'* ('hill') and *'agnimān'* ('has fire') are separated by the irrelevant word *'bhuktam'* ('has been eaten'), and so are the words *'bhuktam'* and *'devadattena'* ('by Devadatta') by *'agnimān'*. These irrelevant interventions are avoided by reordering the complex thus: *"girir agnimān bhuktaṃ devadattena"* ("The hill has fire. It has been eaten by Devadatta"). Thus reordered, the complex consists of two sentences each of which has proximity, and is quite in order.

Understood in this second way, proximity is indeed a criterion of the adequacy of sentences, and belongs only to those sentences which have also expectancy and competency. It is also an indirect attempt at pointing out the necessity of some sort of word-order, especially in shorter sentences of Sanskrit which, strictly speaking (i.e., from a grammatical stand-point), have no rigid order (Apte 1963:263-64; Matilal 1968a:13, 21; Staal 1967:1-2, 60-61).

What kind of a requirement is proximity? Brough (1953:163) says that it is not a linguistic condition. For him only expectancy is a linguistic condition. He seems to rule out semantic considerations as being non-linguistic. However, so far as proximity is understood as the contiguity of words of relevant meanings, it is at least partly semantic (and partly syntactic in so far as it refers to the ordering of words). And it would be a linguistic condition in the sense that word-meanings are associated with words.

$ 2.15 Some NNs like Viśvanātha add intention *(tātparya)* as a fourth requirement for the adequacy of a sentence. It is defined as the desire (intention) of the speaker.[13] It is said to be necessary for deciding between two (or more) possible meanings of a sentence. The sentence *"saindhavam ānaya"* can mean either "Bring salt" or "Bring a horse", and it is the speaker's intention that enables one to choose the appropriate sense under the given circumstances.[14]

$ 2.16 It is objectionable to lay down intention as a further requirement for the adequacy of a sentence for at least two reasons. First, it is

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[13] *vaktur icchā tu tātparyaṃ parikīrtitam (BP 84).*

Annaṃbhaṭṭa also, though he does not mention intention along with the other three properties in *TS 60*, does talk of it while discussing *lakṣaṇā* (derivative meaning). He says in *TD 59*,

> *tat-pratītīcchayoccaritatvaṃ tātparyam. tātparya-jñānaṃ ca vākyārtha-jñāne hetuḥ.* "Being uttered with the desire for that (given) meaning is intention. And the cognition of intention is a cause in understanding the meaning of a sentence".

[14] This example is also given by the Sanskrit grammarians to illustrate the importance of context.

required only to clarify an ambiguous sentence. But an ambiguous sentence is already both syntactically and semantically sound. In so far as the purpose behind distinguishing between adequate and inadequate sentences is to separate ungrammatical and meaningless expressions from grammatical and meaningful ones, an ambiguous sentence must be regarded as adequate despite its defect of ambiguity and irrespective of what the speaker's intention is. It would be strange to declare a sentence as meaningless (or semantically unsound) on the ground that it has more than one meaning.[15]

Second, intention is a pragmatic requirement in the sense that it refers to the speaker's attitude to a sentence. Despite the obvious importance of pragmatic considerations elsewhere (e.g., in moral discourse), they are best ignored in a semantic or syntactic analysis of language aimed at an understanding of logical theory (cf Carnap 1942:13). Such considerations may be necessary in initially determining the semantic and syntactic features of a language as a whole (or even of a given expression), but once these features are discovered, it is preferable not to refer to the users of a language. To do so would be to predicate of an utterance what is true only of the utterer. The NNs themselves seem to appreciate considerations of this sort, since they do not always require the inclusion of intention as a condition of adequacy. But they do consistently require the inclusion of the other three conditions.

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[15]This is not to deny that ambiguity is, in a certain sense, a semantic notion, but only that that sense is relevant in the present context.

$ 2.17 Expectancy, competency, and proximity are, as noticed in $ 2.1, the properties of an adequate sentence. But they are sometimes also said to be the causes of cognition of the meaning of a sentence.[17] In such contexts, 'cognition' is used in a psychological sense which, however, is inessential for my purpose. In line with the stipulation, which I made in keeping with the spirit of the Nn thinking ($$ 0.20, 1.3, 1.11, cf 3.10-16), I shall depsychologise it in all such cases. That is, I shall take 'cognition' only in the sense of its content: cognition of expectancy will be taken as expectancy itself; cognition of the meaning of a sentence *(vākyārtha-jñāna)* will be taken as just the meaning of that sentence *(vākyārtha)*; cognition of the meaning of a word *(padārtha-jñāna)* will be taken as just the meaning of a word *(padārtha)* and so on.[18] To say, then, that expectancy etc., are the causes of cognition of the

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[17] *ākāṅkṣā-yogyatā-saṃnidhis ca vākyārtha-jñāna-hetuḥ (TS 60;* cf *BP 82-83).*

[18] This, however, presents a problem. One cannot in general say that the cognition of x is x itself. The cognition of a table is not the table; it is rather the concept of a table. On the other hand, the cognition of the meaning of a sentence is the meaning itself of that sentence, rather than the concept of that meaning. Perhaps, this difficulty can be resolved thus: where x is a concept, the cognition of x is the same as x; but where x is an object, the cognition of x is the concept of x. This line of approach was actually indicated by Puṇyarāja (or Puñjarāja) (15th century A.D.), the alleged author of the *Vākya-kāṇḍa-ṭikā*, a commentary on the second book of Bhartṛhari's *Vākyapadīya*. Puṇyarāja, and in all probability Bhartṛhari himself, said that the meaning of a word is the object if the object exists, but otherwise it is a concept (Aklujkar 1970a:98, 242; cp Quine 1961:22).

Incidentally, Aklujkar ("The Authorship of the *Vākya-kāṇḍa-ṭīkā*, forthcoming) questions the belief that Puṇyarāja is the author of the *Vākya-kāṇḍa-ṭīkā*. He thinks that Helārāja (10th century A.D.) is its real author.

meaning of a sentence is just to say that they are the determinants[19] of the meaning of a sentence. One can, therefore, say not only that a sentence is adequate if and only if it has those properties, but also that it is adequate if and only if it has meaning, and also that it has those properties if and only if it has meaning. The possession of meaning presupposes that the sentence in question is well-formed, i.e., syntactically sound. Hence, not merely competency, but also expectancy and proximity are said to be the determinants of the meaning of a sentence.

It should be noted, however, that one can arrive at these equivalences even without depsychologising cognition. Even if one says that one cognises expectancy etc., if and only if one cognises the meaning of the relevant sentence, expectancy etc., of a sentence would still be equivalent to (coextensive with) the meaning of that sentence. If 'cognition of x' and 'cognition of y' are equivalent, x and y must be equivalent.

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\$ 2.18 An adequate sentence *(pramāṇa-vākya)* is a sentence with a meaning and corresponds to the English notion of a sentence. The meaning of such a sentence is called *'śābdabodha'* (or *śābdajñāna*).[20] The *śābdabodha* of a declarative sentence is simply what I have called 'cognition' *(jñāna)*

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[19] These determinants are different from contextual factors disambiguating an expression. For an account of the latter see Raja 1963: 48-59.

[20] *vākyārtha-jñānaṃ śābda-jñānam (TS 63;* cp \$ 2.17).

($$ 1.1-3; cf Matilal 1966:393). Hereafter, I shall use *'śābdabodha'* only in relation to declarative sentences.[21] 'Cognition' and *'śābdabodha'*, then, will be, for me, interchangeable. The Nn notion of cognition is, as remarked in $$ 1.5-6, Fregean. Hence, *'śābdabodha'* as a synonym for 'cognition' signifies an abstract entity which, rather than the sentence expressing it, is the real bearer of truth-values ($ 1.7), or as Frege would say, determines one or the other truth-value.

Such a notion of cognition is beset with difficulties. Firstly, it results in the admission into the ontology of a theory of complicating elements whose indispensability is not established, and which, on the contrary, are held by some to be dispensable. Philosophers like Quine (1960:206-08), for example, believe that any thing that can be done by means of sentence-meanings (i.e., cognitions) can be done by means of sentences alone. The notion of cognition (or *śābdabodha*), therefore, violates the law of parsimony, or to borrow a Nn term, is 'heavy' *(guru)*. Secondly, no principle of individuating cognitions has been produced so far. That is, one does not have an effective way of telling when one has two meanings and when one has one. If one could give an adequate criterion of synonymy, one could, perhaps, say that meaning *A* equals meaning *B*, if and only if *a* is synonymous with *b*, where *a* expresses *A* and *b*

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[21] Matilal (1966:382, cp 385-86, 388, 392-93; 1968a:19) says that *śābdabodha* is the *cognitive* meaning of a sentence, i.e., the meaning of a declarative sentence only. Strictly speaking, this is not correct; for the NNs, the meaning of any sentence whatever is *śābdabodha* (fn 2.20). In fact, Matilal is, in the present context, talking about the meaning of a sentence in general. One may, of course, confine *'śābdabodha'* as I do to declarative sentences for practical convenience.

expresses *B*. Unfortunately, such a criterion is not available (Quine 1961:27-32). Attempts such as Church (1946:31; 1951:3-24) to find a principle of individuation are not generally regarded (even by himself) as satisfactory.

Because of such difficulties, some like Quine (1961:11-12, 47-48) reject the notion of meaning as an abstract entity, and prefer to talk in terms of significance and synonymy despite the difficulties involved in adequately characterising these. "What sense" asks Quine (1961:4) "can be found in talking of entities which cannot meaningfully be said to be identical with themselves, and distinct from one another?", and declares (1960:206) that "The very question of the conditions for identity of propositions presents not so much an unsolved problem as a mistaken ideal". He explains the meaningfulness of an expression in terms of dispositions of language users to verbal behavior. He also suggests (1960:201) the possibility that the meaning of a sentence could be identified 'with the very class of all those mutually synonymous sentences that are said to have it'.

$ 2.19 The NNs, however, are not aware of the difficulties just mentioned, and freely talk about meanings. Lacking a principle of individuation for cognitions, they take recourse to linguistic (syntactic) criteria in their explanation of the qualificative character of cognitions. Which element in a given cognition is a qualifier and which is a qualificand is to be determined, according to them, by the structure of the sentence expressing that cognition (Matilal 1968a:11, cf 14; 1966:388). For

instance, the sentence (1) *"ghaṭavad bhūtalam"* ("The ground has a pot") is said to express a cognition in which the qualifier is *a pot (ghaṭa)*, and the qualificand is *the ground (bhūtalam)*; but the sentence (2) *"bhūtale ghaṭaḥ"* (("There is) a pot on the ground") is said to express a different cognition whose qualifier and qualificand are respectively *(occurrence on) the ground* and *a pot* (Ingalls 1951:42; Matilal 1968a:14; 1966:386; Athalye:226). In so far as a cognition is the meaning of a sentence, one would have thought that these two sentences, being synonymous, express the same cognition. Yet, because of their reliance on linguistic considerations for individuating cognitions, the NNs are led to accept the awkward position that just because the two sentences have different grammatical structures, the 'structure' of the corresponding cognitions must be different, and hence that they cannot be identical. But a cognition is a 'translational constant' (cf Matilal 1968a:11, Quine 1960:206): a sentence is to a cognition what a description is to an individual. Just as two synonymous descriptions, however different in structure, refer to the same individual, synonymous sentences must express the same cognition despite their structural differences. The same point can be made with regard to any other pair of synonymous sentences differing in grammatical structure, for example, a sentence in the active voice (say, *"rāmaḥ pustakaṃ paṭhati"* "Rāma reads a book") and its counterpart in the passive voice (*"rāmeṇa pustakaṃ paṭhyate"* "A book is read by Rāma").

A further difficulty is that there are several sorts of (declarative) sentences--for instance, conditionals and disjunctions etc.--where

it is not clear (at least from the sources I have consulted) what the qualifiers and qualificands are (fn 2.32). Even if one could decide what these are in a sentence of one of these types, (say, a conditional) they would not necessarily be the same in a synonymous sentence of another type (say, a disjunction).

$ 2.20 Had the NNs questioned the synonymity of (1) and (2), they would be justified in saying that the qualifiers and qualificands are different in the two sentences. This, however, does not seem to be the case. For example, Ingalls (1951:36, 43) explicitly says, "For 'possesses' *(-mant, -vant, -in)*, one may substitute the synonym '(is) a locus of' *(adhikaraṇa)*", and "The locus may be said to 'possess' the super-stratum *(ghaṭavad bhūtalam)*. The super-stratum may be said to occur or reside or be in the locus *(bhūtale ghaṭo vartate . . .)*". And Matilal (1968a:17, cf 32) follows suit, ". . . the schema for a qualificative cognition which has *a* as its qualificand, and *b* as its qualifier . . . can be written as . . . in short '*b* occurs in *a*' or '*a* has *b*' . . . " (cf Berg 1970:572).

Such remarks as these by contemporary writers suggest that the NNs treated (1) and (2) as synonymous and used them indifferently to express the same cognition. There seems to be, then, a straight contradiction in the Nn position: (1) and (2) both express and do not express the same cognition. This contradiction, apparently not noticed by either Ingalls or Matilal, is perhaps a consequence of the recognition of cognitions as abstract, sentence-independent, entities. The only way out of this contradiction is to admit no synonymity at all between sentences,

not only of different grammatical structure, but also of the same structure. For, the sentences "*p* if and only if *q*" and "*q* if and only if *p*" have the same grammatical structure, and yet the qualifiers and qualificands, as understood by the NNs, would not be the same in the two. But they would have to be the same if the two sentences are regarded as synonymous. The linguistic criteria that the NNs adopt for determining qualifiers and qualificands would indeed provide a principle of individuation for cognitions only at the very high price, namely, that no two sentences are synonymous.

$ 2.21 Though strictly speaking only (and all) cognitions are qualificative[22] even their linguistic correlates, the sentences, are regarded as such in a derivative sense (cf $$ 1.7, 3.23; cp Convention E). That all (declarative, $ 2.19) sentences express cognitions entails that they all are qualificative, whatever their grammatical structure (Matilal 1966:388). Sentences (1) and (2), therefore, are to be regarded as equally qualificative despite their different grammatical structure. (2) is an example of what is called the property-location language, frequently employed by the NNs, which makes use of the notion of occurrence *(vṛtti)*. In it, the ground is said to be the locus *(adhikaraṇa)* (or substratum *(ādhāra)* or abode *(āśraya)*); a pot is said to be the super-stratum *(ādheya)* (or the occurrent *(vartin)*) (Ingalls 1951:43, 45).

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[22]It may be recalled that I ignore indeterminate cognitions. See fn 1.7.

$ 2.22 Regarding sentences as qualificative, the NNs give semantic analyses so as to bring out qualifiers and qualificands.[23] In so far as it is sentences themselves rather than cognitions that are being meta-linguistically analysed, one might think that qualifiers and qualificands are no longer objects but their names. That, however, is not the case. They continue to be regarded as objects. The purpose of the semantic analysis is to render the qualificative character of a sentence explicit. The NNs hold that, in the semantic analysis of a sentence, the chief qualificand must be signified by a subject-noun. The grammarians on the other hand, maintain that it must be signified by a verbal element ($ 1.14). The two rival views, in their primary application to *śābdabodha* or cognition, are respectively called *prathamāntārtha-mukhya-viśeṣyaka-śābda-bodha* and *dhātv artha-mukhya-viśeṣyaka-śābda-bodha* (Matilal 1966:388, esp fn 22).

According to the NNs, the semantic rendition of the sentence,

(3) *rāmo 'śvam ārohati* ("Rama mounts a horse"),

would be,

(4) *aśva-karmakārohaṇānukūla-kṛtimān rāmaḥ* ("Rama possesses the activity conducive to mounting which (activity) has a horse for its object").

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[23] The distinction between object-language and meta-language which such an analysis demands was fairly well-known to ancient Indian thinkers, especially to grammarians like Pāṇini. Staal (1962:53) thinks that even the distinction between use and mention was known to them.

(4) clearly brings out, as (1) does not, that *Rāma* is the chief qualificand and *the activity of mounting a horse* is the qualifier. Again the sentence,

(5) *śūro rāmaḥ kṛṣṇam aśvam ārohati* ("The brave Rāma mounts a black horse"),

would be analysed as

(6) *kṛṣṇatva-viśiṣṭāśva-karmakārohaṇānukūla-kṛtimān śūratva-viśiṣṭaś ca rāmaḥ* ("Rāma is qualified by bravery and by the activity of mounting which has for its object a horse which is qualified by blackness").

(6) indicates that there are more than one qualifier and more than one qualificand in (5) (§ 1.8). The qualifiers are: *bravery*, *blackness*, and *the activity of mounting a black horse*. The corresponding qualificands are respectively *Rāma*, *horse* and *Rāma*. Of these, *Rāma* is said to be the chief qualificand, and *the activity of mounting a black horse* is said to be the chief qualifier (see fn 1.15).[24]

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[24]The NNs also hold that every object signified by a class-term is necessarily qualified by its class-character (i.e., the property determining the class in question). *A man*, for example, is said to be qualified by *manness*, *a horse* by *horseness*, and so on. Such qualifiers are sometimes (e.g., by Ingalls 1951:48) called 'resident limitors'. They are not usually mentioned in the verbal expressions of cognitions, but are taken to be understood (Matilal 1968a:18; 1966:388). In the case of (5), both *blackness* and *horseness* are qualifiers of *a horse*. *Rāmaness* is not a qualifier of *Rāma*, for *'Rāma'* is not a general term.

$ 2.23 In saying that all sentences are qualificative, the NNs are committed to the view that all sentences are predicative (i.e., of the subject-predicate) form. A predicative sentence is the counterpart, in the formal mode of speech, of a (qualificative) cognition. The qualifiers and the qualificands of a cognition roughly correspond, on a linguistic level, to the subjects and predicates of a sentence ($$ 2.19-20; Matilal 1968a:11, 14). The NNs seem to consciously accept this consequence. This is indicated by the fact that they reduce relations to properties: an *n*-ary relation *(n>2)* is first reduced to a series of binary relations, and the latter in turn to properties (Ingalls 1951:44 fn 55, 72; Matilal 1968a:33-37). It is not clear how the *n*-ary relations are reduced to the binary relations,[25] but a binary relation like *being the father of* is treated as the property, *fatherhood* (Ingalls calls such properties 'relational abstracts'). This means that the two-place predicate 'is the father of' is reduced to the one-place predicate 'has fatherhood as conditioned by α' (where α is the name of an individual). For example, the relational sentence, "John is the father of James" is reduced to the predicative sentence, "John has (or is the locus of) fatherhood as conditioned by James".[26]

The view that all sentences are, for the NNs, predicative might suggest that a predicate, as in English, includes the verb. This, however,

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[25] Ingall's very brief illustration of the reduction is not of much help.

[26] Such a reduction has the result that in place of a single two-place predicate, there would be infinitely many one-place predicates (cp Matilal 1968a:33-34).

is not the case: in Sanskrit a sentence need not contain a verb (fn 1.12).

$ 2.24 That there are serious difficulties in reducing n-adic predicates $(n>1)$ to monadic ones is now too well-known to deserve special attention here. It will suffice to take just one example (due to De Morgan): there is no way of reducing the general sentence,

> If a horse is an animal, then the head of a horse is the head of an animal [symbolically, $(x)(Hx \rightarrow Ax) \rightarrow (x)((\exists y)(Hy \ \& \ Rxy) \rightarrow ((\exists y)(Ay \ \& \ Rxy))$],

to a sentence containing only monadic predicates, if the corresponding inference,

> A horse is an animal. Therefore, the head of a horse is the head of an animal,

is to be *formally* valid.[27]

It is, of course, possible to bring all predicates on the same level by a process of 'upgrading'. Consider, for instance, a language in which there are no predicates of degree higher than n and P is a predicate of degree $i>n$. One can form in such a language a new predicate $\overset{*}{P}$ of degree n such that $\overset{*}{P}(x_1,x_2,..,x_i..,x_n)$ if and only if $P(x_1,x_2,...,x_i)$ by simply adding the sequence $(x_{i+1},...,x_n)$ to each i-tuple of P (where $x_{i+1}...x_n$ are any objects whatsoever). To illustrate, if n = 3, the monadic predicate F such that F = {x/x is fat} and F(John), can be changed

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[27] It can, of course, be so reduced: "$(x)(Hx \rightarrow Ax) \rightarrow (y)(Sy \rightarrow Ty)$". But then the corresponding inference would not be formally valid.

into the equivalent tetradic predicate $\overset{*}{F}$ for which, for example, $\overset{*}{F}$(John, Jim, this table). Similarly, the dyadic predicate T such that $T = \{\langle x, y\rangle / x \text{ is taller than } y\}$ and T(John, Jim), can be equivalently expressed as the tetradic predicate $\overset{*}{T}$ for which, for example, $\overset{*}{T}$(John, Jim, Λ). Thus, P, a set of i-tuples is turned into $\overset{*}{P}$, a set of n-tuples. Such 'upgrading', however, is an artificial device, and does not affect the important difference between n-adic predicates ($n>1$) and predicates of degree 1.

$ 2.25 A contributing factor in the NNs' failure to see the irreducibility of n-adic predicates is perhaps their ignorance of the use of variables.[28] Usually, the examples they consider are singular relational sentences involving proper names. Though such examples are typical and the proper names play, to some extent, the role of variables, it is difficult to shed altogether the uniqueness involved in them. Singular relational sentences (like, "John is the father of Jane") can be reduced to sentences involving one-place predicates, (though with some artificiality), and this perhaps led the NNs to believe that all relational sentences (including general ones) could be so reduced. Even when the examples of relational sentences contained general terms, such terms often functioned as singular terms (owing to the lack of definite, and also indefinite, articles in Sanskrit (fn 1.12)), and the general character

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[28] It should be noted that the use of variables by itself does not guarantee that the appropriate structure of a sentence is grasped. Such a use only facilitates that grasp. Aristotle, for instance used (invented?) variables, and yet, like the NNs, failed to see the irreducibility of n-adic predicates.

of the sentences was not fully realised. It is not clear if the NNs considered general relational sentences involving only universal quantifiers (such as "Oceans are larger than rivers"; in symbols, *"(x)(y)((Ox & Ry) → Lxy)"*; nor, if they did, how they would reduce such sentences to those involving only one-place predicates. At any rate, the NNs most certainly did not consider general relational sentences involving mixed quantifiers (such as "Every man is somebody's son"; in symbols, *"(x)(Mx → (∃y)Sxy)"*; or the example about the head of a horse mentioned above); and it is these sentences that are the most intractable as regards their reducibility. In fact, the NNs do not have an analogue for the existential quantifier, though they do have one for the universal quantifier (Goekoop 1967:12).

Such criticisms apply, to remind oneself of a well-worn fact, also to Aristotle's view that all sentences have the same monolithic character. For Aristotle, as for the NNs, all sentences are predicative.

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§ 2.26 It was noticed earlier (§§1.8-10) that the elements of a cognition are qualifiers, qualificands and their connectors (i.e., the relations linking them, namely, inherence, contact and particular qualification). Of these, only qualifiers and qualificands find explicit mention in the linguistic expression of a cognition. A cognition can have more than one qualificand or more than one qualifier, in which case it will have one chief qualificand and one chief qualifier. But it must have at least one qualificand and one qualifier. An important

question arises with regard to the precise nature of a qualificand and a qualifier. With a view to simplifying matters, I shall deal with this question mainly with reference to chief qualificands and chief qualifiers in these few sections (§§ 2.26-31). For the purpose of this discussion, the only qualificand and the only qualifier of a cognition may be regarded as the chief qualificand and the chief qualifier of that cognition.

Since qualificands and qualifiers are elements of a cognition, their nature must depend on the nature of their containing cognition. The paradigm cases of cognitions which both the NNs and their modern exponents (e.g., Matilal 1968a:14-15; 1966:386-91) give to illustrate their qualificative character are such as the following:

(1) |Devadatta is fat|. *(pīno devadattaḥ).*

(2) |Indirā's son is a great poet|. *(indirā-tanayaḥ kavi-puṅgavaḥ).*[29]

(3) |This mountain has fire|. *(parvato 'yaṃ vahnimān).*

A qualifier in such cases is said to be necessarily a property *(viśeṣaṇa, prakāra, dharma)* or a relation *(saṃbandha)*, the latter being assimilated to the former by the NNs (§ 2.23). Hence, *fat (pīna)*, *great poet (kavi-puṅgava)*, and *fire (vahni)*--the qualifiers respectively of the above three cognitions--are all to be considered as properties. It might be

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[29]This example is coined by me. An example that actually occurs in the Nyāya tradition is: *'yaḥ śukla-vāsāḥ'* ('that man who wears the white garment') occurring in *"yaḥ śukla-vāsāḥ taṃ ānaya"* ("Bring that man who wears the white garment").

suggested that these are sets, but the NNs do not talk (explicitly at any rate) about sets and the set-membership relation.[30]

$ 2.27 It is clear that the paradigm cases of cognitions mentioned above are atomic in the sense that their linguistic expressions involve only what in the relevant contexts are to be taken as the equivalents in natural language of individual constants and predicate-letters of the formal language of logic.[31] The predicates involved in these cases are monadic, but as noted above ($ 2.23), the NNs reduce *n*-adic predicates to monadic ones, so that cognitions involving the former present

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[30]Perhaps, the Nn analogue of the set-membership relation is the relation between a locus and what occurs in it ($ 2.22). The locus is said to be an individual, and that which occurs in it is said to be a property (cp Goekoop 1967:4). But, as was shown before, the relation between them is the same as that between a qualificand and its qualifier ($ 2.20). The locus-terminilogy or 'the property-location' language is thus a linguistic quirk of the NNs rather than a real conceptual insight.

[31]There is controversy about whether proper names and definite descriptions (or other singular terms) necessarily name (i.e., satisfy the uniqueness condition, or guarantee the existence of the object they purport to name). One has a tendency to believe that proper names necessarily name but that descriptive phrases do not. But as Quine (1959:216-19; 1961:5-8) has shown, there is no logical distinction between the two; the former can always be converted into the latter. All singular terms only purport to name and are powerless to ensure the existence of the alleged object (Quine 1959:197, 206). If so, unless additional information about the actual existence of the named object is available, a singular term cannot be treated as the equivalent of an individual constant of predicate logic. However, the NNs are operating on a fairly intuitive level, and presuppose in cases like (1) - (3) that the concerned objects do exist. Besides, their theory of unexampled terms ($$ 2.7-9) disallows the use of singular terms that do not have application. Owing to these reasons, I have treated the singular terms occurring in the expressions of (1) - (3) as equivalents of individual constants. Cp Carnap 1956:32-39, Kalish and Montague 1964:233-70.

no special problems, according to them, regarding the character of their qualificands. All this means that a qualificand in such cases is an individual. In the three cognitions given above, the qualificands are respectively, *Devadatta*, *Indirā's son*, and *this mountain*. In the first case, the qualificand is named by a proper name; in the second, by a definite description, and in the third, by a general term followed (or preceded) by a demonstrative pronoun. Sometimes, a cognition may be expressed by an ambiguous expression as, for instance, by

(4) *parvato vahnimān* "Mountain has fire".

Owing to the lack of articles in Sanskrit (fn 1.12), it is not clear whether (4) taken in isolation expresses a general cognition or an atomic one. However, in most cases the ambiguity is resolved by the context, and (4) is taken to be equivalent, both in sense and truth-value, to

(5) *parvato 'yaṃ vahnimān* "*This* mountain has fire"

which of course, is an atomic sentence and expresses the corresponding atomic cognition.[32] Ambiguity of this sort can, of course, be misleading,

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[32]Presumably, a qualificand is an individual also if it is an element of a truth-functional cognition. However, in Nn the status of truth-functional cognitions is not clear, and I abstain from drawing any conclusions regarding the NNs' views on the issue except in the trivial cases of conjunction and negation. A conjunction has, according to the NNs, as many chief qualificands as the linguistic expressions of its (atomic) parts have distinct subjects (cp $ 2.19). See for some helpful remarks regarding the Nn views on truth-functions, Ingalls 1951: 35, 63-72; Matilal 1968a:15-16; *SM 70; TS 64*.

and has in fact led at least one contemporary author to hold what seems to me an awkward theory ($ 5.16).

$ 2.28 So far the Nn account of the nature of a qualificand is at least intelligible. It ceases to be intelligible when one considers non-atomic (i.e., universal)[33] cognitions. In universal cognitions, as in atomic ones, the qualifier is said to be a property.[34] For example in the cognitions,

(6) |Whatever has smoke has fire| *(yo yo dhūmavān sa sa vahnimān)*, and

(7) |A horse has a tail| *(lāṅgūlavān aśvaḥ)*,

the qualificands are said to be, respectively, *an entity having smoke* and *a horse*. But, it is not clear what precisely is the nature of these qualificands according to the NNs. In fact, in their discussion of the qualificative character of cognitions, the NNs usually do not consider universal cognitions. Though both Ingalls (1951:42-43) and Matilal (1966:391; 1968a:15) do mention them, they do not seem to realise the difficulty such cognitions present.

Since the qualificand of a universal cognition is expressed by a general term, the question regarding the character of such a qualificand can be rephrased as, "What is the meaning of a general term?" The

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[33] It may be recalled that the NNs do not have existential cognitions and sentences in their technical language ($ 2.25).

[34] *SM 58;* Matilal 1966:386; 1968a:12,13,15,16,18,88, cf 119; 1970:84; Ingalls 1951:39-40; Potter 1957:7; Kitagawa 1965:19, fn 3.

Nn answer (discussed in $$ 1.16-17) to this question amounts to saying that the meaning of a general word invariably comprises both intension and extension simultaneously. However, that answer comes into conflict with the type of semantic analysis (i.e., in terms of qualifier and qualificand) that the NNs give of (especially universal) sentences. A general word can occur either as a subject or as a predicate of a universal sentence as instanced by (7). When it occurs as a predicate, the NNs regard it as naming a qualifier which is invariably a property (fn 2.34). In such an occurrence, therefore, the meaning *(artha)* of a general word cannot be both intension and extension at once. It can only be intension. When, on the other hand, a general word occurs as the subject of a universal sentence, the NNs regard it as naming a qualificand which is invariably an individual *(viśeṣya, dharmin)*,[35] and not a property. In such an occurrence, the meaning of a general word can only be extension, but extension in the sense of a special sort of individual, not in the sense of a class of individuals to which the word is applicable. But since a general word is not a name like ordinary names (which name only determinate individuals), the individual it names must be, so the NNs seem to argue, an indeterminate individual distinct from any particular individual as well as from the universal. In (7), for instance, the word 'horse' is said to name, not any given horse, but a special sort of horse which shares the common characteristics of all horses, and yet manages to avoid their peculiarities. In thinking that

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[35] See preceding fn for references.

the meaning of a general word (in its usage as the subject of a sentence) is an (indeterminate) individual which it names, the NNs seem to have been influenced by Vātsyāyana *(NBh 2.2.59)* who says that "an attribute can be predicated of an object alone, not of a universal" (Raja 1963:71; cf Datta 1960:265-66).

$ 2.29 There is, then, a two-fold tension in the NNs' beliefs about what constitutes the meaning of a general word. First, there is the belief that the meaning is at once intension *and* extension, which conflicts with the belief, implicit in the type of semantic analysis of sentences adopted by the NNs, that the meaning of a general word can be either intension alone or extension alone. Second, there is the belief that the extension of a general word is the set of objects to each of which the given word is applicable; and it conflicts with the belief that the extension of such a word is an indeterminate individual. It has already been noticed ($$ 1.16-17) that the Nn belief that a word can have both intension and extension at the same time in all of its uses is mistaken. Similarly, the Nn belief that a general word can name an indeterminate individual is also mistaken. An indeterminate individual is not an individual; there are not two kinds of individuals, determinate and indeterminate. The expression 'a horse' does not name an indeterminate individual. In fact, it does not name at all: it is just a linguistic device for talking about any one member (or all) of the class of horses.[36] It is a general term, and as Berkeley and Hume

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[36]There have indeed been, even in recent times, logicians like Carnap (1956:19, 100-17) who hold that a general word ('predicator' in

said long ago, a term becomes general simply by being applied to a number of individuals, and not by being made the name of some undetermined individual. It corresponds, roughly to the variable of a formalised language. A variable, surely, is not the name of any thing, though some people have believed it to be such. As Tarski (1946:4) says, ". . . it is said that the symbols 'x', 'y', . . . also denote certain numbers or quantities, not 'constant numbers' however (which are denoted by constants like '0', '1', . . .) but the so-called 'variable numbers' or rather 'variable quantities'. Statements of this kind have their source in a gross misunderstanding". It must be concluded, then, that the qualificand of a universal cognition is not an individual, as the NNs thought.

The upshot of all this is that the qualificand-qualifier model into which the NNs try to fit all cognitions is inadequate: either a qualificand is an individual in which case universal cognitions are left unexplained and the model turns out to be at best incomplete; or it is not an individual in which case it is not clear what it is and the model turns out to be unintelligible.

$ 2.30 It should be noted that in (3) to (6), the qualifier is not *an individual having fire (vahnimān)* but *fire (vahni)*. The former is not a

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Carnap's terminology) can be said to name its extension, and that the extension is a class. But classes, even if they are admitted as individuals, are by no means indeterminate. The principle of extensionality provides a perfectly adequate identity-condition for them. No identity-condition is available for the indeterminate individuals admitted in this context by the NNs.

property according to the NNs, but the latter is as a qualifier. Again, in (6) the qualificand is said to be *an individual having smoke (dhūmavān)*, but *smoke (dhūma)* itself is said to be a property. Similarly, in (7) even though the qualificand is said to be just a horse and there does not seem to be any qualifier (except the chief qualifier) attached to it, yet on the Nn theory that an individual has of necessity the property determining its class, a horse also has its own (unexpressed) qualifier namely, *horseness* (fn 2.24). Thus, every qualificand of a universal cognition necessarily involves a property. Since every qualifier is necessarily a property, a universal cognition *(vyāpti)* is defined by the NNs as an invariable concomitance of two properties (\$\$ 4.1, 4.3). It can, therefore, be represented in predicate logic as

(8) $|(x)(Fx \rightarrow Gx)|$

where F and G are properties.

\$ 2.31 The difficulties just noticed regarding the nature of a qualificand vitiate the Nn statement of the truth-conditions of a (qualificative) cognition. Simply put, the statement is:

> (S) A cognition is false if and only if the qualificand of that cognition does not have the qualifier of that cognition (or equivalently, if and only if the qualifier does not occur in the qualificand); otherwise it is true (Matilal 1968a:16).[37]

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37 *Yatra yan nāsti tatra tasya jñānam, tad-abhāva-vati tat-prakārakam vā apramā. tad-anyatve saty anubhavatvam eva vā pramātvam.* "Cognition of x in that place where x does not exist, or cognition of x

Thus, the NNs accept what is called the correspondence theory of truth: (S) simply says that a cognition is true just in case it corresponds to reality (cp Tarski 1944:53-56). But the difficulty with (S) is that at best it works only with regard to atomic cognitions. It is useless in the case of universal cognitions. For, if one does not know what the nature of a qualificand is, there is no way of telling when the cognition in question corresponds to reality and when it does not.

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as having y when x has the absence of y is false cognition; being a true cognition is just being a cognition different from that (false cognition)". Gaṅgeśa *(TC pt 1)* cited in Matilal 1968a:16, fn 31.

Since the first part of (S) is a bi-conditional, the second part is superfluous.

CHAPTER III

WHAT IS INFERENCE?

$ 3.1 The NNs' theory of inference is influenced by their theory of causality. I shall, therefore, preface my account of the former with a brief statement, in $$ 3.1-3, of the latter. The NNs hold that all noneternal entities are caused.[1] A cause is said to be an invariable antecedent immediately connected with its effect.[2] Three kinds of causes are distinguished: inhered cause *(samavāyi kāraṇa)*, uninhered cause *(asamavāyi kāraṇa)*, and instrumental cause *(nimitta kāraṇa) (TS 40, BP 16-17)*. The inhered cause is the substratum in which the effect inheres. A pot is said to inhere in the clay from which it is

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[1] Ingalls 1951:31. Ingalls refers to *BP 15* which, however, says only that every thing except an atom is a cause *(parimāṇḍalya-bhinnānāṃ kāraṇatvam udāhṛtam)* and does not exactly support his remark. For, something (e.g., God, universal) may be a cause without being caused. Nevertheless, Ingalls' remark does represent the Nn position. *Anityatva* (being noneternal) and *kṛtakatva* (being caused) are, for the NNs, co-extensive properties. (Matilal 1968b:533; Athalye:302).

[2] *kārya-niyata-pūrva-vṛtti kāraṇam (TS 38)*. To this *TD 38* adds a further qualification namely, *anythāsiddha* 'not remotely connected' (lit. not proved otherwise). *BP 16* gives exactly the same definition.

An *anyathāsiddha* is a circumstance which, though invariably antecedent to the effect, is only remotely connected with it and, therefore, cannot be considered a cause. For instance, neither a potter's father, nor the color of a potter's stick is the cause of a pot. Viśvanātha mentions five varieties of *anyathāsiddha (BP 19-22)*.

made, and a quality say, blue, is said to inhere in a blue pot. So, clay is the inhered cause of the pot and a blue pot is the inhered cause of the quality *blue* (but not of *blueness*). Though this characterisation by itself does not mean that the inhered cause is a material cause, the tendency among modern writers is to regard an inhered cause as a material *(upādāna)* cause;[3] and there does seem to be some textual support for this tendency.[4] The uninhered cause is any quality or action that inheres in the inhered cause. The color of the clay, for instance, is the uninhered cause of the pot, but not of the color of the pot; the pot is the inhered cause of the color of the pot.

$ 3.2 The third sort of cause, namely, the instrumental cause, is the most important of the three for my purpose. It is an instrument which, on the fulfillment of certain other conditions, brings the effect into existence. Instrumental causes fall into two groups, namely, general *(sādhāraṇa)* and specific *(asādhāraṇa)* (fn 3.6). General causes are those conditions on which all effects depend. These are things like God, destiny, time, space, etc.[5] These being common to all effects, do not specifically enter into the description of particular effects. What do

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[3]Matilal 1959:307; Athalye:208-9; Radhakrishan 1927:95, 96; Stcherbatsky 1962a:25, fn 3; Vidyabhusana 1921:390. Actually Matilal calls *asamavāyi kāraṇa* 'material cause', but this is obviously a slip.

[4]E.g., *upādānaṃ samavāyikāraṇam*. "Material cause is inhered cause" *(TD 17)*. Since there is no rigid word-order in Sanskrit, this sentence appears to indicate that material cause is the same as inhered cause. *NK (s.v. upādānam)* lists *samavāyi kāraṇa* at the top of the several meanings of *'upādāna'*.

[5]*TD 37; NB 37, 41;* Athalye:207; Potter 1957:16.

enter are the specific instrumental (as also inhered and uninhered) causes. A specific instrumental cause is that circumstance which when added to an already existing collocation of circumstances triggers the effect into existence. The example given is that of a loom and shuttle in producing a cloth, or an axe in felling a tree *(TS 40)*. A specific instrumental cause is, thus, the most immediate or proximate cause, and is called *karaṇa* (lit. instrument, means).[6] Perhaps because

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6

tad-etat-trividha-kāraṇa-madhye yad asādhāraṇaṃ kāraṇam tad eva karaṇam. "There, among these three sorts of causes, only that which is a specific cause is *karaṇa*". *TS 41;* cf *TS 37.*

It is not clear from the texts what exactly is the relation of the distinction between general and specific causes to that between inhered, uninhered and instrumental causes. The expression *'etat-trividha-kāraṇa-madhye'* ('among these three sorts of causes') in the above verse suggests that inhered and uninhered causes also can be general or specific; that, in other words, they also can be *karaṇas*. However, such an interpretation is ruled out by the following facts: (1) The NNs never talk of inhered and uninhered causes as *karaṇas*; all the examples they give of *karaṇa* are of specific instrumental cause only (e.g., potter's stick, axe, loom and shuttle). Even when they explicitly allow, as they sometimes do, that inhered and uninhered causes are specific, they deny that these can be *karaṇas* on the ground that they lack activity or operation *(NB 41)*, and one cannot see what general inhered and general uninhered causes could conceivably be. (2) That at least uninhered causes cannot have activity is clear also from the Nn belief that activities, like qualities, can inhere only in substances *(BP 86;* Athalye:82-83; Ingalls 1951:37). (3) Modern English writers are unanimous in using *'karaṇa'* only in the sense of specific instrumental cause. See, for instance, especially Athalye:186, 210; Ingalls 1951:30; Matilal 1959:303; Potter 1957:16; Datta 1960:27; Radhakrishnan 1927:96; Uno 1962:20; Vidyabhusana 1921:390. Owing to these reasons, I have, following for example Athalye:207 and Potter 1957:16, confined the general-specific distinction to instrumental causes only.

Ingalls (1951:30) regards all three kinds of causes as specific only. This, of course, has the consequence that a *karaṇa* is necessarily a (specific) instrumental cause; but it also has the consequence that general causes (God, destiny, etc.) are not instrumental causes, which, I think, goes against the definition of an instrumental cause as any cause different from inhered and uninhered causes *(TS 40; BP 18)*.

general causes can hardly be called instruments, the term 'instrumental cause' tends to be taken interchangeably with *'karaṇa'*. I shall henceforth follow this convenient usage.

$ 3.3 The exact nature of an instrumental cause is the subject of much controversy between two schools of NNs. One school upholds the tradition of the old Nyāya, according to which an instrumental cause is that instrument which is actually engaged in the production of the effect (Ingalls 1951:31). It is not, for instance, any stick in a forest, but only that stick that is used to turn a potter's wheel, that is the instrumental cause of a pot. So, an instrumental cause must of necessity have a certain activity or operation *(vyāpāra)*.[7]

The other school, led by Raghunatha, identifies an instrumental cause with what its opponents call operation. The distinguishing characteristic of an instrumental cause according to this school, is that it is immediately followed by the effect.[8] It is not the axe, for

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7 *vyāpāravad asādhāraṇaṃ kāraṇaṃ karaṇaṃ. . . . (NB 37).*

It should be noted that strictly speaking *vyāpāra* is the activity of the agent rather than of the instrument. Yet, the NNs regard it as the activity of the instrument. It is not clear what the status of the so-called efficient cause or agent is according to the NNs. Presumably, the agent is excluded on the ground that he is not immediately connected with the effect, while his activity is. But by transferring the agent's activity to the instrument, the NNs seem to preserve something of the efficient cause, without explicitly recognising it. Some scholars like Athalye (207), Stcherbatsky (1962a:25), and Keith (1921:200), however, treat instrumental cause as including efficient cause. But see also Keith 1921:203.

8 *phalāyoga-vyavacchinnaṃ kāraṇaṃ [karaṇaṃ]*. Nīlakantha in *NK s.v. karaṇaṃ*. See also Athalye: 186-91; Keith 1921:114-5, 198-204;

example, but its contact that is said to be the instrumental cause of the fallen tree. Annaṃbhaṭṭa is said to belong to this school (Ingalls 1951:32). While it is true that there is some good evidence for this classification, (e.g., *TS, TD 47*), there are also passages which favour assigning him to the opposite camp (e.g., *TS 43, 58*). It is certain, however, that so far as the subject of inference is concerned, he belongs to Raghunātha's camp.

* * * * * * *

$ 3.4 The NNs hold that knowledge *(pramā, pramiti)* is something that is caused. The instrumental cause of knowledge is said to be the means of knowledge *(pramāṇa)*. What sort of means gives rise to a given knowledge depends on what sort of knowledge it is. The NNs divide all knowledge into four types: perceptual *(pratyakṣa* or *pratyakṣa-jñāna)*, inferential *(anumiti)*, identificational *(upamiti)*, and testimonial or verbal *(śābda* or *śabdaja-jñāna)*. The instrumental cause of each of these is respectively: perception *(pratyakṣa*, the same word often being used for both the cause and its effect), inference *(anumāna)*, identification *(upamāna)*,[9] and 'word'

Matilal 1959:304-7).

There is a controversy regarding to which of the two schools Gaṅgeśa belongs. While Keith (1921:115) and Matilal (1959:306) assign him to the first, Ingalls (1951:32, fn 16) assigns him to the second. The former view is the more usual.

[9]The other terms generally used for *'upamāna'* are 'comparison' and 'analogy'. But 'identification' is the most suitable of the three, though even it does not capture the exact sense of *'upamāna'*. Cf Ingalls 1951:29, fn 6.

or testimony *(śabda)*.[10]

$ 3.5 It is to be noted that the NNs treat perception, inference, identification, and testimony as the means of *knowledge* (or true cognition) only, and not of false cognition. Not only etymology,[11] but also a long tradition beginning with Gautama[12] favours such treatment. This

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yathārthānubhavas caturvidhaḥ pratyakṣānumity upamiti-śābda-bhedāt. tat-karaṇam api caturvidham pratyakṣānumānopamāna-śabda-bhedāt. "True cognition is of four types: perceptual, inferential, identificational [and] verbal. Its instrumental cause also is of four types: perception, inference, identification [and] testimony". *TS 36.*

Annaṃbhaṭṭa divides cognition *(jñāna)* into two sorts: those derived from memory *(smṛti)* and those derived from apprehenson *(anubhava* or *anubhūti)*. He divides only the latter into true *(yathārtha)* and false *(ayathārtha)*, and limits the word *'pramā'* to true apprehension *(yathārthānubhava)* (fn 1.2). But he also says that even memory is of two kinds, true and false *(TS 65)*, and that true memory results from an earlier true apprehension. The same is the case with false memory *mutatis mutandis*. That is, according to him, the truth-value of memory is the same as the corresponding apprehension. This seems actually to take away the ground for limiting the *pramā-apramā* distinction to apprehension only. Viśvanātha therefore, while dividing cognition into *anubhūti* and *smṛti (BP 51)* yet says: . . . *apramā ca pramā ceti jñānaṃ dvividhaṃ iṣyate.* "Cognition is said to be of two sorts namely, true and false" *(BP 126)*. I have followed Viśvanātha and used *'pramā'* for any true cognition whatever, whether apprehension or memory, and *'apramā'* for any false cognition whatever.

11 Words like *'pramā'*, *'pramāṇa'* and *'prameya'* come from the same root, *'pra + mā'*, 'to know'. Since *'pramā'* means true cognition, *'pramāṇa'* must also mean a means of knowledge.

12

pratyakṣānumānopamāna-śabdaḥ pramāṇāni. "Perception, inference, identification [and] testimony are the means of knowledge". *NS 1.1.3.*

yathārthānubhavaḥ pramā. tat-sādhanaṃ pramāṇaṃ. "True cognition is knowledge. Its instrument is the means of knowledge". Udayana *(Tātparya-pariśuddhi)* cited in Radhakrishnan 1927:122.

restriction of perception etc., is rather odd since these can yield false cognitions as well as true ones. Authors like Athalye (211), therefore, suggest that they should be extended to apply to false cognitions as well (cf Ingalls 1951:30-31, fn 11). This suggestion, though eminently sensible otherwise, is not, on the whole, faithful to the Nn texts. There are, however, two considerations which seem at first sight to point in the direction of Athalye's suggestion, namely: (1) the definitions of all the means of knowledge (except, perhaps, testimony), taken by themselves, are wide enough to apply to false cognitions as well (cf *TS 42, 44, 58-59*). (2) Viśvanātha after dividing all cognitions into apprehension *(anubhūti)* and memory *(smṛti)*, subdivides the former into perceptual, inferential, identificational, and verbal *(BP 51-52)*. He then says that perception etc., are the means of these four types of cognitions respectively *(SM 51)*. Since, according to this division, apprehension can be either true or false it follows that the four means can give rise to false cognitions as well.

But, on closer examination, both these considerations turned out to be of not much help. As for (1), though the definitions taken by themselves are indeed wide enough to cover false cognitions, both the context and the sequential treatment customarily followed in the Nn texts indicate that they are limited to true cognitions. As for (2), Viśvanātha himself later modifies his position by saying that perception etc., are intended as means of true cognition only.[13]

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13 *yathārthānubhava-karaṇasyaiva pramāṇatvena vivikṣitatvāt.* "Because the instrumental cause of true cognitions only is intended as *pramāṇa*". *(SM 135)*.

$ 3.6 The Nn view that knowledge is a non-eternal entity subject to causation seems to contradict what I have said about cognition earlier. I have maintained ($$ 1.5-6) that a cognition according to the NNs is an abstract entity eternal, and independent in principle of linguistic expression. If knowledge is true cognition, it must be eternal and uncaused; there cannot be any *pramāṇas*.

The contradiction, however, is only apparent. It arises from the fact that the NNs use terms like 'knowledge' *(pramā)* and 'cognition' *(jñāna, buddhi)* sometimes in a psychological sense and sometimes in a logical sense and often vacilate between the two senses. In the psychological sense, 'cognition' means a process, or something occurring in one's mind. In the logical sense, it means a proposition in the Fregean sense. A cognition in the psychological sense is, of course, noneternal and subject to causation, but not so in its logical sense. Since I am using 'cognition' only in the logical (Fregean) sense ($$ 1.3, 1.6, 1.11) there is really no contradiction involved in my account of cognition.

$ 3.7 The Nn theory of inference may now be taken up. The NNs usually define (formally valid) inference as the instrumental cause of the |inferential conclusion|[14] (see Convention D). |Inferential conclusion|,

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14

anumiti-karaṇam anumānam . . . (TS 44).

. . . *anumitiḥ. tat-karaṇam anumānam (TC 2.2).* See Keith (1921: 111, fn 1) for references to some other texts on this point.

Keith (1921:111) says, "Inference in the normal definition of the modern school is the proximate cause of the inferential judgment or

in turn, is defined as that cognition which is born of some other cognition, namely, 'consideration' *(paramarśa)*.[15] The explanation of 'consideration' will be given later ($$ 4.20-23), but it may be noticed now that the NNs use two distinct terms *'anumāna'* and *'anumiti'* and these roughly correspond respectively to what, in contemporary logic, are regarded as inference and the conclusion of an inference. They need, therefore, to be kept apart, though sometimes 'inference' is used indifferently as an

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knowledge *(anumiti)*". While the NNs accept this definition, they also say either (a) that pervasion *(vyāpti)* is the instrumental cause of |conclusion| (e.g., *BP 66; SM 52*); or (b) that 'consideration' *(parāmarśa)* is such (e.g., *TS 47*). These two views which reflect the controversy discussed above about the nature of *karaṇa*, conflict with the definition of inference as the instrumental cause of |conclusion|. For, as I argue ($$ 3.12-16), that definition is best understood as saying that inference is the set of four cognitions (all of which the NNs consider necessary) one of which logically follows from the rest (see fn 3.23). I avoid the conflict by regarding (a) and (b) simply as the Nn ways of emphasising the importance of certain elements of inference for non-logical reasons. Uddyotakara says that though *anumāna* includes all the causal elements necessary for the |conclusion|, it is most appropriately identified with the last element because of the latter's proximity to the |conclusion| (Ingalls 1951:32-33, fn 21). This perhaps explains to some extent why 'consideration' is regarded as *karaṇa*, but leaves the characterisation of pervasion as cause still baffling. It should be noted, however, that 'consideration' can by itself yield the |conclusion|, and *a fortiori* can do so together with pervasion (of which it is regarded as the operation by the advocates of (b)) ($ 4.21).

15

parāmarśa-janyaṃ jñānam anumitiḥ . . . (TS 44; SM 52).

vyāpti-viśista-paksadharmatā-jñāna-janyaṃ jñānam anumitiḥ (TC 2.2). See also Chatterjee 1950:233.

That inference is cognition born of some *other* cognition means that the Nn theory of inference excludes trivial inferences where a sentence follows either from (the set consisting of) itself (e.g., '*p* .˙. *p*'); or from a sentence of which it alone is a part (e.g., '*p* & *p* .˙. *p*'). But see Potter 1963:75.

equivalent of either.[16]

$ 3.8 In order to understand fully the implications of the Nn definition of inference in terms of instrumental cause *(karaṇa)*, it will be necessary to note the distinction the NNs make between two sorts of inference. These are inference for oneself *(svārthānumāna) (IS)* and inference for others *(parārthānumāna) (IO)*. *IS* is said to occur when one infers something without expressing the inference in language. When *IS* is expressed in language so that others could follow it, it is said to become *IO*. ($$ 3.20-22).

Annaṃbhaṭṭa describes *IS* and *IO* succinctly:

> . . . [inference] for oneself is the cause of one's own |inferential conclusion|, as [when a man] having himself understood by frequent observation the pervasion that where there is smoke there is fire as in a kitchen, on approaching a mountain and suspecting fire on it and seeing smoke on it, remembers the invariable concomitance that where there is smoke there is fire. After that, the cognition is produced that this mountain possesses smoke which is pervaded by fire. This very [cognition] is called 'consideration'. From it arises the cognition, which is the |inferential conclusion|, that the mountain has fire. This [is] inference for oneself.
>
> When, however, after inferring fire from smoke oneself, [one] employs the five-membered sentence (i.e. the syllogism) for the understanding of others, it is inference for others; as for example,

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[16] I translate *'anumiti'* with '|conclusion|' or '|inferential conclusion|' (Convention D). Strictly speaking, '|conclusion|' is not an accurate rendering of *'anumiti'*, since, according to the NNs, a conclusion can be a conclusion also of the third means of knowledge, namely, 'identification' *(upamāna)*. However, since I am concerned in this thesis only with inference, there is no risk of confusion.

I translate *'anumāna'* as 'inference' despite the fact that in English it usually names a set of sentences, while its Sanskrit counterpart names, as I maintain ($$ 3.20-24), a set of cognitions. I could find no better word.

"The mountain has fire, because it has smoke. Whatever has smoke has fire, for instance, a kitchen. And this [mountain] is [also] like it. Therefore, [this is] like it . . . "[17] *(TS 45)*.

§ 3.9 Let me call the examples of *IS* and *IO* in Annaṃbhaṭṭa's account respectively as IS_1 and IO_1. IO_1, it is clear, consists of five elements which, to repeat, are:

IO_1 1. The mountain has fire (i.e., there is fire on the mountain)

2. Because it has smoke (lit. because of smoke)

3. Whatever has smoke has fire, e.g., a kitchen

4. And this is like it

5. Therefore, this is like it.[18]

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[17] The account of *IS* and *IO* given here by Annaṃbhaṭṭa is the same as that of Gaṅgeśa (Vidyābhūṣaṇa 1921:435).

The distinction between *IS* and *IO* is not present either in Gautama or in Kaṇāda. It is first introduced in the Nyāya-Vaiśeṣika literature by Praśastapāda who, Keith (1921:106-7) maintains, borrowed it from Dignāga. Randle (1930:160-1), however, holds that the distinction is Praśastapāda's own creation.

[18]

(1) *parvato vahnimān. (2) dhūmāt. (3) yo yo dhūmavān sa sa vahnimān yathā mahānasaḥ. (4) tathā cāyam. (5) tasmāt tathā.*

(2) and (3) are also expressed respectively as

(2') *dhūmavattvāt* ("Because [it] posseses smoke"); and (3') *yatra yatra dhūmas tatra tatra vahniḥ yathā mahānasaḥ* ("Wherever there is smoke, there is fire as in a kitchen").

But the difference between (2) and (2') and that between (3) and (3') is merely verbal (cf Kitagawa 1965:19, fn 3). Also, *IO* is quite often

The five members of IO_1 are called respectively, thesis *(pratijñā)*, 'reason'[19] *(hetu)*, 'example' *(udāharaṇa)*. 'application' *(upanaya)*, and conclusion *(nigamana)*. 'Application' and conclusion are usually, as in IO_1, stated elliptically. When fully stated, conclusion (minus the word 'therefore' *(tasmāt)*) becomes identical with thesis, and 'application' reads as:

> The hill has smoke which is pervaded (invariably accompanied) by fire.

IO_1, therefore, needs to be reformulated as:

IO_2
1. The mountain has fire
2. Because it has smoke
3. Whatever has smoke has fire, e.g., a kitchen
4. This mountain has smoke which is pervaded by fire
5. Therefore, the mountain has fire.[20]

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expressed as, for example,

parvato vahnimān dhūmāt ("The mountain has fire because of smoke").

But this form is enthymematic, and consists of only *pratijñā* and *hetu*; the other three sentences are to be supplied.

The elements of IO_1 are, strictly speaking, not sentences, but cognitions as is argued below in $$ 3.20-22.

[19]Quotes in such cases are intended to indicate that the enclosed expressions are used in a rather unusual way. See Convention C.

[20]The reasons discarding (4) and (5) of IO_1 in favour of (4) and (5) of IO_2 are discussed in $$ 4.25-29.

$ 3.10 The examples IS_1 and IO_1 of the two sorts of inference are paradigmatic. In the light of them, what sense can one make of the Nn definition that inference is the instrumental cause of the |conclusion|? The question hinges on how the crucial expression 'instrumental cause' *(karaṇa)* is to be interpreted. The usual practice among the modern interpreters of Nyāya is to take it in the psychological sense of a thought-process,[21] and there is some textual basis for their doing so. The account of *IS* given for instance by Annaṃbhaṭṭa and Gaṅgeśa seems, if taken literally, to be merely a description of what happens in one's mind. It is, in other words, an account of the mental activity whose end-result is the conclusion. The activity and the conclusion, thus, seem to be related as cause and effect. Again, just as inference is said to be the (instrumental) cause of the |inferential conclusion|, perception is said to be the cause of the perceptual cognition. And the account given of perception is clearly psychological. It is said to be the result of the process by which the senses come into contact with their object.[22]

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[21] E.g., Athalye:253; Randle 1930:160; Keith:112-13; Ingalls 1951:33; Datta 1960:217; Schayer 1933:249.

[22] *indriya-saṃnikarṣa-janyaṃ jñānaṃ pratyakṣam (TS 42;* see also *TS 43 BP 59).*

Vātsyāyana, whom the NNs follow in this regard, describes the process of perception thus:

> *atmā manasā saṃyujyate mana indriyena indriyam artheneti.* "The self comes into contact with the mind, the mind with the sense, the sense with the object". *NBh 1.1.4* cited in Athalye: 212. See also Keith 1921:68.

In this process the contact of the self with the mind is common to all

Evidence such as this favours taking 'instrumental cause' in its strict and literal (i.e., psychological) sense.

$ 3.11 However, taking 'instrumental cause' in a psychological sense would render the Nn theory of inference as a whole nonsensical. For, firstly, a study of psychological processes, whatever its importance elsewhere, has at best only a minor role in logic. Formal logic aims at abstracting its subject-matter as much from persons thinking it as from the special content which may happen to be associated with it. Secondly, one cannot make sense, on this view of 'instrumental cause', of the Nn view that *IO* is a linguistic expression of *IS* ($ 3.8), nor indeed of the fact that the term 'cause' is applicable in the case of *IO*. The elements of *IO* are sentences expressing cognitions. They are stated in isolation of persons thinking them, and there is nothing psychological about them. The set of premises, therefore, cannot be said literally to *cause* the conclusion. Besides, as I have held ($$ 1.5-6) cognitions, according to the NNs, are eternal entities, and as such not subject to causation. Thirdly, the conclusion is already an element in *IO*, and the relation between the two is that of a set and its member. A

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types of cognition. Only the contact of the sense with the object is peculiar to perception.

Though both Viśvanātha *(BP 58-59)* and Annaṃbhaṭṭa *(TS 43)* regard a sense as the instrumental cause and contact with object as its operation, those NNs who identify the instrumental cause with operation would regard sense-object contact as the *karaṇa* of *pratyakṣa*. E.g., *NK (s.v. karaṇam)* attributes to Nīlakaṇtha the remark, *"pratyakṣa indriya-saṃnikarṣaḥ karaṇam"*.

set, in today's language, can hardly be said to cause its member. Finally, if the set of premises is taken to cause the conclusion, it would mean that the same set of premises produces the same conclusion always as, according to the doctrine of causality, the same cause is supposed to produce the same effect always. However, it is a commonplace in contemporary logic that the same set of premises can yield, in principle, an infinite number of conclusions.[23]

These considerations are enough to show that it will not do to take 'instrumental cause' *(karaṇa)* in the psychological sense.[24]

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[23]Aklujkar thinks that the word *'anumāna'* as used in *"anumiti-karaṇam anumānam"*, and as used in *'svārthānumāna'* and *'parārthānumāna'* does not mean the same. In the former case it means a specific instrumental cause (which can be either pervasion ($$ 4.3-13, fn 5.4) or 'consideration' ($$ 4.20-23)). In the latter case, it means the process of inference, and refers collectively to all the stages of inference (cp Ingalls 1951:32-33). However, I do not share Aklujkar's view because the NNs clearly say that *svārthānumāna* is the cause *(hetu)* of *svārthānumiti*, just as they say that *anumāna* in general is the cause *(karaṇa)* of *anumiti*. *('Hetu'* in this context can only mean *karaṇa*, since it obviously cannot mean any of the remaining varieties of cause recognised by the NNs, namely, *samavāyi*, *asamavāyi*, and *sādhāraṇa nimitta)*. This shows that for the NNs the relation of *anumiti* to its premises is the same in either case. That is, in either case, the word *'anumāna'* has the same sense, namely, the sense (as I argue) of a set of cognitions one of which logically follows from the rest. The NNs hold that all the elements of an inference are necessary ($ 3.21). When, therefore, they also say that pervasion (together with 'consideration' as its operation) alone *(BP 66)*, or 'consideration' alone *(TS 47)* is the cause *(karaṇa)* of *anumiti*, they presumably intend to emphasise a certain element because of non-logical reasons (i.e., because of their special view of causality, especially of *karaṇa* as requiring or not requiring operation) (cf Ingalls 1951:29-30). See fns 3.14 and 2.7.

[24]It is presumably because of the irrelevance of the psychological sense of inference to logic that Ingalls choses to understand by 'inference' only what is inferred. He says (1951:29, fn 5), " . . . By inference, I shall mean that which is inferred, not the act of inferring". But this is either (a) saying that *anumāna* is the same as *anumiti* which is of course, obviously against the texts; or (b) ignoring *'anumāna'*

$ 3.12 Since taking 'instrumental cause' in a psychological sense leads to the difficulties noted above, it might be well to see if an alternative way can be found of understanding it. The clue to an alternative interpretation lies in considering the spirit rather than the letter of the Nn characterisation of *IS*. The intent of this characterisation, though undoubtedly couched in a psychological language, should, I think, be taken as purely logical. What IS_1, for instance, should be taken to convey is that the conclusion, namely the cognition that the mountain has fire logically follows from (the set of) certain other cognitions which, though, are not recognisable as such because of their psychological garb. In order to bring out their true character, therefore, IS_1 is more appropriately formulated as:

IS_2 (1) |The mountain has smoke|

(2) |Whatever has smoke has fire, e.g., a kitchen|

(3) |The mountain has smoke which is pervaded by fire|

(4) |Therefore, the mountain has fire|.

Thus represented, *IS* is seen to be a set of cognitions related in a certain way and the view that *IO* is the linguistic expression of *IS* becomes readily intelligible. For, there is no longer the difficulty

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altogether and regarding only *'anumiti'* as inference. But this use of 'inference', though an escape from the psychological sense, is hardly relevant to the logician. The logician is interested not merely in a conclusion, but also in the premises that lead to it. In practice, however, Ingalls takes inference as consisting of both premises and conclusion (1951:33, 36).

that the relation between the premises and the conclusion, while psychological in *IS*, is logical in *IO*. What is at issue in both is a purely logical relation.

$ 3.13 If what is at issue is fundamentally a logical relation in the case of both *IS* and *IO*, the NNs' use of the term 'cause' in relation to them needs an explanation. The explanation lies basically in the fact that the NNs do not make the important distinction between cause and reason (or ground). This is indicated by the fact that the relation between substance and qualities is regarded as causal[25] ($ 3.1), while it is closer to that between ground and consequent familiar in traditional metaphysics. Again, the same word *'hetu'* is used for both reason and cause. It is invariably used by the NNs to refer to the second sentence in their syllogism (e.g., IO_1 and IO_2).[26] As thus used it can only mean *reason*, and is invariably translated as 'reason' by modern interpreters of the Nyāya system. But it is also used to refer to a cause.[27] Furthermore, physical analogies are sometimes given to illustrate the manner in which the conclusion of an inference follows from its premises. It is said, for instance, that just as the cloth results from the movement of

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[25]The NNs also say, of course, that a substance is the locus or substratum of qualities ($$ 0.19, 2.21).

[26]Although IO_2 has five members, that its structure is essentially syllogistic (in the sense of traditional western logic) should be obvious. See $ 4.1.

[27]The distinction between cause *(kāraka-hetu)* and reason *(jñāpaka-hetu)* was indeed known in the Indian tradition (see *Agni-purāṇa* (Anandāśram series No 41), Ch 344, verses 29-30; Daṇḍin: *Kāvyādarśa* (ed

the loom, so does the conclusion from its premises (Athalye:233). The use of the same word in two distinct senses does not by itself mean that the NNs do not distinguish between those senses. But it does add to other evidence, noted above, for saying that the NNs switch back and forth between them.[27] Even in the framework of their own metaphysics, it is necessary for the NNs to distinguish between them. For, the causal relation is, according to them, such that what are caused can only be spatio-temporally limited, though their causes need not be so limited (fn 3.1). A relation involving reason on the other hand, is a logical relation and has no such limitation. In fact, one can even say that it can obtain only between cognitions, and therefore is, like them, timeless.

$ 3.14 Because the NNs confuse the psychological and the logical senses of the word 'cause', the fact that they use 'instrumental cause' *(karaṇa)* in a clearly psychological sense in relation to perception ($ 3.10) cannot be good evidence for saying that they must be using it similarly in relation to inference. The considerations adduced above, on the contrary, show that the NNs' intention is best served by taking it in a logical sense.

$ 3.15 If 'instrumental cause' is taken in a logical sense, there are, *prima facie*, two plausible ways of understanding the Nn definition that

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V Narayana Ayyar, 1952), Ch 2, verse 235); and the word *'kāraṇa'* was more often used for 'cause', while *'hetu'* was more often used for 'reason'. But the NNs are unmindful of the distinction at least in the present context, and use *'kāraṇa'* and *'hetu'* interchangeably. See, for example, *SM 137; BP 17; TS 45.*

inference is the instrumental cause of |inferential conclusion|. It could be taken to mean either: (a) that the conclusion logically follows from the premises, and is thus 'born of' or 'produced' by them; or (b) that the conclusion in some sense results from the underlying inference-form. Alternative (a) entails identifying inference with its premises alone. Such identification is ruled out not only by contemporary usage, but also by the usage of the NNs themselves. The instances of *IS* and *IO* are, for the NNs, inferences and they clearly include the conclusion as well. Besides, for the NNs the conclusion cannot be a reason for itself, i.e., cannot be counted as its own premise (fn 3.15). Alternative (b), therefore, seems to be the more promising.

$ 3.16 An inference-form is simply the schema of any concrete inference and is a device for attaining generality. It enables one to talk indifferently of any one of a whole range of inferences. It consists of matrices which, when appropriate substitutions are made for their sentential, class or individual letters, convert into actual sentences, and the inference-form which consists of them converts into an actual inference.[28] It can be conceived as an embodiment of the formal conditions of whole ranges of arguments. An inference-form can, therefore, be compared to an apparatus with a certain input and a certain output. The

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[28]The word 'matrix' is used in the sense of Mates (1965:14). It is a purely formal expression "built up out of so-called logical words . . . together with sentential, class or individual letters, and such that the result of replacing the letters by the appropriate kinds of expressions is a sentence".

premises are the input, the conclusion the output. Thus viewed, an inference-form may be said to 'produce' or 'cause' the conclusion of an inference which instantiates that form.

I suggest that the Nn definition that inference is the instrumental cause of the |inferential conclusion| should be understood in the light of the notion of an inference-form. That is, in the context of this definition, 'inference' *(anumāna)* is to be taken to mean an inference-form, rather than an actual inference. Thus conceived, it is a logical, not a psychological, apparatus which produces the conclusion. It can, therefore, be said to be a means or an instrument *(karaṇa)* for the conclusion. In this way, the use of *'karaṇa'* in the Nn definition is made intelligible. Whatever the relation between the inference-form and the conclusion resulting from it, it certainly is not causal. It is a logical relation and resembles to some extent the relation between ground and consequent. The two, however, are not identical, since the relation between ground and consequent is entailment and holds between sentences, while the logical relation here in question is between an inference-form and a conclusion. The inference-form cannot be said to entail the conclusion of any of its instances.

$ 3.17 There is no doubt that the NNs, while defining 'inference', *consciously* use *'karaṇa'* (instrumental cause) in what according to them is clearly a psychological or causal sense. They bring all the paraphernalia of their theory of causality to bear upon their *direct* discussion of inference. They usually, as in *TS*, state their theory of causality

as a prelude to their theory of the means of knowledge including inference. However, their conception of cause is much wider than ours and embraces at least two distinct senses, the logical and the psychological, which the NNs often confuse. My attempt above has been to show how a good sense can be made of their definition of inference, avoiding their confusions and capturing their unformulated insights.

$ 3.18 My suggestion that 'inference' as it occurs in the Nn definition should be understood to mean an inference-form does not, I emphasise, mean that the NNs themselves distinguish between an inference and an inference-form. In fact, they are unaware of the use of variables (or other similar devices) ($ 2.25), and have no way of separating the two. It is not surprising, therefore, that they use the same word 'inference' *(anumāna)* for both. Lacking the use of variables, the NNs have little to say directly and explicitly about an inference-form. But their actual practice implies that they were vaguely aware of it. For instance their theory of inference, of the elements of inference, of the constituents of these elements ($ 4.1) is quite general, and so is their theory of fallacies ($ 6.9-13). This generality implies abstraction and would not be possible without some awareness, of the notion of an inference-form. Again, the NNs' use of examples is often paradigmatic ($ 2.25), designed to bring out the formal features of an inference. Though such a use can never be a substitute for the use of variables, and can have only a limited success in the attainment of generality, it nevertheless shows that an actual inference has a double role to play: to draw

attention to its specific or unique character as determined by its content, and to represent the formal conditions governing it. In other words, the only way available to the NNs of referring to an inference-form is through an inference. *'Anumāna'*, therefore, is, according to the NNs, always an inference--a set of cognitions related in a certain way--despite its dual role. Hence, I feel I am justified in translating it as such.

$ 3.19 My motive behind this somewhat detailed examination of the NNs' cryptic remark *"anumānaṃ anumiti-karaṇaṃ"* ($ 3.7), was to find out the true Nn answer to the question "What is inference?". My account of that answer shows that of the four senses of 'inference' to be found in English--namely, (1) the act of inferring, (2) the result of inferring, (3) a set of sentences (or cognitions) one of which is logically related[29] to the rest in a certain way, and (4) inference-form--only the last two are relevant to the Nn theory of inference, and perhaps, for that matter, to *any* theory of inference at all. The common practice among modern interpreters of Nyāya of attributing the first or the second sense to the NNs (fns 3.21, 3.24) while trying to understand their *logical* theory, therefore, seems to me on the whole mistaken.

$ 3.20 My proposal that inference *(anumāna)* should be taken as a set of cognitions (rather than sentences) standing in a certain logical relation

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[29] It will not do to say: "one of which is conclusively supported by the rest", since this is not true of all (deductive) inferences. E.g., "Grass is green $\therefore$ 2 + 2 = 4" or "$p \,\&\, \sim p \therefore r$".

calls for an explanation, since in today's logic it is standard usage to take inference as a set of sentences. The explanation lies in what, according to the NNs, is the precise nature of the relationship between *IS* and *IO*. Earlier (§ 3.8), I stated this relationship by saying that *IO* is the linguistic expression of *IS*. I now wish to dwell a little more on the evidence for my construing the relationship in this way.

The NNs say that *IO* employs language, or more precisely, the five-membered sentence (§ 3.8), which by implication suggests that *IS* does not. This is so because, according to them, the purpose of *IS* is to enable oneself to see how the conclusion follows from the premises. This purpose could be realised by means of cognitions themselves, and there is no need for words. The NNs talk of the elements of *IS*, therefore, as cognitions. Their normal manner of speaking in logic is to say that one *cognition (jñāna)* follows from (lit. 'caused by', 'produced by') another, not that one *sentence* follows from another. They say, for instance, that the |conclusion| *(anumiti)* is born of 'consideration' *(parāmarśa)*, where both |conclusion| and 'consideration' are cognitions *(TS 45)*. These considerations by themselves show that *IS* is something non-linguistic. This is further confirmed even more emphatically when it is said, "*IO* is lingual while *IS* is cognitional *only*".[30] Expecially

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30 *parārthānumānaṃ śabdātmakam; svārthānumānaṃ tu jñānātmakam eva* (cited in Athalye:252).

The author of these lines is actually the Buddhist logician Dharmottara; but the NNs are generally regarded as subscribing to this characterisation of *IS*. Cf *NK s.v. parārthānumānam* and *svārtham*. Śivāditya also says that *IS* is in terms of meaning *(artharūpatva)*, while *IO* is in terms of words *(śabdarūpatva)* (Keith 1921:123).

the word 'only', I think, leaves no doubt as to the non-linguistic character of *IS*. Moreover, I have maintained earlier ($$ 1.5-6) on independent evidence that for the NNs a cognition is an abstract entity, independent in principle of *any* linguistic expression. *IS*, which consists of cognitions, therefore, must be non-linguistic. But as soon as it is linguistically expressed it ceases to be *IS* and becomes *IO*. *IO* then is *IS* linguistically expressed.

$ 3.21 If, however, *IO* is just the linguistic expression of *IS*, both ought to have the same number of elements. But this apparently is not the case. IS_2, for example, has four elements ($ 3.12) while IO_2 has five ($ 3.9). The NNs are silent as to why there is this discrepancy. The discrepancy can be explained by saying that thesis and conclusion--which are both two tokens of the same type--of IO_2 are synonymous and express an identical cognition so that the number of cognitions involved in both *IS* and *IO* is the same, namely, four. On this explanation, one of these two sentences is superfluous and ought to be discarded. However, the NNs insist on the inclusion of all the five sentences (cf Randle 1930: 164-65).[31] This difficulty is overcome by saying that though the two sentences in question are *cognitively* synonymous, they are not synonymous

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[31] The number of sentences recognised as necessary for an inference varies from school to school. For Buddhists it is two (Stcherbatsky 1962a:279-80) and for the Mīmāmsakas and Vedāntins it is three. Vātsyāyana even mentions an ancient school of Naiyāyikas for whom the number was ten (Keith 1921:85-86; Athalye:272-73; Randle 1930: 161-62).

in non-cognitive respects. For, the NNs assign a non-logical or psychological function to thesis while the function of the remaining four remains purely logical. They conceive the purpose of *IO* as being more dialectical than logical. The purpose is to *convince* another person of the truth of the conclusion given that of the premises. Its realisation is aided by stating the conclusion first. Doing so would focus the attention of the listener on the question at issue and create in him a desire *(akāṅkṣā)* to solve it.[32] If *IO* allows room for non-logical considerations and *IS* does not, my remark that *IO* is just the linguistic expression of *IS* is not, strictly speaking, true. But it is true if only logical considerations are taken into account. And logical considerations alone are important for my purpose.

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[32]Keith 1921:126; Athalye:LVII, 266; Radhakrishnan:1927:75. Cf Randle 193:163-67.

Ingalls (1951:33) holds that thesis and 'reason' are ascripts while the remaining three sentences of *IO* are assertions. He also says that assertion is not necessary for *IS* thereby implying that *IS* consists only of ascripts. "An ascript", he says, "merely associates a predicate with a subject or a relation with its terms, e.g., 'John's being rich' . . . whereas an assertion (statement, proposition) asserts this predicate . . . " . It is not clear to me how the notions of ascript and assertion can help clarify the distinction between *IS* and *IO*, nor how they can explain the recurrence of the same expression as thesis and conclusion. Vatsyayana's remark which he invokes in his support, namely,

saṃbhavas tāvat pratijñā ("Thesis is only something possible"),

is quite consistent with my view that thesis and conclusion express the same cognition. As a modality, possibility can belong only to sentences, and the NNs clearly say that thesis is a sentence (or statement) *(vākya)*. See *NK s.v. pratijñā*.

$ 3.22 If the logically irrelevant thesis is eliminated, and suitable changes are made in 'reason',[33] *IS* and *IO* will have exactly the same elements and IO_2, for instance, reduces to IS_2. The elements in either case are cognitions. There is, of course, the difference that in *IS* the cognitions and their interrelations are directly 'grasped', while in *IO* they are grasped only through language. But this makes no difference to what is grasped. The logical structure of both *IS* and *IO* is the same. There is, therefore, no *logical* basis whatever for distinguishing between the two (cf Keith 1921:123). The Nn preoccupation with the distinction can only be attributed to their frequent inability to separate psychological and logical questions.

$ 3.23 *IS*, as something directly 'grasped', is completely private and cannot be the subject of inquiry. Strictly speaking, even IS_2 cannot be said to be an instance of *IS*,[34] since it is represented in language and as such is really an instance of *IO*. The elements of *IO*, like those of *IS*, are, to repeat, cognitions. They are expressed by sentences. The NNs have two sets of names, one for the cognitions and the other for the sentences expressing them *(TD 46)*. 'Pervasion' *('vyāpti')*, 'consideration' *('parāmarśa')* and '|conclusion|' *('anumiti')* are the names of

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[33] The 'reason' *(hetu)* of IO_1, it may be recalled, is *"dhūmāt"* ("Because it has smoke"). It refers back to the thesis and if the thesis is eliminated it no longer is intelligible. It has to be replaced by a full-fledged sentence, *"ayaṃ parvataḥ dhūmavān"* ("This mountain has fire").

[34] IS_1 is a (metalinguistic) *description* of IS_2, and, therefore, is on a different level.

the second, third, and fourth cognitions respectively in the order in which they are stated in IS_2. The first cognition does not have a convenient name but is usually described as the cognition that the subject has probans *(pakṣa-dharmatā-jñāna)* (§ 4.2). It must be emphasised that though *IO* consists of five sentences, it has only four cognitions and is more accurately represented by IS_2. The names of the five sentences are, as already noted (§ 3.9), 'thesis' *('pratijñā')* 'reason' *('hetu')*, 'example' *('udāharaṇa', 'vyāptivākya')*, 'application' *('upanaya')* and 'conclusion' *('nigamana')*. The NNs are not always careful to keep these two sets of names apart, and often use them indifferently to designate either a cognition or the corresponding sentence. This is especially true of 'reason' and 'pervasion'. There is no distinct cognition corresponding to thesis, since as I have maintained, it is cognitively synonymous with conclusion which expresses |conclusion|. Therefore, while all other names of sentences have parallel names (or descriptions) naming cognitions, thesis can have no such parallel.

§ 3.24 I think I have now explained why for the NNs inference is a set of cognitions. I have done so with reference to what I consider to be the true nature of the distinction between *IS* and *IO*. That distinction has appeared rather baffling to modern interpreters of Nyāya (cp Schayer 1933:249), and I believe my account makes it at least intelligible. It also makes intelligible the Nn belief in the superiority of *IS* over *IO*.[35]

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[35]This belief has been frequently remarked upon by modern writers. See, for instance, Ingalls (1951:33), Keith (1921:95, 122), Athalye: 252 and Hirianna (1932:255-56).

There are, I think, two reasons for this belief. Firstly, there is the fact that *IS* alone (as I represent it) is governed by purely logical considerations. It alone can, therefore, give the true logical structure, while *IO*, vitiated as it is by non-logical considerations cannot. Secondly, *IS* is in terms of cognitions themselves which can be directly 'grasped' and their interrelationships intuited. There is no intervention of a medium--language in this case--between the thinker and the cognitions which he 'grasps'. In *IO*, on the other hand the cognitions have to be understood indirectly through language. The NNs rate direct grasping much higher than grasping through language *(sākṣātkāra TD 81)*. This is in line with their--in fact, of most Indian philosophical schools--metaphysical belief that final truth is attained through direct intuition rather than through linguistic media.

CHAPTER IV

THE ELEMENTS OF INFERENCE

\$ 4.1 For the NNs inference in its strict logical sense is, as shown in \$\$ 3.7-24, a set of cognitions one of which stands in a certain logical relation to the rest. One, and the most usual, form of it is represented by IO_2. But IO_2, although it involves five sentences, consists, as noted above (\$\$ 3.21-22), only of four cognitions, and is more accurately represented as IS_2. The NNs give an account of the logical character of each of these four cognitions, and their account depends on three basic notions, namely, those of *subject (pakṣa)*, *probans (sādhana)*, and *probandum (sādhya)*. According to the NNs, subject is the subject of inference. It is the entity[1] about which an inference is drawn. Probandum is the entity which is inferred or proved about the subject.[2] Probans is the entity that mediates, as it were, between subject and probandum, and is 'instrumental' in the derivation of the |conclusion| from the premises.[3] In IO_2, for example, the mountain is

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[1] See fn 0.22 for the wide sense in which I use the word 'entity'. See also Convention B.

[2] *anumiti-vidheyatvaṃ . . . sādhyatvam.* "The property of being probandum (is) . . . the property of being the object of |inferential conclusion|". *NK s.v. sādhyatā.*

[3] Hence, it gets its name *'sādhana'*, which literally means *means* or *instrument*. Its other names are: *'liṅga'* ('mark', 'sign') and *'hetu'*

the subject, *fire* is the probandum, and *smoke* is the probans. The Nn notions of subject, probandum, and probans are reminiscent respectively of the minor, major and middle terms of traditional--but not Aristotle's[4] --logic. However, they are not the same as the latter. The latter are expressions while the former are, according to the NNs, usually non-linguistic entities.

The subject of inference is, according to the NNs, always an individual. It is named by a singular term, and is necessarily the qualificand of the cognition in which it occurs.[5] Probans and probandum, on the other hand, are usually regarded by modern writers[6] as properties ($ 2.30). This would suggest that they occur only as qualifiers in the cognitions of an inference. While they do so occur in atomic cognitions, the situation, as noted before ($$ 2.28-29), is unclear and complicated with regard to non-atomic cognitions.

Both subject and probandum are determined (i.e., identified) with reference to thesis.[7] Since thesis is linguistically the same as conclusion,

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('reason'). *'Hetu'* is also used to name the second sentence of *IO*. To avoid confusion, I refrain from using it as a name for probans, and use it only for naming the second sentence of *IO*. The same is the case with its English counterpart, 'reason'.

[4] For important differences between the Aristotelian and traditional logic see Lukasiewicz 1957: esp 1-7.

[5] See $$ 2.25-27. Cf Athalye:271; Chatterjee 1950:236-37; Schayer 1933a:255.

[6] E.g., Sen 1924:49-50; Kitagawa 1965:20-21. Cf Goekoop 1967:4, 14-15; Randle 1930:26-27, 223, cp 264-65; Radhakrishnan 1927:78.

[7] *sādhyavattayā pakṣa-vacanaṃ pratijñā*. "Thesis is the expression of the subject as having probandum". *TD 46*.

See for similar remarks from Gaṅgeśa, *NK s.v. pratijñā*. Cp $ 6.2.

this also amounts to saying that they are determined with reference to conclusion, as the minor and major terms are determined in traditional logic. Probans is determined with reference to 'reason'.[8]

$ 4.2 Given the notions of subject, probans, and probandum, the Nn account of the different cognitions constituting an inference may be taken up. It is, as was pointed out before ($$ 3.20-22), IS_2, rather than IO_1, or IO_2, that truly represents *IO*, and hence it is with reference to it that the Nn account will be considered here. Let me repeat IS_2:

IS_2 (1) |The mountain has smoke|

(2) |Whatever has smoke has fire|

(3) |The mountain has smoke which is pervaded by fire|

(4) |Therefore, the mountain has fire|.

The first cognition of *IO* as represented by IS_2 has no handy name but is described as *'pakṣa-dharmatā-jñāna'*. The property that the subject of inference has of having the probans of that inference is called *'pakṣa-dharmatā'*.[9] The expression, *'pakṣa-dharmatā-jñāna'*, therefore, means the

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8 *. . . liṅga-pratipādakaṃ vacanaṃ hetuḥ.* " . . . the expression propounding probans is reason". *TD 46.*

It must be noted that what is at issue here is not the definition of probans, but only a criterion of its determination. These lines are a definition of 'reason' in terms of probans and cannot very well be taken also as the definition of probans in terms of 'reason'. These remarks apply, *mutatis mutandis*, to the preceding fn also.

9 *vyāpyasya parvatādi-vṛttitvaṃ pakṣa-dharmatā (TS 44).*

cognition that the subject has probans (cp fns 4.45, 4.51).

$ 4.3 Pervasion is the second, and according to the NNs the most important, element of IS_2. Viśvanātha defines it thus:

> *hetumanniṣṭha-virahāpratiyoginā sādhyena hetor aikādhikaraṇyaṃ vyāptir ucyate.* "The property of probans of having the same locus as probandum, which (=probandum) is not the counterpositive of the absence located in that which possesses probans, is said to be pervasion". *BP 69.*[10]

This definition, which I call 'E', is basically the same as Gaṅgeśa's 'final' definition *(siddhānta-lakṣaṇa)*[11] (Staal 1960a:119; Berg 1970: 573), and consists of two parts. The first part--. . . *sādhyena hetor aikādhikaraṇyaṃ vyāptir ucyate*--means that pervasion is the coexistence (or invariable concomitance) of probans with probandum. That is, it says that whatever has probans also has probandum, and could be formulated as

(5) $(x)(Hx \rightarrow Sx)$ (where the intended interpretation is such that $H = \{x/\ x$ has probans$\}$ and, $S = \{x/\ x$ has probandum$\}$).

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[10] Annaṃbhaṭṭa also gives exactly the same definition: *hetu-samānādhikaraṇātyantābhāvāpratiyogi-sādhya-samānādhikaraṇyaṃ vyāptiḥ.* . . . "The property (of probans) of having a common locus with probandum which (=probandum) is not the counterpositive of the constant absence having a common locus with probans (is) pervasion". *TD 44.*

[11] See *TC 2.101-03,* for *siddhānta-lakṣaṇa,* and Goekopp 1967:116 for a formulation of it, which differs from my formulation, given below, of E. For formulations of Gaṅgeśa's other definitions of pervasion, see Goekoop 1967:*passim;* Bocheński 1961:442-43.

The second part--*hetumanniṣṭha-virahāpratiyoginā* . . . --enjoins a condition on probandum. It could be interpreted either as: if everything having probans has the absence of something F, then F cannot be probandum; in symbols,

(6) $(x)(Hx \rightarrow (F)(\sim Fx \rightarrow (F \neq S)))$;

or as: if every x has probans, then that x cannot have the absence of probandum; in symbols,

(7) $(x)(Hx \rightarrow \sim\sim Sx)$;

or as: probans and absence of probandum do not coexist; in symbols,

(8) $\sim(\exists x)(Hx \ \& \sim Sx)$ (cf Goekoop 1967:111-12; cp McDermott 1969:11-12).

(7) and (8) are obviously equivalent to (5). (6), which is the most literal of the three interpretations, can also be proved in second order logic with identity to be equivalent to (5). In effect, then, the second part of E does not add anything to what the first part says: E simply boils down to (5), and can always be adequately represented by it.

Pervasion can also be looked upon as a set of ordered pairs $\langle F,G \rangle$ (where F and G are probans and probandum respectively), such that anything that has the first component has also the second component. The two components, F and G, are respectively called 'pervadend' *('vyāpya')* and 'pervader' *('vyāpaka')*. (2) of IS_2 is a favorite Nn example of

pervasion. In it, *smoke* is the pervadend and *fire*, the pervader.[12]

$ 4.4 Staal (1960a:119; cf Berg 1970:573) represents E as

(9) $(\alpha xB(x,H) = \alpha xB(x,S)) \ \&\ A(S, \alpha xB(x,H))$ (where $A = \{\langle x,y\rangle / x$ occurs in $y\}$, and $B = \{\langle x,y\rangle / y$ occurs in $x\}$).

In this representation, Staal (1960a:109-10) uses Hailperin's notion of a restricted variable.[13] The expression '$\alpha xF(x)$' means the same as the expression 'x such that Fx'. The two conjuncts of (9) correspond to the two parts of E.

It is obvious, however, that (9) is not a correct representation of E. The first conjunct asserts that probans and probandum are co-extensive which, according to the NNs, need not be the case (see $ 4.8). It is perhaps for this reason that Berg (1970:573) also thinks Staal's representation to be inadequate.

$ 4.5 Berg's own representation of E (1970:573) is more promising. It is:

(10) $(\exists x)(Hx \ \&\ Sx) \ \&\ (x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy)))$.

In an earlier publication, Berg (1963:605; cf Follesdal 1968:605) omits the first conjunct of (10), and formulates E as

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[12]The definition E is actually inadequate, as I argue in $ 4.10.

[13]See Hailperin 1957.

(11) $(x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy)))$.

But these representations also, though preferable to Staal's, yet are not quite satisfactory. Consider (11) first. It says, in effect, "Everything having probans has all the properties that everything having probandum has". This is far from a literal rendering of E, and therefore, cannot be said to be textually justified. One has, of course, the right to stretch a text when the text does not admit of a clear interpretation, provided that doing so would help clarify the issue at hand. However, (11), instead of clarifying the issue, makes it unnecessarily complicated. (5) (i.e., my formulation of E), on the contrary is, I think, close to the text, and yet does exactly the same job in a much simpler way. For, the following proof shows that (11) is equivalent to (5).[14] (The proof employs the system of Mates (1965), with the exception that *F* is treated as a predicate variable, and the rules *UG* and *US* are extended to quantification over *F*).

$ 4.6	{1}	1.	$(x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy)))$	*P*
	{1}	2.	$Ha \rightarrow (F)(\sim Fa \rightarrow \sim(y)(Sy \rightarrow Fy))$	*1 US*
	{3}	3.	Ha	*P*
	{1,3}	4.	$(F)(\sim Fa \rightarrow \sim(y)(Sy \rightarrow Fy))$	*3,2 T*
	{1 3}	5.	$\sim Sa \rightarrow \sim(y)(Sy \rightarrow Sy)$	*4 US (2nd order)*
	{1,3}	6.	$(y)(Sy \rightarrow Sy) \rightarrow Sa$	*5 T*

[14] I am indebted to Dr. Richard E. Robinson for having pointed out this equivalence to me.

Λ	7.	$Sa \rightarrow Sa$	*T*
Λ	8.	$(y)(Sy \rightarrow Sy)$	*7 UG*
{1,3}	9.	Sa	*8,6 T*
{1}	10.	$Ha \rightarrow Sa$	*3,9 C*
{1}	11.	$(x)(Hx \rightarrow Sx)$	*10 UG*
Λ	12.	$(x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy))) \rightarrow (x)(Hx \rightarrow Sx)$	*1,11 C*
{13}	13.	$(x)(Hx \rightarrow Sx)$	*P*
{14}	14.	Ha	*P*
{13}	15.	$Ha \rightarrow Sa$	*13 US*
{13,14}	16.	Sa	*14,15 T*
{17}	17.	$\sim Ba$	*P*
{13,14,17}	18.	$\sim(Sa \rightarrow Ba)$	*16,17 T*
{13,14,17}	19.	$(\exists y)\sim(Sy \rightarrow By)$	*18 EG*
{13,14,17}	20.	$\sim(y)(Sy \rightarrow By)$	*19 Q*
{13,14}	21.	$\sim Ba \rightarrow \sim(y)(Sy \rightarrow By)$	*17,20 C*
{13,14}	22.	$(F)(\sim Fa \rightarrow \sim(y)(Sy \rightarrow Fy))$	*21 UG (2nd order)*
{13}	23.	$Ha \rightarrow (F)(\sim Fa \rightarrow \sim(y)(Sy \rightarrow Fy))$	*14,22 C*
{13}	24.	$(x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy)))$	*23 UG*
Λ	25.	$(x)(Hx \rightarrow Sx) \rightarrow (x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy)))$	*13,24 C*
Λ	26.	$(x)(Hx \rightarrow (F)(\sim Fx \rightarrow \sim(y)(Sy \rightarrow Fy))) \leftrightarrow (x)(Hx \rightarrow Sx)$	*12,25 T*

§ 4.7 Thus, (11) is not an adequate representation of E in so far as closeness to a text is a criterion of adequacy. Since (10) contains (11)

as a conuunct, it shares the flaws of (11). It also presents additional problems owing to its first conjunct, namely,

(12) $(\exists x)(Hx \ \& \ Sx)$.

Since (11) is equivalent to (5), (12) can be tagged on to (5) to yield

(13) $(\exists x)(Hx \ \& \ Sx) \ \& \ (x)(Hx \rightarrow Sx)$.

The purpose of (12) in (13) is apparently to bring out the existential import of (5) (and hence of (11)), although "$(\exists x)Hx$" alone would have sufficed for that purpose. Even though it is true that, according to the NNs, universal sentences (i.e., those expressing pervasions) including universal conditionals can be said to have existential import, there is nothing in E itself to indicate that truth. That truth has to be inferred from other views of the NNs, especially their theory of unexampled terms (§§ 2.8-9). Hence (10) is even farther from the text than (11).

The formulation of E as (13) is unsatisfactory also for another reason: it conflicts with the law of contraposition which the NNs accept (with certain reservations) (§§ 4.11-13). That is, for them (5) is equivalent to

(14) $(x)(\sim Sx \rightarrow \sim Hx)$.

But (13) is not equivalent to

(15) $(\exists x)(\sim Sx \ \& \ \sim Hx) \ \& \ (x)(\sim Sx \rightarrow \sim Hx)$.

This shows that there is something wrong in explicitly incorporating the existential import in the representation (in the object language) of a pervasion. The existential import is best brought out, as I point out below (§ 6.5), by specifying (in the metalanguage) that an adequate interpretation of (5) (or (11)) must assign non-empty sets to *'H'* and *'S'*.[15]

It may be concluded then that there is no reason to represent E either as (10), or as (11), and that (5) will do quite well for the purpose.

§ 4.8 Whether something is a pervader or pervadend, is, it should be noted, relative to a given pervasion, and is determined with reference to it alone. For instance, *fire* is the pervader with reference to the pervasion, |Whatever has smoke has fire|, while it is the pervadend with reference to the pervasion, |Whatever has fire has heat|. In particular, the status of an entity as pervader or pervadend is not determined with reference to its range of occurrence or 'extensiveness'. While in the stock example about smoke and fire, the pervader *(fire)* indeed is wider in range than the pervadend *(smoke)*, there are other examples given by the NNs where a pervadend and the pervader are

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[15] A further defect of (10) is that it is inapplicable to contrapositive pervasions, and in particular to universally contrapositive pervasions (fn 5.4, § 6.1). But (10) inherits this defect from E itself. As I argue below in § 4.10, E is narrow, and needs to be modified (see fn 4.12 above).

coextensive. One such example is |Whatever is knowable is nameable|,[16] where *knowable* (or *knowability*) is the pervadend and *nameable* (or *nameability*) is the pervader. The NNs believe that everything is knowable[17] and nameable *(TS, TD 48)*, so that the example is best expressed as (a cognition expressed by) the bi-conditional, "Everything is knowable if and only if it is nameable" (*"(x)(kx ↔ Nx)"*). When two entities are, as in this example, coextensive, their range of occurrence cannot provide a basis for determining which of them is pervader or pervadend.[18] Pervader, therefore, is to be understood strictly as defined: *G* is a pervader of *F* if and only if every locus of *F* is also a locus of *G*.[19]

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[16] *yatra yatra prameyatvaṃ tatra tatra abhidheyatvam.* The word *'jneyatvam'* is also used in place of *'prameyatvam'*. This shows that the words *'jñāna'* and *'pramā'*, (and their related forms) are also occasionally used synonymously by the NNs (fn 1.1) though this is not usually the case ($ 1.1).

Some other examples of pervasions with coextensive pervader and pervadend are:

(1) Whatever has animal functions has soul (Radhakrishnan 1927:79; Keith 1921:119).

(2) Every earthy thing is a smelly thing.

A pervasion with coextensive pervader and pervadend is called *'samavyāpti'* while that with non-coextensive ones is called *'asamavyāpti'* or *'visamavyāpti'* (Radhakrishnan 1927:80 fn 1; Datta 1960:205-6; Chatterjee 1950:240-41).

[17] What is meant is that to God at least everything is known.

[18] Athalye (245), therefore, is wrong in arguing that a strip of ten acres of land (or a sum of fifty rupees) is the pervader of a strip of twenty acres (or a sum of one hundred rupees) on the ground that the former, though smaller in size, has a greater range of occurrence. Ingalls (1951:28) is clearly aware of the possible coextensiveness of pervader and pervadend, and yet seems to concur with Athalye.

[19] McDermott (1969:52) says that while a probandum contains the probans extensionally, a probans contains the probandum intensionally. Though her remark is directed to a Buddhist logician, it is relevant to

Pervasion, thus conceived, is a transitive relation: if all loci of *F* are loci of *G* and if all loci of *G* are loci of *H*, it necessarily follows that all loci of *F* are loci of *H*. It is also a reflexive relation since every attribute is pervaded by itself: *F* is pervaded by *F* because every locus of *F* is a locus of *F*.

$ 4.9 The NNs distinguish two forms of pervasion, namely, positive pervasion *(anvayavyāpti)* and contrapositive pervasion *(vyatirekavyāpti*, lit. 'negative or absential pervasion'). A positive pervasion is the pervasion of a probans by the corresponding probandum, as in the example about smoke and fire. A contrapositive pervasion is the pervasion of the absence of a probandum by the absence of the probans as in |Where there

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the Nn logical theory as well since the notions of probans and probandum are *essentially* the same for all Indian schools. The following observations may be made about it: firstly, probans and probandum are not linguistic expressions, and it would not be accurate to talk of their intension or extension. Secondly, even if this inaccuracy is ignored, and extension is taken as range of *occurrence*, McDermott's remark does not hold if 'contains' means the same as is meant by 'properly includes'. This is shown by the case of *samavyāptis*. Thirdly, a probans may be said to contain its probandum 'intensionally' only on the Buddhist view of *antarvyāpti*. On this view, every sentence expressing pervasion is analytically true. Sentences can be analytically true without involving intensional connection, in the sense that in sentences like "If John is fat, then 2 + 2 = 4", the antecedent and the consequent are unrelated in meaning. Buddhists, however, consider only those universal sentences, which they believe involve intensional connection and are analytically true, as expressing pervasion.

The NNs, by and large, do not accept the view of *antarvyāpti* ($$ 4.14-16, 4.19), and for them entities may coexist without any intensional connection (cf their definition of *vyāpti* as *samānādhikaraṇya)*. It would not be true, therefore, to say that according to them a probans 'intensionally' contains the probandum. Two entities may be associated without having any 'internal' connection. To take Quine's example, every creature with a kidney is a creature with a heart; yet there is no 'internal' connection between having a kidney and having a heart.

is absence of fire, there is absence of smoke| *(yatra vahnyābhāvas tatra dhūmābhāvaḥ).*[20] Given a positive pervasion with, say, *F* as probans and *G* as probandum, one can, according to the NNs, generate *in most cases* a contrapositive pervasion by simply making the absence of *F* the probandum and absence of *G*, the probans. And coversely, given a contrapositive pervasion, one can generate a positive pervasion by proceeding in the reverse manner.[21]

$ 4.10 In view of this distinction between positive and contrapositive pervasion, the Nn definition, E, of pervasion considered in $ 4.3 is narrow. That definition says simply that pervasion is the coexistence of the probans with the probandum and does not say anything about their absences. It is, therefore, inapplicable to contrapositive pervasion. This is clear from the fact that according to definition E, pervader and probandum are identical, and so are pervadend and probans. But this is

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hetu-sādhyayor vyāptir anvaya-vyāptiḥ tad-abhāvayor vyāptir vyatireka-vyāptiḥ. "The pervasion of probans and probandum is positive pervasion. The pervasion of their absences is contrapositive pervasion". *TD 48* (cf *TS 48*).

. . . *dvaividhyaṃ tu bhaved vyāpter anvaya-vyatirekataḥ.*
anvaya-vyāptir uktaiva vyatirekād ihocyate.
sādhyābhāva-vyāpakatvaṃ hetvābhāvasya yad bhavet.
". . . and there are two kinds of pervasion due to presence [and] absence. Positive pervasion is already spoken of. (That) due to absence, which consists in the probans' absence being the pervader of the probandum's absence, is here being spoken of". *BP 142-43.*

[21]The NNs call *F* and *G* in such cases the counterpositives *(pratiyogin)* of the absence of *F* and the absence of *G* respectively. (Ingalls 1951:55. See also Matilal 1968a:52-59). It should be noted that a counterpositive can itself be an absence. E.g., the absence of a pot is the counterpositive of the absence of the absence of the pot.

not true of a contrapositive pervasion where the pervader is the *absence* of the probans and the pervadend is the *absence* of the probandum. The set of ordered pairs $\langle F, G \rangle$ mentioned in \$ 4.3, represents only a positive pervasion. A contrapositive pervasion is represented by the set of ordered pairs $\langle -G, -F \rangle$.[22] The two sets of ordered pairs have totally different members and can by no means be said to be the same.

The NNs do not seem to realise that their definitions of pervasion and of contrapositive pervasion are incompatible, and as a result run into rather serious difficulties (discussed in \$\$ 6.2-4 below) regarding inferences that contain contrapositive pervasions. To remove this incompatibility and to make their definition of pervasion general and inclusive of both varities, it is necessary to say, as is done in *TD 48* and *BP 142-43* (fn 4.20) for example, that a pervasion is either the coexistence of probans with its probandum, or the coexistence of absence of probandum with absence of the probans.

\$ 4.11 The distinction between the two forms of pervasion is important in that it shows that the NNs were aware, within certain limits, of the (complete) law of contraposition $[(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)]$. However, their theory of non-referring *(aprasiddha)* expressions (\$\$ 2.8-9) and some metaphysical considerations (\$\$ 4.8, 4.12) lead them to say that the

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[22] I use '-' (signifying absence) as a term-operator as distinct from '$\sim$' (signifying negation) which I use as a sentential operator.

expressions, "$p \rightarrow q$" and "$\sim q \rightarrow \sim p$" are not unconditionally equivalent.[23] Thus, the NNs hold that not every pervasion of the one form corresponds to a pervasion of the other form, although most do. For instance, |Whatever is knowable is nameable| (\$ 4.8) is said to be a universally positive pervasion *(kevalānvaya-vyāpti)*,[24] that is, a pervasion that has no disagreeing instances[25] (fn 5.4). It has no corresponding contrapositive pervasion. The sentence "Whatever is not nameable is not knowable" cannot express the contrapositive pervasion, because it contains two vacuous expressions 'not nameable' and 'not knowable' which is not permissible in the Nyāya system. That is, from a term *A* another term *-A* can be obtained by means of the term-operator '-', only if the extension of *A* does not exhaust the whole domain. If it does, then *-A* is not defined, and its use in reflective discourse is forbidden. If *-A* is not defined any sentence containing it is also not defined (\$ 2.7). So "$\sim q \rightarrow \sim p$" is not defined, if either $\sim q$ or $\sim p$ or both contained *-A*.

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[23]The NNs are talking about cognitions, not of sentences, here. Properly speaking, the positive-contrapositive distinction applies to sentences only. But I have extended it to cognitions in order to keep as close as possible to what the NNs are saying (see Convention E). Two cognitions are equivalent if and only if they are expressible by equivalent sentences.

[24]The NNs do not actually use the expression *'kevālanvaya'* in relation to *vyāpti*. They use the related expression, *'kevalānvayin'* in relation to probans and inference (fn 5.4). But the former usage is implicit in the latter. This is true, *mutatis mutandis*, also of the expression, *'kevalavyatireka'*. The NNs do, however, use the expressions, *"anvaya-vyāpti"* and *"vyatireka-vyāpti"* (fn 5.4).

[25]The notions of *agreeing instance* and *disagreeing instance* are explained in \$\$ 4.14-15 below.

The contrapositive of the sentence "Whatever is knowable is nameable" ["*(x)(kx → Nx)*"] namely, "Whatever is not nameable is not knowable" ["*(x)(∿Nx → ∿kx)*"] therefore, is not defined since its components 'not nameable' and 'not knowable' are undefined. But this is an unnecessary restriction on the law of contraposition. There is no need to regard *-A* as undefined in the above case. The NNs regard it as undefined because they make the definability of an expression dependent on its interpretation. But contemporary logic prefers to make definability and well-formedness independent of how the world is constituted, i.e., independent of whether an expression is applicable, or whether it is true or false (if it is a sentence). It, therefore, considers *-A* as defined (or well-formed) without regard to whether on a given interpretation it names an empty class.

Besides the theory of non-referring expressions, another factor which might have made the NNs hold that the sentence *"(x)(∿Nx → ∿Kx)"* is inadmissible while *"(x)(Kx → Nx)"* is, is the belief that these two sentences are about different things: that the latter is only about *K's* (i.e., about the extension of the subject-term), and that the former is only about *-N's*.[26] But this belief, though natural and widespread even today, is mistaken. Both sentences are equally about *all* the things in the domain concerned. Both say something about all the things by imposing certain restrictions on their nature. The latter says that no

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[26]This is implied also by the Nn semantic analysis of sentences ($$ 1.8-10, 2.22, 2.26-30).

matter what x is taken, if it is K it is also N; and the former says that no matter what x is taken, if it is not N then it is also not K (see § 5.6).

§ 4.12 Another type of pervasion which, according to the NNs, imposes a restriction on the law of contraposition is made up of what are called universally contrapositive pervasions *(kevala-vyatireka-vyāpti)*. A stock example of an inference containing a universally contrapositive pervasion is the following:

IO_3 1. |Earth differs from other things (than earth)|
2. |Because it has smell|
3. |Whatever does not differ from other things (than earth) has no smell, e.g., water|
4. |This is not like it|
5. |Therefore, this is not like it|. *TS 48; SM 142.*

(3) of IO_3 is a universally contrapositive pervasion. It is said to have no agreeing instances (fn 5.4) as defined by the NNs (§§ 4.14-15). For, the only entity which seems at first to satisfy the Nn definition, D_1, of an agreeing instance is earth itself.[27] But earth, being the subject of this inference, can not be used as evidence for this pervasion

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[27] In the Nn metaphysics, earth, a substance, is the only entity that has smell. In this it is said to differ from all the other fourteen entities (the eight other substances and the six categories). In the early stages of the Vaiśeṣika system, earth was believed to differ from thirteen entities in having smell, as the seventh category, absence, was not recognised.

without begging the question; that is, it cannot be regarded, even according to the NNs, as an agreeing instance. Hence, the NNs believe that a universally contrapositive pervasion has no positive pervasion corresponding to it. They do not allow the pervasion,

6. |Whatever has smell differs from other things|

[or symbolically, $|(x)(Sx \rightarrow x = e)|$]

as a parallel to (3) of IO_3; that is, according to them, (6) can not replace (3) of IO_3. However, this restriction on the law of contraposition does not stem from the use of unexampled terms, as it does at least in part, in the case of universally positive pervasions; (6) does not involve any unexampled terms. I think that there are two reasons for the restriction whether or not the NNs clearly saw them: (a) (6), like (3) of IO_3, can have no agreeing instances for exactly the same reasons (§ 5.1), and a positive pervasion without agreeing instances is self-contradictory (fn 5.4). (b) (6) is not really a pervasion since it is about only one entity, viz., earth; while (3) of IO_3 is about a whole class of entities and is genuinely a pervasion. Thus, the case of universally contrapositive (as also universally positive) pervasions shows that, for the NNs, formation-rules for formulas expressing cognitions are not purely syntactic; they allow for semantic considerations as well. As remarked above (§ 4.11), contemporary logic does not favour this practice.

§ 4.13 The NNs' account of a universally contrapositive pervasion, like that of a universally positive pervasion, is determined by metaphysical

considerations. The latter, as noticed in $ 4.11, results partly from the metaphysical belief that every thing is knowable and nameable. The former is developed mainly with reference to IO_3, and results from the NNs' belief that earth alone has smell. Of the two reasons for saying that a universally contrapositive pervasion represents a restriction on the law of contraposition, reason (a) holds only with regard to IO_3. Both (3) of IO_3 and (6) can have agreeing instances when they are members of some other inferences. For example, in the inference,

IO_4 1. |Water does not have smell|
2. |Because it does not differ from others|
3. |Whatever has smell differs from others, e.g., earth|
4. |This is not like it|
5. |Therefore, this is not like it|,

fire would be an agreeing instance of (3) of IO_4 (=(6)), and also of (3) of IO_3, *were it to replace (3) of* IO_4. Thus, the Nn account of a universally contrapositive pervasion leads to the strange consequence that one and the same pervasion may be universally contrapositive in relation to one inference, but not in relation to another. But the Nn account of a universally positive pervasion is not thus relative owing to the Nn theory of unexampled terms with which it is connected.

As for reason (b), it is not true, as was shown in $ 4.11, that (3) of IO_3 and (6) are about different things. The upshot of these considerations is that the NNs are not justified in restricting the law

of contraposition, and not treating (3) of IO_3 and (6) as logically equivalent.[28]

$ 4.14 The NNs discuss not only the logical character of pervasion, but also the manner of its establishment; that is, they have a certain theory of induction. I shall state that theory here ($$ 4.14-19) mainly in terms of what the NNs themselves actually say, and fully reconstruct it in the next Chapter in terms of what has come to be called 'confirmation theory' in recent times.

According to the NNs, a pervasion is established by means of frequent observation *(bhuyo darśanena)* of the coexistence of probans and probandum.[29] A coexistence may be either of probans with probandum or of the absence of probandum with the absence of probans. The observed instances of coexistence may, therefore, be either agreeing *(sapakṣa)* or disagreeing *(vipakṣa)*.[30] An agreeing instance is defined as one where the probandum definitely occurs;[31] and a disagreeing instance as one

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[28]For a discussion of the difficulties about inferences containing contrapositive pervasions in general, see $$ 6.2-4, cp $ 5.1.

[29] *dhūmāgnyor vyāpti-grahe sādhya-sādhanayor bhūyaḥ sahacāra-darśanena*. . . . "In the understanding of the pervasion of smoke and fire [achieved] by means of frequent observation of the concomitance of probans and probandum . . . " . *TD 45* (cf *TS 45*).

[30]Other English equivalents used for *'sapakṣa'* are: 'similar', 'homologous', and 'positive'. Those for *'vipakṣa'* are: 'dissimilar' 'heterologous', and 'negative'. 'Positive' and 'negative' are the most literal, but 'negative instance', unlike *'vipakṣa'*, means, in contemporary usage, *a contrary instance*. 'Agreeing' and 'disagreeing' are the next best.

[31]*niścita-sādhyavān sapakṣaḥ (TS 50)*.

where the probandum definitely does not occur.[32] For example, if the probandum under consideration is *fire*, and the pervasion is that whatever has smoke has fire, a kitchen would be an agreeing instance, and a lake would be a disagreeing instance. It is clear from these definitions, that, for the NNs, an instance, whether agreeing or disagreeing, is an entity.

$ 4.15 Let me call the definitions of agreeing and disagreeing instances, just mentioned, as D_1 and D_2 respectively. In so far as the NNs regard agreeing and disagreeing instances as evidence for pervasion, D_1 and D_2 are, obviously, not satisfactory as they stand, and for two reasons. Firstly, on D_1 anything that has probandum but no probans would also be an agreeing instance, but it could not count as evidence for the pervasion in question; it would be a neutral instance. Similarly, on D_2 anything that lacked the probandum but not the probans also would be a disagreeing instance; but such an instance, far from being evidence for a pervasion, would actually be evidence against it. Secondly, the subject of an inference would, on D_1, be necessarily an agreeing instance,[33] but it cannot be used, short of begging the question, as evidence for the pervasion in question since its having the pervader is the very question at

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[32] *niścita-sādhyābhāvavān vipakṣaḥ (TS 51).*

[33] The subject of an inference would necessarily be an agreeing instance on D_1, because the |conclusion| of any inference, according to the NNs, is true, and asserts that the subject has the probandum, although it is sometimes expressed by (what amounts to) a double negative sentence ($$ 4.28-29), and is sometimes in terms of absence (Athalye:272).

issue (§ 4.12). In order to avoid these difficulties and to reflect truly the practice of the NNs themselves of treating both agreeing and disagreeing instances as constituting evidence for pervasion, it is necessary to ensure that an agreeing instance has also probans in addition to probandum and that it is different from the subject of inference. It is also necessary to ensure that a disagreeing instance lacks probans as well in addition to probandum. Besides, in so far as agreeing and disagreeing instances are defined in terms of the presence or absence of probandum, they are, according to the NNs, relative to an inference (§ 5.1). Owing to these considerations, the Nn definitions of agreeing and disagreeing instances need to be modified as follows:

> For a pervasion (of the form either $|(x)(Hx \rightarrow Sx)|$ or $|(x)(\sim Sx \rightarrow \sim Hx)|$) in relation to an inference I,
>
> an entity a is
>
> i. an agreeing instance if and only if $a \neq p$, and Ha & Sa;
>
> ii. a disagreeing instance if and only if $\sim Ha$ & $\sim Sa$
>
> (where p, H, and S are respectively the subject, the probans and the probandum of I).[34]

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[34] Viśvanātha himself recognises the inadequacy of D_1: He says (fn 5.4) that a universally contrapositive inference has no agreeing instances, even though on D_1, the subject of such an inference would necessarily be an agreeing instance (§ 4.12, fn 4.33). Staal (1962b: 634-35) and Matilal (1968b:531, fn 1) seem to take cognizance of only the second of my two reasons for the inadequacy of D_1 and D_2, and modify only D_1 as indicated in (i). (They do not modify D_2 at all). But my second reason, clearly, needs to be accommodated as much as the first. The NNs certainly would not want to include an irrelevant instance

Thus defined, instances have the following relations to pervasions: A universally positive pervasion has only agreeing instances; a universally contrapositive pervasion has only disagreeing instances; and a positive-contrapositive pervasion has both agreeing and disagreeing instances (fn 5.4).

$ 4.16 Pervasion, then, is based on observed instances of coexistence either of probans with probandum or of the absence of probandum with the absence of probans.[35] But the observation of such instances, however numerous they be, is not by itself enough. It must be reinforced by the non-observation of contrary instances also. How, ask the NNs, can there be a pervasion like |Whatever has fire has smoke| when a contrary instance like a thunderbolt is observed, even though the coexistence of fire and smoke is observed a hundred times? *(TD 45)*. They insist, therefore, that the observation of coexistence must be accompanied by the non-observation of deviation *(vyabhicāra,* non-coexistence).[36] Deviation is just the opposite of pervasion, and amounts to a contrary instance. *F* is said to

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(i.e., one having probandum but no probans) under *sapakṣa*, and a contrary instance (i.e., one having probans but no probandum) under *vipakṣa*. This is evident also from their account of the marks of a good probans *(saddhetu)* ($ 6.10).

[35] Although *TD 45* explicitly mentions only the observation of the coexistence of probans and probandum, the observation of the coexistence of their absences is also, obviously, intended ($ 4.1, fn 5.4).

[36] *vyabhicāra-jñāna-viraha-sahakṛta-sahacāra-jñānasya vyāpti-grāhakatvāt*. "Because (that) cognition of coexistence (alone) makes one grasp pervasion which is accompanied by the absence of the cognition of deviation". *TD 45* (cf *BP, SM 137*).

deviate from *G* if and only if *G* does not occur in some of the loci of *F*. Fire deviates from smoke because smoke occurs in only some loci of fire. That is, some things that have fire have no smoke, e.g., a red hot iron ball (a favorite Nn example).

Though the NNs hold that in general pervasion is established by means of *repeated* observation, they also recognise that sometimes the observation of a single instance is enough if there is no suspicion of deviation *(SM 137)*. If there is such a suspicion, it is sometimes removed by means of a *reductio ad absurdum* argument *(tarka)*[37] *(TD 45; SM 137)*. If, for instance the pervasion that whatever has smoke has fire is doubted, the doubt could be removed by showing that the assumption of its contradictory |Some things having smoke have no fire|, leads to an absurdity. For, if the contradictory is true, fire cannot be the invariable antecedent of smoke and so, there must be a breakdown of the accepted causal relation between fire and smoke which, the NNs claim, is absurd (Athalye:258-59, 356-57; Radhakrishnan 1927:88). It is obvious, however, that the use of this type of argument simply begs the question as the Vedāntins were quick to point out (Datta 1960:208; Athyle:259).

$ 4.17 The NNs also raise the interesting question: How can the observation of only some instances justify a pervasion about all

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[37] Strictly speaking, *'tarka'* stands for a whole group of unsound arguments of which the NNs accept five: infinite regress *(anavasthā)* *petitio principii (cakraka)*, self-reliance *(atmāśraya)*, mutual reliance *(anyonyāśraya)* and *reductio ad absurdum (pramāṇabādhitārtha prasaṅga)*. But it is usually taken to mean the last variety. See fns 5.20, 6.18.

instances?[38] This is the traditional (Humean) problem of induction and the NNs' answer to it, in view of what they say about how a pervasion is established, is rather disappointing. Their answer is that while observing the few given instances one observes also *all* the instances by means of what they call 'intuition of universals' *(sāmānya-lakṣaṇa-pratyāsatti)*.[39] This intuition consists first in apprehending a universal through the observation of some of its instances and then in apprehending through that universal *all* its instances. It is admitted, however, that all the instances apprehended through their universal are apprehended only in their generality, not in detail, lest one be omniscient! *(SM 65)*.[40]

$ 4.18 'Intuition of universals', thus conceived, can hardly answer the problem of induction the NNs raise. To take a trivial example, suppose

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. . . *sakala-vahni-dhumayor asaṃnikarṣāt katham vyāpti-grahaḥ . . . ?* " . . . How [can there be] the grasping of a pervasion since there is no contact with (observation of) all smokes and fires . . . ?". *TD 45*.

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dhūmatva-vahnitva-rūpa-sāmānya-lakṣaṇa-pratyāsattyā sakala-dhūma-vahni-jñāna-sambhavāt. "Because through the 'intuition of universals' in the form of smokeness and fireness, the cognition of all smokes and fires is possible". *TD 45;* see also *SM 63-65*. This is Gaṅgeśa's view as well (Chatterjee 1950:250, fn 1).

The NNs distinguish between two types of perception namely ordinary *(laukika)* which involves sense-object contact and extra-ordinary *(alaukika)* which does not. The latter is also called *pratyasatti* (intuition). *Sāmānya-lakṣaṇa-pratyāsatti* is only one of its three forms, the other two being *jñāna-lakṣaṇa-pratyāsatti* and *yogaja-pratyāsatti*.

40For more details on 'intuition of universals', see Chatterjee 1950:209-13; Datta 1960:121-24; Athalye: 214, 261; Keith 1921:87, 117; Rādhākrishnan 1927:86, 89-90.

I never saw a skunk before, but see several in Vancouver and notice that each wears a collar. But this can be no justification for my generalizing that *all* skunks wear collars. For, through observed skunks I can see all other skunks only in their common nature, and through observed collars, I can see all other collars only in their common nature. But the common nature of skunks may not include the property of wearing a collar, nor may the common nature of collars include the property of being worn by skunks. So long as my pervasion does not touch the common (or essential, if you will) natures of the pervadend and the pervader the 'intuition of universals' can provide no evidence at all. All the evidence must come from observed instances.

'The intuition of universals', however, does provide evidence if the pervasion in question touches the essential natures of the pervader and pervadend. For instance, if rationality is an essential property of man it forms part of the universal 'manhood' and in seeing a particular man, John, I already see all other men as rational, so that I am justified, on the basis of 'intuition of universals', in saying that all men are rational. But this is so only because the evidence I get from the intuition is conclusive, and there is no longer any need for repeated observation of men. All I need is to observe one single man (or at most a few men) so that I apprehend through him the universal 'manhood', and through it all other men in their common nature. In such a case, 'intuition of universals' turns out to be what Johnson (1964b:29, 189 f) calls 'intuitive induction' in which "we see the universal in the particular". According to the notion of intuitive induction, experience provides only

an occasion for apprehension of universal connections, and therefore, it is possible to have knowledge of such connections through the observation of a single instance. The paradigm example of intuitive induction is the use of a particular diagram to establish a general theorem in geometry. Though the use of diagrams in mathematics is, in principle, unnecessary, this example does serve to illustrate the idea behind intuitive induction. Another example given is the universal sentence, 'Red is darker than pink' established on the basis of a single observation that *this* red patch is darker than *that* pink patch (Stebbing 1948:243).

$ 4.19 But intuitive induction is not induction, nor even inference for that matter (Cohen and Nagel 1934:273-75; Chatterjee 1950:213-14). The same goes, therefore, for 'intuition of universals'. If a pervasion can be established by means of a single instance, the number and variety of instances in no way affects the rationality of a pervasion, and the concept of probability so basic to induction becomes meaningless. This is so because the pervasion thus established is one that is expressed by an analytic sentence. It is what later Buddhists call 'internal pervasion' *(antarvyāpti)* (fn 4.19).[41] On the whole, the NNs are believed not to subscribe to the theory of internal pervasion.[42] If so, the notion of

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[41] The theory of internal pervasion was first explicitly stated by Ratnākaraśānti, though his teacher Ratnakīrti already anticipated it (McDermott 1969:5). See Randle 1930:184-85.

[42] See Matilal 1968b:531; Bocheński 1961:440; Chatterjee 1950:247. Cf. McDermott 1969:12; Stcherbatsky 1962a:26, 282.

'intuition of universals' is a futile attempt at solving the problem of induction: it either cannot justify a pervasion or does so only by destroying its inductive character. It has, therefore, simply to be ignored, and the NNs are to be taken in general as maintaining that a pervasion is established by means of enumerative induction.[43] This is also indicated by the continued Nn practice of coupling a pervasion with an observed instance in an inference. The NNs bring in this notion of intuition in connection with induction perhaps because they do not distinguish between analytic and synthetic sentences (§ 2.8). Intuition

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[43]One might try to reconcile the Nn views about the roles of intuition and observation in establishing a pervasion by assigning to intuition a less important role than its account presented here implies. One might argue: presumably, the NNs would allow that a pervasion, though believed to be true at a given time, may turn out to be false later. In so far as the NNs use intuition in establishing a pervasion, they could not have regarded it as infallible. They might have assigned to it a role distinct from observation, and not involving infallibility. They might have conceived it in the fashion of Hume's notion of habit. Just as Hume thought that *habit* produces a feeling of conviction about the truth of a hypothesis without guaranteeing its truth, so also the NNs might have thought that intuition generates conviction while allowing for the possibility of falsehood, and that the strength of conviction is in direct proportion to the amount of experience of the coexistence of pervader and pervadend.

I do not think that such an argument is tenable. Firstly, the NNs define intuition just in one way (fn 4.39) and the way in which it is defined clearly implies that as a means of knowledge it is superior to sense-perception (and hence to at least inference and 'identification'). There can be no comparison of intuition, thus defined, with the Humean notion of habit. Secondly, the alleged indirect evidence, namely, the fact that the NNs use intuition in testing a hypothesis, is hardly enough for a fruitful comparison. The Nn notion of intuition is meant to offer a *logical* explanation of induction, while the Humean notion of habit provides at best a psychological explanation. The former is meant to *confirm* a hypothesis; the latter is not. In fact, Hume, unlike the NNs, has no theory of confirmation. But see Goodman (1965:59-61) on Hume.

is presumably relevant only to analytic sentences (which do not need observation) but not to synthetic ones (which do).[44]

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$ 4.20 The third cognition of IS_2 is 'consideration'. It is defined as the cognition that the subject has the probans, the cognition being qualified by pervasion.[45] In other words, it is the cognition that the

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[44] There are, of course, philosophers like Quine (1961:20-46) who maintain that there is no rigid distinction between analytic and synthetic sentences, and that observation is relevant at all levels of our knowledge. Nevertheless, the distinction is commonly recognised ever since Kant first introduced it.

[45]

vyāpti-viśiṣṭa-pakṣa-dharmatā-jñānaṃ parāmarśaḥ (TC 2.2; TS 44).

vyāpyasya pakṣa-vṛttitva-dhīḥ parāmarśa ucyate. "'Consideration' is said to be the cognition of the occurrence of pervadend in the subject". *BP 68.*

This characterization actually makes *parāmarśa* identical with *pakṣa-dharmatā-jñāna*. That this is not intended is shown in *SM 68*. Cf also *BP 132-33*.

Some pre-Gaṅgeśa members of the Nyāya-Vaiśeṣika school, like Śrīdhara, hold that *pakṣa-dharmatā* is the property of having not just *sādhana*, but *sādhana* as related to *sādhya*, so that *pakṣa-dharmatā-jñāna* for them becomes necessarily identical with *parāmarśa*. According to them, *hetu* simply mentions *sādhana* by itself. It does not express a cognition at all: *hetu-vacanaṃ hetu-svarūpa-mātraṃ* (Randle 1930:170-72). This usage sometimes slips into the discussions of the NNs also in their unguarded moments. *BP 68*, just cited, provides an instance, and so does *TD 46:*

pakṣa-dharma-jñānārthaṃ upanayaḥ. "'Application' is meant for [expressing] the cognition that the subject has probans".

But normally, the NNs confine the expression *'pakṣa-dharmatā-jñāna'* to characterising the first cognition of IS_2, and the expression *'vyāpti-viśiṣṭa-pakṣa-dharmatā-jñāna'* to characterising *parāmarśa*.

subject has, not the probans merely, but the probans as invariably related to the probandum. For example, in IS_2 and IO_2 ($$ 3.9, 3.12) 'consideration' is the cognition that this mountain has smoke which is pervaded by fire.[46] Consideration is expressed by the fourth sentence of IO_2 namely, 'application'.[47] Often, as in IO_1, 'application' is elliptical and has to be fully restated ($ 3.9).[48]

$ 4.21 The NNs believe that 'consideration' is absolutely essential for inference: they always speak of a |conclusion| as born of *(janya)* 'consideration' *(TC 2.2; TS 44)*. Annaṃbhaṭṭa even goes to the extent of identifying it with inference.[49] But this is only a way of emphasising

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[46] *vahni-vyāpya-dhūamavān ayaṃ parvata iti jñānaṃ parāmarśaḥ. (TS 44;* see also *SM 68).*

[47] *TS 44-46; SM 68;* Athalye:234, 237, 264, 269; Keith 1921:124; Hirianna 1932:256; Uno 1962:20.

[48] The other names of *parāmarśa* are *'liṅga-parāmarśa'* and *'tṛtīya-liṅga-parāmarśa'* (Athalye:254; Randle 1930:156, fn 1). The former derives from the fact that what is considered in *parāmarśa* is probans or sign *(liṅga)* as occurring in the subject and as related to probandum. The latter derives from the fact that *parāmarśa* contains the third occurrence of the sign, the first two being in pervasion and *pakṣa-dharmatā-jñāna* respectively (Athalye:255). Because the latter contains the second occurrence, it is also sometimes called *'dvitīya-liṅga-jñāna'* (Randle 1930:170). This means that psychologically, the order in which the cognitions of *IS* arise in the thinker's mind is: pervasion, *pakṣa-dharmatā-jñāna* and 'consideration' *(TS 45;* Keith 1921:112). Logically, the order of the elements of an inference is indifferent. Nevertheless, the NNs keep the order of *IO* fixed, and I have represented *IS* by IS_2 because firstly, according to the NNs, *IS* actually begins only when one has the cognition that the subject has probans; and secondly, by doing so, a parallelism is maintained between the order of *IO* and that of *IS*. On my representation of *IS*, *pakṣa-dharmatā-jñāna* would be *prathama-liṅga-jñāna* and pervasion, *dvitīya-liṅga-jñāna*.

[49] . . . *liṅga-prāmarśo 'numānam (TS 47).*

its importance (fns 3.14, 3.23). Even some modern interpreters seem to agree with the NNs in regarding it as the very heart of inference and extol its virtues.[50] They claim that it makes the Nn syllogism superior to the western traditional syllogism by bringing together, as the latter does not, all the three 'terms'.

A little examination of the nature of 'consideration', however, will show that, logically speaking, it is totally superfluous. The cognition that this mountain has smoke which is pervaded by fire is nothing but a conjunction of two cognitions, namely: (1) |This mountain has smoke| and (2) |Smoke is pervaded by fire| (Goekoop 1967:12). The first cognition is *pakṣa-dharmatā-jñāna* and the second is pervasion (excepting the deductively irrelevant instance ($$ 4.27, 5.16).[51] As a conjunction, 'consideration' plays no role that is not played by its conjuncts and is, therefore, superfluous. 'Consideration' can, of course, be retained, but only at the cost of making its conjuncts superfluous.

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[50] Athalye:233-34; cp 236-37; Chatterjee 1950:280, cp 264; Keith 1921:112-15; Radhakrishan 1927:83.

[51] Ingalls remarks " . . . the Navya-nyāya understands such an expression as 'the mountain possess(es) fire because of smoke' as an abbreviation for 'the mountain possess(es) fire because it possess(es) smoke pervaded by fire'" (1951:31, fn 12, cf 35-36). This seems to suggest that, according to him, the NNs replace *pakṣa-dharmatā-jñāna* by *parāmarśa*. Such an interpretation means that *pakṣa-dharmatā-jñāna* exists only as a part of 'consideration', and has no separate status as an element of inference. It, thus, goes against the Nn view that *pakṣa-dharmatā-jñāna* (as a separate element) is necessary for inference, and that it is expressed by 'reason'. Perhaps, Ingalls does not have such an interpretation in mind, since he concedes (1951:33) that the NNs accept the five-membered syllogism. But I do not know how else to interpret his remark.

Since the NNs define 'consideration' in terms of its conjuncts (i.e., pervasion and *pakṣa-dharmatā-jñāna*) and not conversely, it is the former, not the latter, that needs to be rejected.

$ 4.22 Schayer (1933a:254-55; 1933b:100-01) considers 'application' only in its elliptical form, "And this is like it" and, in relation to IO_1, takes it to mean |If this mountain has smoke, it has fire|. He represents (1933a:254) IO_1 as:

1. Ψa
2. ϕa
3. $(x)(\phi x \rightarrow \Psi x)$
4. $\phi a \rightarrow \Psi a$
5. Ψa

'Consideration' for Schayer, therefore, is of the form $|\phi a \rightarrow \Psi a|$, and not of the form $|\phi a \ \& \ (x)(\phi x \rightarrow \Psi a)|$ as I have maintained. Schayer also holds (1933a:255) that 'application' formalised as "$\phi a \rightarrow \Psi a$" "is the rule of substitution", ("ist die schlussregel der Substitution"). What he perhaps means is that it is the rule of universal specification or instantiation (but see below).

I find Schayer's interpretation unacceptable for the following reasons. Firstly, neither the general characterisation of 'consideration' nor the actual examples of it that the NNs give support it. The typical example of 'consideration' is |This mountain has smoke which is pervaded by fire|, and this is very much different from |If this mountain has smoke, it has fire|, both in sense and in truth-conditions. Schayer also

equates (1933:255) 'application' with the expression of *pakṣa-dharmatā* [*jñāna*]. This equation holds only for those early stages of Nyāya when 'consideration' had not yet made its appearance. During those stages, 'application' and 'reason' used to express one and the same cognition, viz. *pakṣa-dharmatā-jñāna* ($$ 4.25-26). But 'application' has come to express 'consideration' ever since the latter's emergence. Even granting that Schayer is talking about Nyāya in general ignoring its different phases of development, and that 'application' expresses *pakṣa-dharmatā* [*jñāna*], 'application' would have to be of the form "ϕa", and it is difficult to see how it could be construed as "$\phi a \rightarrow \Psi a$".

Secondly, if 'application' is construed as "$\phi a \rightarrow \Psi a$", pervasion becomes unnecessary. The conclusion "Ψa" can be derived by means of sentential logic alone from (2) and (4) of Schayer's representation of IO_1. But the NNs believe that pervasion provides the main ground for |conclusion|, and this is also perhaps one of the reasons why they discuss it at great length ($ 5.17). The logic of quantification, therefore, is necessarily involved. In fact Schayer's interpretation of 'application' as a rule of instantiation already assumes this.

Finally, a rule of inference is a metatheoretic expression and cannot legitimately occur as a premise in the very inference which employs it. Yet, this result is inescapable on Schayer's interpretation of 'application' as a rule of instantiation. Treating a rule of inference as a premise reminds one of the puzzle posed long ago by Lewis Carroll (1895: 278-80), namely, that every deductive inference involves an infinite regress. Carroll says that in the inference, for instance,

$$p \rightarrow q$$

$$p$$

$$\therefore q$$

there has got to be another premise namely: "$((p \rightarrow q) \ \& \ p) \rightarrow q$". But once this additional premise is allowed, a further premise,

$$(((p \rightarrow q) \ \& \ p) \ \& \ (((p \rightarrow q) \ \& \ p) \rightarrow q)) \rightarrow q$$

would have to be allowed on the same ground and so on ad infinitem.

It might be said on Schayer's behalf that 'application' is not actually a rule of instantiation, but only corresponds to, or represents, it. This can only mean that "$\phi a \rightarrow \Psi a$" is a step in the derivation licensed by the rule of instantiation. But again, a step in a derivation is not a premise. It is only a consequence of the (set of) premises. The NNs, like Aristotle, do not have any notion of derivation and for them 'application', even according to Schayer, is necessarily a premise. So even this revised version of Schayer's view will not be faithful to the Nn position.

$ 4.23 Other schools of Indian philosophy, especially the Mīmāṃsakas and the Vedāntins, recognise the logical superfluity of 'consideration',[52] and object to the Nn view that 'consideration' is an indispensable element of inference. The NNs indeed make a special effort to answer such

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[52] See Datta 1960:217-8; Chatterjee 1950:278; Rādhākrishnan 1927: 81-82.

objections, but their answers naturally tend to be lame *(TD 47: SM 68)*. In fact, the recognition of 'consideration' by the NNs is a retrograde step. For, in Gautama, it does not exist and even in the early stages of the post-Gautama distinction between *IS* and *IO*, *IS* was generally believed to have only three members, namely, the cognition that the subject has the probans, pervasion and |conclusion|. But Prasastapāda and Uddyotakara introduce 'consideration' also as essential and the NNs follow them in this respect (Randle 1930:163; fn 1, 170-71, cf Radhakrishnan 1927:82). Again, Śridhara, insists that in *IS* |conclusion| results only from the experience of probans (which, for him is different from *pakṣa-dharmatā-jñāna* (fn 4.45)) and the remembrance of pervasion.[53]

$ 4.24 |Conclusion| (Convention D) is the cognition that the subject has the probandum. It is expressed by the conclusion whether positive or negative. The difference between thesis and conclusion is that while the former is entertained provinsionally and is characterised by possibility or doubt (fn 3.32), the latter is known to be true. The transition from the one to the other, therefore, indicates the thinker's progress from a state of doubt to a state of certainty. Needless to say, logic is not much interested in such progress, and confines its attention mainly to the logical relationship between the elements of an inference. It is on this ground that I have ignored thesis as logically irrelevant. My interest in |conclusion| is simply as a cognition which is a logical

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53 *liṅga-darśana-vyāpti-smaraṇābhyām evānumeya-pratity utpattiḥ* (cited in Randle 1930:171).

consequence of the other cognitions of IS_2.

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\$ 4.25 I have remarked (\$ 3.9) that 'application' and conclusion are usually elliptical and that IO_1, therefore, needs to be restated as IO_2. The reason for this restatement is not just the linguistic deficiency of these cryptic expressions, but also, what is more important, the logical incoherence of their literal meaning with certain aspects of the Nn logical theory. I shall now try to point out what the nature of this incoherence is.

In its early phases of development (as in Gautama), the Nyāya syllogism does not have pervasion as its third member (\$ 4.23). The third member consists exclusively of an instance.[54] The elliptical 'application' and conclusion are presumably formulated during these phases with reference to the instance. They are in fact entirely incomprehensible without such reference. The instance, according to Gautama, is either of similarity *(sādharmya)* with probandum, or of dissimilarity *(vaidharmya)* with it (*NS 1.1.34-37*). An instance of similarity amounts to what the NNs call an agreeing instance *(sapakṣa)* and that of dissimilarity amounts to what they call a disagreeing instance *(vipakṣa)*. The former is defined with reference to the presence, and the latter with reference to the absence, of probandum only. But in order to count as

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[54] Athalye:276-78; Keith 1921:86-87, 96, cp 92; Randle 1930:178. Vidyābhūshaṇa (1921:61) in formulating the syllogism of Gautama mentions also pervasion as the third member, but it is not clear on what basis he does so. The *NS* does not mention pervasion while discussing inference.

a basis for conclusion , the former must also involve the presence, and the latter the absence, of the probans (cp $ 4.15). When the instance is one of similarity, the elliptical 'application' and conclusion are both affirmative and assert the similarity of the subject with the instance. When the instance is dissimilar, both are negative in form (i.e., *"na cāyam tathā", "tasmān na tathā")* and assert the dissimilarity of the subject with the instance. An affirmative 'application' asserts the similarity only with regard to probans, and an affirmative conclusion asserts it only with respect to the probandum. Similarly, a negative 'application' asserts the dissimilarity only with regard to probans, and a negative conclusion asserts the dissimilarity only with regard to the probandum.[55] If both asserted the similarity (or dissimilarity) of the subject with regard to both probans and the probandum, they would in effect be saying, in relation to IO_1, that the mountain has smoke and fire. In that case, not only would one of them be totally redundant, but also inference would no longer be a means of knowledge, since it would already assume the conclusion. In Gautama's stage, as in the Nn stage, probans is determined with reference to 'reason' and probandum with reference to thesis (and hence, with reference to conclusion)[56] ($ 4.1).

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[55] Vidyabhushana 1921:60-61; Radhakrishnan 1927:80; cp Randle 1930:178.

[56] *sādhya-nirdeśaḥ pratijñā.* "Thesis is that which states probandum". *NS 1.1.33.*

$ 4.26 In its early stages, then, the Nyāya syllogism could be either of the two types represented, for instance, by:

IO_5 1. |The mountain has fire|
2. |Because it has smoke|
3. |Like a kitchen|
4. |This [mountain] is like it (kitchen)|
5. |Therefore, this [mountain] is like it (kitchen)|,

and

IO_6 1. |This mountain has fire|
2. |Because it has smoke|
3. |Unlike a lake|
4. |This [mountain] is not like it (lake)|
5. |Therefore, this [mountain] is not like it (lake)|.

In IO_5, kitchen is an instance of similarity, since it has the probandum, *fire* (and the probans, *smoke*). The element (4) of IO_5 likens the mountain to the kitchen only with respect to the probans *smoke*, and says, in effect, that the mountain has smoke. (5) of IO_5 likens it to the kitchen only with respect to the probandum, *fire* and says, in effect, that the mountain has fire. Similarly, in IO_6, the lake is a dissimilar instance since it lacks the probandum, *fire*. (4) of IO_6 contrasts the mountain with the lake only with respect to the probans and says, in effect, that it is not the case that the mountain has no smoke which is equivalent to (2) of IO_6. (5) of IO_6 contrasts the mountain with the lake only with respect to the

probandum, and says, in effect, that it is not the case that the mountain has no fire, which is equivalent to (1) of IO_6. It should be noticed that in both these types, thesis and 'reason' are affirmative. Even when they are negative, they are assimilated to the affirmative form by the simple expedient--easily available in Sanskrit--of utilising prefixes like *'a'* and *'an'* (equivalent to the English 'non') etc. It should also be noticed that at this stage nothing like the later law of contraposition is even vaguely implied. This should be clear from the absence of pervasion. The only concern of the Naiyāyikas at this stage, as far as 'application' goes, is the presence, in the subject, of the probans and nothing else; as far as conclusion goes, it is the presence of the probandum in the subject. Hence, the elliptical 'application' and conclusion are never restated, as they sometimes are by the NNs: their sense is transparent. The sense of 'application' whether in IO_5 or in IO_6 is the same as that of 'reason' (just as the sense of conclusion is the same as that of thesis). 'Application', therefore, expresses the same cognition as is expressed by 'reason' (just as conclusion expresses the same cognition as is expressed by thesis). It, like thesis, is nevertheless retained for non-logical reasons.

This is the situation, I believe, until pervasion, and 'consideration'--which partly depends on it in that it has pervasion as a constituent--appear on the scene. Both these are introduced as elements of inference presumably in the fifth century A.D. They definitely figure in both Praśastapāda and Uddyotakara, though the word *'parāmarśa'* ('consideration') actually appears only in Uddyotakara, and words like *'avinābhāva'*

and *'sāhacarya'* are used in place of *'vyāpti'* ('pervasion').[57] Before the fifth century A.D., owing to the absence of pervasion, the dependent distinctions of positive and contrapositive pervasions and positive and contrapositive inferences (i.e., inferences which employ them) ($$ 4.11-13, fn 5.4) could not have existed and the law of contraposition could not have played any role in the Nyāya theory of inference.

$ 4.27 Let me now consider the situation as it prevails in Navya-nyāya. The introduction of pervasion, of course, makes the instance totally irrelevant from the point of view of formal reasoning. Some later NNs, indeed explicitly recognise this. Laugākṣi Bhāskar, for instance, says that the inclusion of the instance is only conventional and not necessary.[58] Yet the NNs generally retain it for nondeductive purposes--as an inductive support to pervasion ($$ 4.14-16, 5.16-17). But once it is retained, the retention also of the elliptical 'application' and conclusion seems natural. For, these, originally formulated with reference to the instance, seem to continue to refer to it and to make sense as before. In truth, however, the deductive irrelevance of the instance renders them unintelligible. Most NNs do not realise this and run into difficulties regarding them. Let me illustrate these difficulties with reference to two types of inference, one involving a positive pervasion, the other a contrapositive pervasion. Consider first the example IO_1 $ 3.9). Its

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[57] Randle 1930:25-26, 163, 170-71, cp 264-65; Keith 1921:27, 93, 96; Vidyabhusana 1921:130; cp $$ 4.20-21.

[58] *dṛṣṭānta-prayogas tu sāmayiko na niyataḥ* (cited in Athalye:278).

'application' and conclusion liken the mountain to the kitchen, and are meaningful only in relation to it. 'Application' could be taken as saying, in effect, either that

(a) The mountain has smoke

or that

(b) The mountain has smoke *and* fire.

And conclusion, though it literally means the same as 'application', could be taken as saying, in effect, either that

(a) The mountain has fire,

or that

(b) The mountain has fire and smoke.

Interpretation (a) is, as pointed out in $$ 4.25-26, the one that the pre-Uddyotakara Naiyāyikas give. It would be acceptable to the NNs as far as conclusion goes, but would not be acceptable with regard to 'application'. For, according to interpretation (a), 'reason' and 'application' express the same cognition, which is contrary to the NNs' view that all the sentences, except the first, of *IO* express distinct cognitions ($$ 3.12, 3.21).

(b) is also a possible interpretation because in order to count as evidence for pervasion, an agreeing instance, which kitchen is in this case, must have both probans and probandum ($ 4.15). In so far as the mountain is likened to the kitchen, it is possible that it also has both. But the difficulty with this interpretation is that, though it makes 'application' express a distinct cognition from the one expressed by 'reason', it also makes 'application' and conclusion identical, and is like

(a), open to the criticism that it goes against the Nn requirement that all the sentences (except the first) of *IO* express distinct cognitions. It also goes against the Nn requirement that inference be a means of (new) knowledge, since it already assumes the conclusion. Further, according to it, thesis and conclusion do not express the same cognition, as they must for the NNs ($ 3.21, fn 4.7). Thus, on either of the interpretations (a) and (b), which are the only possible ones, an 'application' cannot express 'consideration' as the NNs conceive it.

$ 4.28 Consider now an example with a contrapositive pervasion:

IO_7 1. |The mountain has fire|
2. |Because it has smoke|
3. |Whatever does not have fire does not have smoke, e.g., a lake|
4. |This is not like it|
5. |Therefore, this is not like it|.

As in IO_1, in IO_7 too 'application' and conclusion are intelligible only in relation to the instance mentioned in the 'example'. The instance in this case is a disagreeing instance since it lacks the probandum *fire* (and of course, also the probans *smoke*).[59] In so far as 'application' and

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[59] Since it is thesis (or in effect, conclusion) that provides a criterion for determining what a probandum is ($ 4.1) it is thesis, and not pervasion, that also provides a criterion for determining what an agreeing or a disagreeing instance is. The instance in IO_7 would be an agreeing instance only if probandum (and hence also probans) is taken as determined with reference to pervasion, but it cannot be so taken ($$ 6.2-4).

conclusion say that the mountain is not like the lake, the former can, again, be construed either as

(a') It is not the case that the mountain has no smoke,

or as

(b') It is not the case that the mountain has no smoke and that it has no fire.

And the latter could be construed either as

(a') It is not the case that the mountain has no fire

or as

(b') It is not the case that the mountain has no fire and that it has no smoke.

Under interpretation (a'), which again, would be that of pre-Uddyotakara Naiyāyikas, 'application' would express the same cognition as is expressed by 'reason', and conclusion would express the same cognition as that expressed by thesis. Hence, (a') would be acceptable to the NNs as far as conclusion is concerned; but with regard to 'application' it is open to the same objection mentioned above under (a) in connection with IO_1.

Interpretation (b') makes 'application' and conclusion identical and involves three subcases:

(b'_1) The mountain has smoke and the mountain has no fire

(b'_2) The mountain has no smoke and the mountain has fire

(b'_3) The mountain has smoke and the mountain has fire.

Under each of these subcases, (b') like (b), makes 'application' express a

distinct cognition from that expressed by 'reason', but is otherwise open to the same criticism to which (b) is. In fact (b'_3) is the same as (b). Hence, once again, under neither (a') nor (b'), can 'application' express 'consideration'.

$ 4.29 There is a different way of looking at the instance accompanying pervasion which would enable an elliptical 'application' to express 'consideration'. This is to regard the instance of a positive inference as having probans as pervaded by probandum. In IO_1, kitchen may be viewed as an instance in virtue of its having smoke as pervaded by fire. On this view of an instance, the 'application' in IO_1, which asserts the similarity of the mountain with the kitchen, would say:

(c) The mountain has smoke which is pervaded by fire

and so, would express 'consideration'.

Similarly, in a contrapositive inference, the instance may be regarded as not having probans as pervaded by fire. That is, in IO_7 the lake may be regarded as not having smoke which is pervaded by fire. In so far as the 'application' in IO_7 asserts the dissimilarity of the mountain from the lake, it would say:

(c') It is not the case that it is not the case that the mountain has smoke which is pervaded by fire.

Or equivalently,

(c'') The mountain has smoke which is pervaded by fire.

(c'') is equivalent to

(c''_1) The mountain has smoke, and whatever has smoke has fire

which in turn is equivalent to

(c_2'') The mountain has smoke and whatever does not have smoke has no fire

which is the conjunction of 'reason' and 'example' (except that part of it which mentions the instance) and, therefore, may be said to express 'consideration'.

But this way of looking at an instance creates other difficulties. Firstly, to say that the kitchen has smoke which is pervaded by fire is to say that the kitchen has smoke and that whatever has smoke has fire. On this view, an instance fails of the purpose for which it was (primarily at any rate) intended, namely, to provide inductive support for pervasion.[60] For, instead of supporting it, the instance would already assume it ($$ 4.27, 5-16). Secondly, this interpretation also would make 'application' and conclusion exactly the same and to that extent would be as defective as (b) and (b').

For all these reasons, I think that there is no way of interpreting the elliptical versions of 'application' and conclusion so as to make them

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[60] It is possible to say that an entity can be an instance without providing inductive support. For example, Gage (the present President of The University of British Columbia) is an instance of the pervasion |All bachelors are men|. Yet, the instance cannot be said to have a confirmatory role, because the pervasion is (what we call) analytic, and needs no confirmation; it can only have an illustrative role. But if an instance can have an illustrative role in the case of some (i.e., analytic) pervasions, there is no reason to deny it in the case of other (i.e., synthetic) pervasions. However, the NNs did not have the analytic-synthetic distinction (from which stems the illustrative-confirmatory distinction) ($ 2.8), and it is hard to say, except on an intuitive level, whether they were aware of the illustrative role of an instance. The interesting point is that they were very much aware of the confirmatory role.

consistent with the Navya-nyāya theory of inference. I feel that some how the NNs have failed to realise that the retention of these versions is incoherent with the changes brought in by the emergence of pervasion as a member of inference. My suggestion, therefore, is to ignore their literal meaning altogether and to mechanically take them as expressing 'consideration' and |conclusion|. IO_1 and IO_7, therefore, have to be restated respectively as IO_2 and

IO_8 1. |This mountain has fire|

2. |Because it has smoke|

3. |Whatever does not have fire does not have smoke, e.g., a lake|

4. |This mountain has smoke, and whatever does not have fire does not have smoke|

5. |Therefore, this mountain has fire|.

CHAPTER V

A RECONSTRUCTION OF THE NAVYA-NYĀYA THEORY OF CONFIRMATION

\$ 5.1 The most peculiar aspect of the Nn theory of pervasion is that it makes pervasion relative to an inference. The NNs regard pervasion only as an element of inference, and define it in terms of probans and probandum (or their absences) (\$ 4.15). Such a restriction is, of course, unnecessary. Pervasion, according to the NNs, is the meaning of a universal sentence, and a universal sentence obviously has significance even outside inference and needs to be defined independently of the inferential context. This seems to have been *partly* realised by Gaṅgeśa who objects to all definitions of pervasion in terms of probans and probandum,[1] and gives his own final definition in terms of relative and demonstrative pronouns (fn 4.11). However, his definition runs into other difficulties (discussed in \$\$ 6.2-4).

As a consequence of the restriction of pervasion to inference, agreeing and disagreeing instances are defined not with reference to pervasion itself, but with reference to the presence or absence of probandum (\$\$ 4.14-15). So, whether something is to count as an agreeing or a disagreeing instance for a pervasion is to be determined, on the Nn view, by looking to the inference as a whole in which that pervasion

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[1] *TC 2.91-92.* See also Goekoop 1967:18, 21-23, 83 and 107.

occurs, and not by looking to that pervasion itself. That is, no choice of instances, agreeing or disagreeing, is possible without reference to the inference containing the corresponding pervasion, and it is not possible to talk of establishing a given pervasion in general. Since the same pervasion can occur as part of different inferences (containing different probandums), this has the odd consequence that the same entity can be an agreeing and a disagreeing instance in relation to the same pervasion! With reference to IO_2 for example, where the pervasion is |Whatever has smoke has fire|, a kitchen is an agreeing instance. But with reference to the inference,

IO_9 1. |This mountain has absence of smoke|
2. |Because it has absence of fire|
3. |Whatever has smoke has fire, e.g., a kitchen|
4. |This mountain has absence of fire pervaded by absence of smoke|
5. |Therefore, this mountain has absence of smoke|,[2]

which contains the same pervasion, a kitchen is a disagreeing instance since it lacks the probandum, viz., *absence of smoke* (i.e., it has smoke).

Not only would the same entity count as both an agreeing and a disagreeing instance for the same pervasion, but also, the same entity would count as an agreeing (or a disagreeing) instance both for a given pervasion and its contrapositive. In IO_2, a kitchen is an agreeing

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[2]This example is not actually mentioned in the texts, but is a natural modification of IO_2.

instance; but even if the pervasion of IO_2 is replaced by its contrapositive, |Whatever has absence of fire has absence of smoke|, a kitchen would still be an agreeing instance, since it has the probandum, *fire*. Even though one is inclined to think that the same entity should count as an agreeing (or a disagreeing) instance for two logically equivalent hypotheses (as a pervasion and its contrapositive are), it is not clear if the NNs are willing to accept this necessary consequence of their definitions of agreeing and disagreeing instances. They hardly ever cite kitchen as a supporting instance for the contrapositive pervasion just mentioned. The supporting instance usually given is a lake. A further odd consequence which results from the Nn restriction of pervasion to inference, and which also the NNs would perhaps be unwilling to accept, has already been noted (§ 4.13). It is that whether or not a pervasion is universally contrapositive depends on the inference containing it.

These difficulties could have been easily avoided by defining an agreeing and a disagreeing instance with reference to pervasion itself instead of with reference to probandum. An agreeing instance would then be an entity that has the pervader (and the pervadend), and a disagreeing instance would be one that lacks the pervader (and the pervadend).[3] Thus defined, an instance would be relative only to pervasion,

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[3]Even Gaṅgeśa, who had the insight of defining pervasion independently of inference, defines an agreeing and a disagreeing instance in terms of probandum and its absence (Athalye:290), and does not seem to see the difficulties involved in so doing.

not to inference. While pervasion itself is, according to the NNs in general, relative to inference, Gaṅgeśa's final definition (§ 5.1) shows how it can be made independent of inference. If pervasion is thus made independent of inference and an instance is defined in terms of pervader (or its absence), then there is no longer the difficulty that the same entity can count as both an agreeing and a disagreeing instance for the same pervasion. Similarly, the same entity could not be an agreeing (or a disagreeing) instance for both a pervasion and its contrapositive; and whether or not a pervasion is universally contrapositive would not be dependent on the inference containing it.

§ 5.2 Despite these difficulties about agreeing and disagreeing instances, it remains true, on the Nn view, that in relation to any given inference, whether a particular entity is to count as an agreeing or a disagreeing instance is unambiguously determined. The 'extension' of the probans and the probandum of that inference will also show whether both agreeing and disagreeing instances, or only agreeing instances, or only disagreeing instances are possible.[4] According to the NNs, most

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[4]Accordingly, inference is divided into three kinds:

> *anumānaṃ hi trividhaṃ kevalānvayi-kevalavyatireky-anvaya-vyatireki-bhedāt.* . . . "Inference indeed [is] of three kinds owing to the difference between the universally positive, the universally contrapositive, [and] the positive-contrapositive . . . ". *SM 142.*

The NNs base this distinction on a three-fold distinction of probans. Viśvanātha, for instance, continues in the above passage:

> *tatrāsad-vipakṣaḥ kevalānvayī* [*hetuḥ*]. . . . *asat-sapakṣaḥ kevala-vyatirekī*. . . . *sat-sapakṣa-vipakṣo 'nvaya-vyatirekī*. . . .

In these lines, the adjectives *'kevalānvayī'* etc., are in the masculine

inferences have both agreeing and disagreeing instances.[5] This means that most pervasions (i.e., those contained in such inferences) are

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form, and hence can not qualify *'anumāna'* (which is in neuter gender). They must be understood to qualify *'hetuḥ'*. On this understanding, the lines can be rendered as follows:

> There (i.e., in the context of the three-fold distinction of inference), the universally positive [probans] is that which has no disagreeing instances. . . . The universally contrapositive is that which has no agreeing instances. . . . The positive-contrapositive is that which has [both] agreeing and disagreeing instances. . . .

However, the three-fold distinction of probans is itself made in terms of pervasion, and naturally so since the question of agreeing and disagreeing instances (whose purpose is to establish a pervasion ($$ 4.14-16)) is, strictly speaking, irrelevant to probans. Thus, Annaṃbhaṭṭa says:

> . . . *anvayena vyatirekeṇa ca vyāptimad anvaya-vyatireki* [*liṅgam*]. . . . *anvayamātra-vyāptikaṃ kevalānvayi*. . . . *vyatirekamātra-vyāptikaṃ kevala-vyatireki*. . . . "That [probans] is positive-contrapositive whose pervasion is [established] by means of [both] presence and absence (i.e., by means of both agreeing and disagreeing instances). . . . That is universally positive whose pervasion has only presence (i.e., has only agreeing instances). . . . That is universally contrapositive whose pervasion has only absence (i.e., has only disagreeing instances) . . . ". *TS 48*. (In this translation, the expression 'whose pervasion' is to be understood as 'the pervasion of that inference in which the probans occurs'. It should not be understood as 'the pervasion in which the probans occurs', since in a contrapositive pervasion the probans does not occur).

In view of the fact that the distinction of probans is in terms of pervasion, it can be dispensed with, and the three-fold distinction of inference can be taken to be directly in terms of pervasion. In other words, one can legitimately say: a positive-contrapositive inference is one whose pervasion is established by means of both agreeing and disagreeing instances; a universally positive inference is one whose pervasion is established by means of agreeing instances alone; and a universally contrapositive inference is one whose pervasion is established by means of disagreeing instances alone.

The following points about this three-fold distinction of inference deserve notice: (1) Since it is concerned with the way in which a pervasion is established, it is not a distinction of *forms* of (deductive)

established by means of *both* agreeing and disagreeing instances. This is clear not only from *TS 48, SM 142* (both cited in part in fn 5.4), and *SM 137*,[6] but also from the Nn requirement that a probans must occur only where the probandum occurs, *and* that it must not occur where the probandum does not occur (§ 6.10).[7] Despite the NNs' practice of mentioning only an agreeing or only a disagreeing instance in support of a pervasion, their theory demands that they both be mentioned. There are

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inference. It must not, therefore, be confused with another which *is* a formal distinction, namely, the two-fold distinction, expressed almost in the same terms, between a positive *(anvayi)* inference and a contrapositive *(vyatireki)* inference. These two forms are so-called because the former contains, like IO_2 (§ 3.9), a positive pervasion; and the latter contains, like IO_3 (§ 4.12), IO_4 (§ 4.13), IO_7 (§ 4.28), and IO_8 (§ 4.29), a contrapositive pervasion. Though this distinction is not explicitly formulated by the NNs, it is implicit in their theory of inference (cf esp *TS 48; BP, SM 142-43*). The logical form of positive and universally positive inferences is the same. So is the logical form of contrapositive and universally contrapositive inferences (§ 6.1). (2) The three-fold distinction of pervasion, on which the three-fold distinction of inference is based, is likewise not to be confused with the two-fold distinction between a positive pervasion *(anvya-vyāpti)* and a contrapositive pervasion *(vyatireka-vyāpti) (BP 142-43)*. The two distinctions are based on different principles: the former on the manner in which a pervasion is established, and the latter on the *form* of a pervasion.

See Staal (1962b:638-41) for a brief discussion of the three kinds of inference just mentioned.

[5] From an examination of the NNs' theory of inference, and a survey of the examples they give, I think that this is a natural assumption to make.

[6]

> *evaṃ anvaya-vyatirekābhyāṃ sahacāra-grahasyāpi hetutā.* "Similarly, the apprehension of coexistence by means of presence and absence is also (i.e., besides non-observation of contrary instances) a cause (in establishing a pervasion)".

[7] This requirement of the NNs reminds one of the 'three aspected logical mark' *(trairūpya)* of the Buddhists. For details on *trairūpya*, see Stcherbatsky 1962a:241-43, 281-83; 1962b:51-58; Staal 1962b:634-38; McDermott 1969:11-12.

some pervasions which are established by means of only agreeing instances, and some others which are established by means of only disagreeing instances. These are the universally positive and the universally contrapositive pervasions (fn 5.4; $$ 4.12-13). As noticed before ($ 4.12-13), it is because of certain metaphysical beliefs that the NNs hold that a universally positive pervasion has no disagreeing instances, and that a universally contrapositive pervasion has no agreeing instances. Leaving these special cases aside for the moment,[8] one may say that a pervasion is established according to the NNs, by means of both agreeing and disagreeing instances.

This account of the NNs, I think, contains at least implicitly, some sort of what in contemporary philosophy of science has come to be called 'confirmation theory'. Giving a satisfactory account of what constitutes an agreeing instance has turned out to be one of the toughest tasks of confirmation theory, and all accounts so far attempted are found to give rise to the so-called paradoxes of confirmation. A brief consideration of some of these accounts is necessary for an assessment of the Nn theory of agreeing and disagreeing instances.

$ 5.3 There is, to begin with, what Hempel calls "Nicod's Criterion".[9] This view is intuitively appealing and therefore, widely held. In

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[8] I return to these special sorts of pervasions in $ 5.15.

[9] This criterion is propounded in Nicod 1930. It is also treated in Hempel 1945 which is included, with some changes and a postscript, in Hempel 1965. My account of it is based on Hempel's treatment.

relation to hypotheses of the form,

(6) $(x)(Rx \rightarrow Bx)$

(to which his account is limited), Nicod regards an object

i. as a positive instance if and only if it satisfies both the antecedent and the consequent of the formula following the quantifier;

ii. as a negative (contrary) instance if and only if it satisfies the antecedent but not the consequent; and

iii. as a neutral instance if and only if it fails to satisfy the antecedent whether or not it satisfies the consequent (Hempel 1965:11; Scheffler:1963:239).

In other words, an object a is a positive or confirming instance of (6) if and only if the sentence

(7) $Ra \ \& \ Ba$

is true. It is a negative (or contrary or disconfirming) instance if and only if the sentence,

(8) $Ra \ \& \ \sim Ba$

is true; and it is neutral (i.e., neither confirms, nor disconfirms) if and only if either

(9) $\sim Ra \ \& \ Ba$

or

(10) $\sim Ra \ \& \ \sim Ba$

is true.

But this criterion of positive, contrary and neutral instances violates the equivalence condition which "demands that everything confirming any sentence confirm also every logically equivalent sentence" (Scheffler 1963:240). It thus gives rise to a paradoxical situation: though (7) confirms (6), it does not confirm the equivalent hypothesis,

(11) $(x)(\sim Bx \rightarrow \sim Rx)$

but is neutral to it. Again, (10) which is neutral to (6) confirms (11).

In addition, Nicod's account is very much restricted in scope: it does not apply to hypotheses in the form of existential sentences. Even within universal conditionals, it does not apply to those with mixed quantifiers.

§ 5.4 There is, next, the 'satisfaction criterion' of Hempel[10] who pioneered the work in this field. This criterion accepts, among others, the equivalence condition as a necessary adequacy condition for any criterion of confirmation. Nicod regards an instance as an object, so that confirmation for him is a semantic relation: a dyadic relation between an extra linguistic entity (i.e., the evidence) and a linguistic entity (i.e., the sentence expressing a hypothesis). In order to make confirmation purely syntactic, Hempel (1965:21-22) construes it as a relation between two sentences, one describing the given evidence and the other expressing the hypothesis. Thus, instead of saying that an object

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[10]The basic source is Hempel 1943. Hempel 1945 contains a less technical account.

a which is both a raven and black confirms the hypothesis "All ravens are black", he says that the sentence "*a* is a black raven" confirms it. Sentences like the latter he calls observation reports or observation sentences, since they describe data accessible to observation. An observation report thus consists only of individual constants and 'observable' predicates (besides, of course, the truth-functional constants) and no variables.

This distinction between regarding an instance as an object and regarding it as a sentence, though important, is not necessary for my limited purpose. I will, therefore, be talking, especially in connection with the Nn view of confirmation, of objects and sentences indifferently as confirming or disconfirming a hypothesis. The context invariably makes it clear whether an object or a sentence is meant.

The main idea behind Hempel's construction is that if a hypothesis is true of the class of individuals mentioned in a given observation report, then that report confirms that hypothesis, and not otherwise (Scheffler 1963:248). In other words, the report confirms the hypothesis if and only if the hypothesis would be true, were the universe to shrink to just those objects mentioned in the report. More precisely, a confirming report logically implies what the hypothesis says of this shrunken universe. This notion of restricted assertion of a hypothesis, Hempel calls the '*C*-development' of that hypothesis. *C*-development is the development of a hypothesis *H* in relation to the class *C* of individuals mentioned in an observational report *R*. For example, consider again the hypothesis (6) and the observational report

(12) $(\sim Ra \vee Ba) \ \& \ (\sim Rb \vee Bb)$

The class of individuals mentioned in (12) is $\{a,b\}$. If the universe consisted only of this class, then (6) would be expressed as

(13) $(Ra \rightarrow Ba) \ \& \ (Rb \rightarrow Bb)$.

(13) thus is the *C*-development of the hypothesis (6) in relation to the observation report (12). Since (12) and (13) are equivalent and (12), being an observational report, is true, (13) must be true also. Hence, (12) confirms (6). In order that an observational report confirm a hypothesis, it is, of course, not necessary that it be equivalent to the *C*-development of that hypothesis; it is enough if it logically implies the *C*-development. On Hempel's theory then, (9) and (10), which on Nicod's theory are neutral to (6), both confirm not only (6), but also its equivalent (11), and so does (7).

An observational report disconfirms a hypothesis, according to Hempel, if it confirms the denial of that hypothesis. For example, the observational report

(14) $(Ra \ \& \sim Ba) \ \& \ (Rb \ \& \sim Bb)$

confirms the hypothesis

(15) $(\exists x)(Rx \ \& \sim Bx)$

since it implies the *C*-development of (15) which is,

(16) $(Ra \ \& \sim Ba) \vee (Rb \ \& \sim Bb)$

Since (15) is the denial of (6), (14) disconfirms (6).

Finally, an observational report, according to Hempel, is neutral to a hypothesis if it neither confirms nor disconfirms it.

If one talks in terms of entities instead of in terms of observational reports about them, one can notice that Hempel's account boils down to the simple statement: those objects are positive instances of which the hypothesis in question is true; those are negative instances of which it is false; and those are neutral to which it is inapplicable.

§ 5.5 Hempel's account, by accepting the equivalence condition, avoids the paradoxical situation arising from Nicod's position; but it gives rise to other paradoxes. These paradoxes stem mainly from the acceptance of the equivalence condition. Firstly, there is the paradox that a totally 'unrelated' object can confirm a scientific hypothesis. For instance, (10) implies the *C*-development of (6) and so confirms it; and similarly (7) confirms (11). This means that one can claim to have confirmed a hypothesis like "Fat people are cheerful" just by looking at the numerous pins on one's desk!

Secondly, there is the paradox that two contradictory reports confirm one and the same hypothesis. For instance (7) and (10) are contradictory, and yet confirm either of (6) and (11), since each implies the *C*-development of either.

Thirdly, there is the paradox that the observational report,

(17) $\sim Ra$

by itself confirms not only (6) and (11), but also

(18) $\sim(\exists x)Rx$ [or equivalently, (18') $(x)\sim Rx$].

Similarly, the observational report

(19) Ba

confirms, in addition to (6) and (11), also the hypothesis

(20) $(x)Bx$.

If (6) and (11) are taken as representations respectively of

(21) All ravens are black

and

(22) All non-black things are non-ravens,

then the paradoxes of Hempel's theory can be summed up in concrete terms as follows: (a) a non-black non-raven confirms (21) and a black raven confirms (22); (b) a black raven and a non-black non-raven both confirm either of (21) and (22); and (c) any non-raven confirms besides (21) and (22) also

(23) Nothing is a raven

which is represented by (18'). Similarly, any black thing, raven or non-raven, confirms, in addition to (21) and (22), also

(24) Everything is black

which is represented by (20).

§ 5.6 Hempel, of course, is aware of all these paradoxes, but maintains that they are theoretically harmless and should be disregarded. As he says, "The impression of a paradoxical situation is not objectively founded; it is a psychological illusion" (Hempel 1965:18). The paradoxes arise not because of any formal contradiction in the theory but because of a conflict between two of our intuitions which seem to be equally obvious. On the one hand, there is our intuition regarding what constitutes a positive instance. It refuses to accept a non-raven as a positive instance of (21), and hence to accord it the same confirmatory status as a black raven. On the other hand, there is the intuition which steadfastly adheres to the equivalence condition. Hempel holds the former intuition responsible for the mischief, and explains the paradoxes by means of the following two considerations:

Firstly, there is a widespread tendency to think that sentences of the form (6) and (11) differ from each other because they are about different things; that, in other words, (6) is about only those x's that are R, and (11) is about only those x's that are not B. But this tendency is mistaken. According to first order logic, there is, in this regard, no difference between (6) and (11). Both say something about *all* the members of the domain in question by imposing certain restrictions on them (Hempel 1965:18-19; Scheffler 1963:265). (6), for instance, says that *no matter what x is taken*, if it is R then it is B; or that every x is either not R or B. The same goes, *mutatis mutandis* for (11) (§ 4.11). Hence, all x's that are either both R and B, or neither R nor B, or only not R or only B can be confirming instances of either (6) or (11). There is no

basis to discriminate among them as to their confirmatory *status*. There may, of course, be basis to discriminate among them as to their degree of confirmatory *force*, but what is at issue here is qualitative, and not quantitative, confirmation (Hempel 1965:48).

Secondly, underlying the intuitive inequalities among positive instances of a hypothesis, there is frequently the illegitimate introduction of extra information. For instance, one might feel that a piece of yellow burning sodium confirms the hypothesis

(25) All sodium salts burn yellow,

while an object like a piece of ice does not, though it confirms

(26) All non-yellow-burning things are non-sodium salts.

This is so because the given object is already known to be ice, and, therefore, *independently* known not to be a sodium salt. But the importation of this independent knowledge, though unwitting, is illegitimate. In judging the relevance of an instance I to a hypothesis H, no information bearing on H, other than merely that I is an instance (confirming, disconfirming or neutral) must be assumed. If the given object is not independently known as ice, and is taken as purely unspecified, and, on being found not to burn yellow, is analysed and found to lack sodium salt, it would be taken as genuinely confirming not only (26) but also (25). It would no longer generate the feeling of paradox. Because of the disguised independent information, the given object does not constitute a *new* positive instance, and there is the feeling that it does not add to the evidence in

favour of (25). But if it is shorn of the independent information, it does genuinely add to the evidence, though not to the same degree to which a piece of yellow burning sodium would.

$ 5.7 The same point may be expressed in terms of the notion of *C*-development. Let *a* be the given object and let (25) and (26) be represented as

(27) $(x)(Sx \rightarrow Yx)$

and

(28) $(x)(\sim Yx \rightarrow \sim Sx)$.

Now, the *C*-development of (27) and (28) with reference to the object *a* are respectively

(29) $Sa \rightarrow Ya$ [or equivalently, (29') $\sim Sa \vee Ya$]

and

(30) $\sim Ya \rightarrow \sim Sa$ [or equivalently, (30') $Ya \vee \sim Sa$]

If one already has the information conveyed by

(31) $\sim Sa$

it will imply (29) and hence confirm (27) irrespective of what observational report one may have regarding *a*. (31) indicates that *a* is an already known instance. It cannot, therefore, further strengthen (27), thus giving rise to a feeling of paradox.

The paradox about (17) and (19) confirming respectively (18) and (20) is also explained by Hempel as being due to the intrusion of additional and illegitimate information. One is unwilling to treat (17) and (19) as confirming (18) and (20) because one has independent information that these latter are false. Once this extra information is excluded, there is no reason why (17) and (19) should not be regarded as positive instances of (18) and (20).[11]

§ 5.8 Hempel's explanation of the paradoxes of confirmation as arising from (i) faulty views concerning the reference of universal conditionals and (ii) improper intrusion of extra information, is not found to be satisfactory by some, and alternative proposals are advanced. For example, J. W. N. Watkins argues[12] that the paradoxes are avoidable in the context of a "Popperian theory" of confirmation. On such a theory, not all confirming instances, but only those which provide a satisfactory test of a hypothesis confirm that hypothesis. For instance, (7) confirms (6) not because (7) is an instance of (6), but because it represents an unsuccessful attempt at falsifying (6). The same cannot be said of (10) and

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[11] My aim here has been to get at the essentials of the different criteria of confirmation. Hence, the account here presented of Hempel's criterion is rather oversimplified and bypasses many finer points. In particular, it ignores certain defects of the criterion, acknowledged by Hempel himself in his 1965 postscript, namely: (a) that it is too restrictive and does not allow for the confirmation of hypotheses involving an infinite domain; (b) that it classifies as neutral certain instances which are normally regarded as confirmatory; (c) that the consistency condition it requires is too strong; and (d) that it has, after all, to be based on the concept of quantitative confirmation.

[12] See Watkins 1957 and Watkins 1958.

so it, though an instance of (6), cannot be said to confirm (6). The intuitively felt inequality between (7) and (10) is thus not a psychological myth as Hempel thought, but is based on objective features of the instances themselves: one represents a satisfactory test, the other does not (Scheffler 1963:269-70).

The difficulty with this view, however, is that Watkins accepts not only the equivalence condition but also the equivalence of (6) and (11). This acceptance immediately leads to the paradoxes of confirmation. For, (7) must confirm not only (6) but also (11) which is equivalent to it, and so must (10) confirm (6) . Watkin's claim as to the superiority of a "Popperian theory" is thus untenable.[13] In particular, it fails as an effective criticism of Hempel's position.

$ 5.9 A more serious criticism of theories like Hempel's comes from Goodman. Goodman (1965:70-71) points out that "logically equivalent statements may have contraries which are not logically equivalent to one another" (Scheffler 1963:288). Hence, positive instances which confirm equivalent hypotheses may have no systematic confirming relationships with their contraries, and it turns out that on Hempel's view an instance may confirm both a hypothesis and its contrary. For example,

(10) $\sim Ra \ \& \sim Ba$

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[13] As a matter of fact, Watkins withdrew this view later in favor of a revised version. In the latter, he acknowledges the paradoxes, but insists that (1) his theory is less paradoxical than Hempel's, and (2) that the paradoxes are not harmless as Hempel thinks. These details, however, are not of importance for my purpose. See Scheffler 1963:271-78.

confirms

(6) $(x)(Rx \rightarrow Bx)$

and also its contrary

(32) $(x)(Rx \rightarrow \sim Bx)$

But

(7) $Ra \ \& \ Ba$

confirms (6) but disconfirms (32). Again, (7) confirms both

(11) $(x)(\sim Bx \rightarrow \sim Rx)$

and its contrary

(33) $(x)(\sim Bx \rightarrow Rx)$

But (10) confirms only (11) and disconfirms (33). Further,

(34) $\sim Ra \ \vee \ Ba$

confirms both (6) and (11) but neither of their contraries (32) and (33). Worse still,

(9) $\sim Ra \ \& \ Ba$

confirms both (6) and (11) and their contraries (32) and (33). It should be noticed that while (6) and (11) are equivalent, their contraries (32) and (33) are not.

These difficulties show that "the paradoxes are not wholly illusory but arise out of intuitions marking objective distinctions of a logical sort" (Scheffler 1963:288). In particular, they show that (10) does not have the same confirmatory status as (7) in relation to (6), since (10) confirms also the contrary of (6) while (7) does not. The same can be said of (7) in relation to (11). Hempel's idea that the paradoxes are a subjective myth, and that reports like (7) and (10) have the same confirmatory status in relation to (6) is thus undermined. There is not much point in regarding an instance as positive when it confirms two incompatible hypotheses. (10), therefore, cannot be accorded the same logical status as (7).

One may attempt to avoid these difficulties by suitably restricting the concept of confirmation. One may say, for example, that an instance *I* confirms a hypothesis *H* if and only if *I* confirms *H* but not its contrary (Ackermann 1966:20). But such attempts would be futile so long as the equivalence condition is accepted. For, in the latter case even selective confirmation (as this restricted notion of confirmation is called) leads to equally unacceptable results. For example, (7) selectively confirms (6) but does not selectively confirm (11) which is equivalent to (6); and (10) selectively confirms (11) but not its equivalent (6). They thus violate the demand that a given evidence must have the same confirmatory relationship to logically equivalent hypotheses. The notion of selective confirmation seems, *prima facie*, plausible, but it can be retained only at the cost of the equivalence condition. There is thus some point, after all, in Nicod's not having incorporated the latter in his account!

$ 5.10 Let me now return to the Nn theory of confirmation. It should be clear from my earlier remarks about how a pervasion is established according to the NNs ($$ 4.14-16) that what the NNs call a disagreeing instance *(vipakṣa)* is also, like an agreeing instance, a positive or confirming instance, while an instance of deviation *(vyabhicāra)* is a negative or disconfirming instance. Moreover, an instance for the NNs is not a sentence but an object like a kitchen or a lake. In so far as the NNs theoretically stipulate that to confirm a hypothesis (of the positive-contrapositive variety) both agreeing and disagreeing instances are necessary, a confirming instance, strictly speaking, cannot be a single entity, but a pair of entities.[14] Some Buddhists realise this and mention both the entities (Stcherbatsky 1962a:281-82). The NNs, however, mention only one of them in 'example' and the other is to be understood.

The NN's theory of confirmation implicit in their demand that a pervasion be confirmed by means of both agreeing and disagreeing instances may now be constructed as follows:

With respect to hypotheses expressed in the form of universal conditionals, a pair of objects constitutes

i. a confirming instance if and only if one of the objects satisfies both the antecedent and the consequent (of the expression following the quantifier), and the other satisfies neither;

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[14] It would be a single entity only for universally positive and universally contrapositive pervasions ($ 5.15).

ii. a disconfirming instance (i.e., an instance of deviation *(vyabhicāra)*) if and only if either object satisfies the antecedent but not the consequent;

iii. a neutral instance if and only if it neither confirms, nor disconfirms a hypothesis.

These definitions may be elucidated with the help of the notion of an observation report:

A pair of objects $\{a\ b\}$ constitutes

i. a confirming instance of (6) or (11) if and only if either of the observational reports

(35) $(Ra\ \&\ Ba)\ \&\ (\sim Rb\ \&\ \sim Bb)$

or

(36) $(\sim Ra\ \&\ \sim Ba)\ \&\ (Rb\ \&\ Bb)$

is true;

ii. a disconfirming instance if and only if the observational report

(37) $(Ra\ \&\ \sim Ba)$

or

(38) $(Rb\ \&\ \sim Bb)$

is true; and hence if and only if one of the following

(39) $(Ra\ \&\ Ba)\ \&\ (Rb\ \&\ \sim Bb)$

(40) $(Ra \ \& \ \sim Ba) \ \& \ (Rb \ \& \ \sim Bb)$

(41) $(\sim Ra \ \& \ Ba) \ \& \ (Rb \ \& \ \sim Bb)$

(42) $(\sim Ra \ \& \ \sim Ba) \ \& \ (Rb \ \& \ \sim Bb)$

(43) $(Ra \ \& \ \sim Ba) \ \& \ (Rb \ \& \ Bb)$

(44) $(Ra \ \& \ \sim Ba) \ \& \ (\sim Rb \ \& \ Bb)$

(45) $(Ra \ \& \ \sim Ba) \ \& \ (\sim Rb \ \& \ \sim Bb)$

is true; and finally,

iii. a neutral instance if and only if neither (35) and (36) nor (37) and (38) hold; and hence if and only if any of the following holds:

(46) $(Ra \ \& \ Ba) \ \& \ (Rb \ \& \ Bb)$

(47) $(Ra \ \& \ Ba) \ \& \ (\sim Rb \ \& \ Bb)$

(48) $(\sim Ra \ \& \ Ba) \ \& \ (Rb \ \& \ Bb)$

(49) $(\sim Ra \ \& \ Ba) \ \& \ (\sim Rb \ \& \ Bb)$

(50) $(\sim Ra \ \& \ Ba) \ \& \ (\sim Rb \ \& \ \sim Bb)$

(51) $(\sim Ra \ \& \ \sim Ba) \ \& \ (\sim Rb \ \& \ Bb)$

(52) $(\sim Ra \ \& \ \sim Ba) \ \& \ (\sim Rb \ \& \ \sim Bb)$

If, instead of entities, one regards, following Hempel, observation reports themselves as instances, then (35) and (36) would be confirming instances; (39)-(45) would be disconfirming instances; and (46)-(52) would be neutral instances. Since the atomic parts *'Ra'* *'Rb'* *'Ba'* and *'Bb'* in the sentences (35)-(52) can be either true or false, there are in all only sixteen possibilities, as represented in the following table:

TABLE I

CONFIRMATORY STATUS OF OBSERVATION REPORTS

Truth Value				Confirmatory Status
Ra	*Ba*	*Rb*	*Bb*	
T	T	T	T	N
T	T	T	F	D
T	T	F	T	N
T	T	F	T	C
T	F	T	T	D
T	F	T	F	D
T	F	F	T	D
T	F	F	F	D
F	T	T	T	N
F	T	T	F	D
F	T	F	T	N
F	T	F	F	N
F	F	T	T	C
F	F	T	F	D
F	F	F	T	N
F	F	F	F	N

(C = confirming, D = disconfirming, N = neutral, T = true, F = false).

It can be seen that there are two C's ((35) and (36)), seven D's ((39)-(45)) and seven N's ((46)-(52)).

$ 5.11 For the NNs, a pervasion is a cognition and thus, an extra linguistic entity. To simplify the comparison of the Nn theory of confirmation with the contemporary theories, let me regard it in the present context (i.e., $$ 5.11-15) as a sentence. With this stipulation, the Nn view, as reconstructed above, agrees with Nicod's (i) in being limited to universal conditionals; (ii) in regarding an instance as an extra linguistic entity and thus construing confirmation as a semantic relation; and (iii) in having the same notion of a disconfirming instance. It differs from Nicod's view (i) with regard to what is a confirming and hence with regard to what is a neutral instance; (ii) in admitting disagreeing instances and the equivalence condition, though the full scope of the latter is not realised ($$ 4.11-15). Despite its admission of disagreeing instances, the Nn view escapes the paradoxical result of Nicod's view, namely, that a given evidence can fail to confirm equivalent hypotheses: its definition of a confirming instance ensures that the same observation report confirms both a hypothesis and its contrapositive. It also ensures that a totally unrelated object (i.e., a disagreeing instance, *vipakṣa*) cannot by itself confirm a hypothesis. Hence, the pleasant prospect of confirming a scientific hypothesis without leaving one's desk ($ 5.5) is no longer there. Thus, Hempel's first paradox also is avoided.

The consequence that (7) and (46) do not confirm (6) and that (10) and (52) do not confirm (11) might seem strange, but it directly follows from the Nn requirement, responsible for avoiding Hempel's first paradox, that for confirming a pervasion both agreeing and disagreeing instances are necessary. One can avoid the consequence only by giving up that

requirement (as the NNs themselves do in the special cases of universally positive and universally contrapositive pervasions (fn 5.14, §5.15)). But then, one has to accept the resulting paradox as well.

By requiring, in theory at least, that both agreeing and disagreeing instances must be considered while confirming a hypothesis, the NNs, in effect, achieve two things, though, perhaps, without realising it, namely, (a) to guard against illegitimate intrusion of extra information independently obtained; (b) to insure that the total evidence is taken into account. (b) means that no evidence should be informally admitted; all relevant evidence must be formally and explicitly stated and assessed before a regularity is rationally projected. The importance of (a) is, as noticed earlier (§§ 5.6-7) effectively brought out by Hempel; that of (b) is indicated below (§ 5.12) by the notion of positive confirmation.

While my interpretation of the Nn theory of confirmation avoids Hempel's first paradox, it does not avoid his second paradox, namely, that two contradictory reports confirm the same hypothesis. For, (35) and (36) are contradictory reports and yet confirm either of (6) and (11). As for Hempel's third paradox that *"Ra"* confirms *"(x)Rx"* and that *"Ba"* confirms *"(x)Bx"*, it is beyond the scope of the Nn theory which is limited, as remarked above, to universal conditionals only.

Hempel's theory even within the limited field of universal conditionals is unacceptable to the NNs because it is too weak and allows reports that would be neutral on the Nn theory to confirm a hypothesis. For example, (7), (10) and (46)-(52) are all neutral to (6) and (11) on

the Nn theory, but turn out to be confirming on Hempel's theory, since all of them logically imply the *C*-development of both (6) and (11). The relationship between the two theories may be summarised as follows:

i. Every confirming instance on the Nn theory is also a confirming instance on Hempel's theory but not conversely.

ii. Every disconfirming instance on the Nn theory is also a disconfirming instance on Hempel's theory and conversely.

It should be noted that whenever an instance both confirms and disconfirms a hypothesis, it is to be taken only as disconfirming it. Hence, though (39), (43), (44), and (45) appear both to confirm *and* disconfirm (6) and (11), they are to be taken to be only disconfirming. Disconfirmation is a stronger notion than confirmation, and when accompanied by the latter, nullifies it.

iii. Every neutral instance on Hempel's theory is a neutral instance on the Nn theory as well but not conversely. For example, none of the reports (46)-(52) is a neutral instance on Hempel's theory.

$ 5.12 On my interpretation, the Nn theory within its limited range of application avoids the serious criticism that a given evidence confirms two incompatible hypotheses. For example, the reports (35) and (36) confirm (6) and (11) but not their contraries nor their contradictories. The Nn theory, of course, has the following results as well:

i. (7) is neutral to both (6) and (11), but is neutral to only one of their contraries (32) and (33) and disconfirms the other.

ii. (8) disconfirms both (6) and (11), but is neutral to both of their contraries.

iii. (9), like (7), is neutral to both (6) and (11), and also to their contraries (32) and (33).

iv. (10), like (7) and (9), is neutral to both (6) and (11), but disconfirms (33) and is neutral to (32).

But these results show only what is true of *any* confirmation theory, namely, that an observation report does not have any systematic relationship with the contraries of the equivalent hypotheses it confirms. They do not affect the result, of the Nn theory, that no instance can confirm two incompatible hypotheses, nor the result that if an instance confirms a hypothesis, it also confirms its equivalent.

In so far as the Nn theory of confirmation escapes the criticism that a given evidence confirms two incompatible hypotheses, it amounts to what in present confirmation theory is called 'positive confirmation'. The notion of positive confirmation is a refinement of that of selective confirmation designed to escape the criticism, just mentioned, to which the latter is open. Ackermann (1966:23) defines it thus: "If evidence is such that some hypothesis is compatible with it, but all of the contraries of that hypothesis are incompatible with the evidence or with known cases of individuals not formally part of the evidence, the hypothesis

is said to be positively confirmed by the evidence".[15] The idea behind positive confirmation is that the contingency of the same evidence confirming contrary hypotheses arises, because certain relevant information is taken for granted and left out. In other words, it is informally admitted, but not formally stated. If it is also formally stated, the contingency could be avoided. As I pointed out above ($ 5.11), the Nn requirement that both disagreeing as well as agreeing instances be stated avoids the contingency just in this way.

$ 5.13 That the same evidence confirms two incompatible hypotheses is a serious objection to a theory of confirmation. In so far as the notion of positive confirmation (and hence, the Nn notion of confirmation) aims at circumventing this objection, it might appear that it can, after all, provide the basis for a satisfactory theory of confirmation. Unfortunately, however, it has been found that it cannot do so. It seems to be satisfactory only in relatively simple cases. As soon as complicated cases are brought in, the danger of the same evidence licensing incompatable hypotheses or predictions reappears. This fact is highlighted by the famous 'grue-bleen paradox' of Nelson Goodman.

Goodman introduces two unusual predicates, namely, 'grue' and 'bleen'. He defines them as follows:

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[15] Since a contrary has infinitely many equivalents, a hypothesis can always be said to have an infinite number of contraries. Also, all the contraries of equivalent sentences can be said to be the contraries of any one of the equivalent sentences.

"x is grue" = df "x is observed and found to be green before a certain time t and blue during or after t".

"x is bleen" = df "x is observed and found to be blue before t but green during or after t".

In order to see the paradox Goodman wants to bring out, imagine a member a of a community who talk the grue-bleen language; and suppose a person b, speaking our language, observes a thousand emeralds just before t and finds them all green. On a theory like Hempel's, or Nicod's, b can then project the hypothesis,

(53) All emeralds are green; and hence, in particular,

(53') All emeralds observed after t are green.

The same projection can be made on the basis of the Nn theory, supposing trivially, that b also observes some non-green things and finds them all to be non-emeralds. Now, on the basis of the same evidence as observed by b, a would project the hypothesis

(54) All emeralds are grue; and, in particular,

(54') All emeralds observed after t are grue.

For, on his definition of 'grue', the observed evidence would all be grue. However, if translated into our blue-green language, a's hypothesis (54') would be

(55) All emeralds observed after t are blue,

since during or after t an emerald would be grue just in case it is blue. Clearly, (53') and (55) are incompatible (Goodman 1965:74).

It may be objected that 'grue' and 'bleen' are not legitimate predicates; that they are not purely qualitative like 'green' and 'blue' in so far as they involve a reference to time. This objection, however, is untenable, since it can be turned against the so-called legitimate predicates like 'green' and 'blue' as well. For, the latter can themselves be defined in terms of 'grue' and 'bleen':

"x is green" = df "x is observed and found to be grue before t and bleen during or after t".

"x is blue" = df "x is observed and found to be bleen before t and grue during or after t".

There is, thus, no clear objective basis for preference of 'blue' and 'green' over 'grue' and 'bleen'. If one starts with the former as basic color words, one tends to regard the latter and the hypotheses they license as illegitimate; if one starts with the latter, one tends to regard the former as illegitimate. One, thus, has the surprising result that whether or not one finds a change in a given situation, or what regularity one finds in it depends on the linguistic machinery used to describe that situation (Skyrms 1966:58-59).

It would not be so bad if this totally destructive result were confined to a few isolated cases; actually, however, it extends to any evidence at all. Any evidence can confirm any hypothesis on any confirmation theory by the choice of appropriate predicates. For any hypothesis

whatever that one wants to project, one can always find a regularity in the observed evidence that warrants it. For example, on the basis of the same evidence, not only (53) and (55), but also

(56) All roses observed after t are blue

can be projected by defining, say, 'emerose' as

"x is an emerose" = df "x is observed and found to be an emerald before t and a rose during or after t".

On the basis of this definition, the observed evidence about emeralds would confirm the hypothesis

(57) All emeroses are grue

and this, in our language would be the same as (56) (Goodman 1965:74, fn 10).[16]

$ 5.14 In view of the all-embracing and serious consequence that "any thing confirms any thing", it becomes of the utmost importance that not every observed regularity is projected. A distinction must be made between those regularities that are projectible and those that are not. The former are 'law-like', and involve only 'well-behaved' predicates. The latter are 'accidental' and involve 'ill-behaved' predicates. The Nn

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[16] See for a similar example Hempel 1965:50. Some other interesting examples are to be found in Skyrms 1966:61:66.

view, like other versions considered here of confirmation theory, including the notion of positive confirmation, has no criteria for such a distinction, though the NNs, like Hume, intuitively assume that they are concerned only with lawlike regularities. They define a pervasion simply as an association or coexistence of two properties ($$ 2.30, 4.1, 4.3, 4.9-10), and this definition is wide enough to include any regularity at all. It, thus, opens the way to the 'new riddle of induction'. Hempel's account of confirmation is purely syntactical and those of Nicod and the NNs are easily translatable into purely syntactical ones. Goodman's grue-bleen paradox, which illustrates the 'new riddle of induction', conclusively shows that no purely syntactical account of confirmation is possible.[17]

The formulation of the criteria for distinguishing projectible regularities from unprojectible ones, is a very difficult task, and the attempts made in this regard are not met with general approval. Goodman locates these criteria in the 'entrenchment' of the regularities, i.e., in the extent to which they have been used in previously projected generalisations. On this ground regularities about grue and bleen are ruled out as unprojectible. These further details, however, are not directly relevant to my aim in this Chapter which was mainly to set the Nn theory of confirmation in the context of recent developments in the field. That purpose is now completed with regard to a very large class of pervasions. It is yet to be pursued with regard to those special

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[17]This is acknowledged by Hempel (1965:50). It was Hempel (1943) who first explicitly claimed that such a definition is possible.

sorts of pervasions which I set aside in the beginning of this Chapter ($ 5.2). These are the universally positive and universally contrapositive pervasions. Let me, therefore, turn to them.

$ 5.15 A universally positive pervasion, according to the NNs, can be confirmed only by means of agreeing instances, since no disagreeing instances are possible ($ 4.11, fn 5.4). Hence, the pervasion "Whatever is knowable is nameable" ($ 4.8), or symbolically,

(60) $(x)(Kx \rightarrow Nx)$

is confirmed by the report

(61) $Ka \ \& \ Na$

(see $ 5.11). A universally contrapositive pervasion can be confirmed only by disagreeing instances, since it has no agreeing instances ($ 4.12, fn 5.4). The Nn examples of inferences involving universally contrapositive pervasions show that the pervader in such pervasions is the absence of the probans of the inference in question, and the pervadend is the absence of the probandum. Hence, the pervasion, "Whatever does not differ from other things (than earth) has no smell" ($ 4.12), or symbolically,

(62) $(x)(\sim Dx \rightarrow \sim Sx)$

is confirmed by the report

(63) $\sim Da \ \& \ \sim Sa$

Generalising from (60)-(63), it can be seen that the NNs' definitions of instances implicit in their notions of universally positive and universally contrapositive pervasions are exactly the same as those of Nicod. That is,

an object *a* is

i. a confirming instance if and only if it satisfies both the antecedent and the consequent;

ii. a disconfirming instance if and only if it satisfies the antecedent but not the consequent;

iii. a neutral instance if and only if it does not satisfy the antecedent irrespective of whether or not it satisfies the consequent.

Thus, for these special types of pervasions, a single object is enough to constitute a confirming instance; while for the usual run of pervasions, i.e., those that are positive-contrapositive, two objects are necessary for the same purpose.

Since the definitions given above are the same as Nicod's, they give rise to the paradox that an evidence confirming a given hypothesis does not confirm its equivalent. However, the NNs rule out the possibility of such a paradox by not accepting the equivalence condition in these special cases. According to them, the law of contraposition does not hold in these cases ($$ 4.11-13).

$ 5.16 Pervasion, it may be recalled, is defined by the NNs as an invariable concomitance *(sāhacarya-niyama)*; but 'example' *(udāharaṇa)*,

the third sentence of *IO*, which is used to express it[18] contains also an expression referring to an instance. An explanation of this discrepancy is already to be found in $$ 4.27-29. It is briefly that an instance, whether agreeing or disagreeing, plays no rôle in the (deductive) inference in which it is mentioned. The conclusion can be validly inferred even without it. The NNs nevertheless mention an instance in an 'example' in order to show that a pervasion is established by means of observed instances. In view of the fact that they did not separate induction from deduction this is understandable (cp fn 4.60).

An interesting question that arises with regard to an instance is whether it is to be taken as an individual or as a class. Textual evidence is not much help here: an instance is expressed by words like 'kitchen' and 'lake'. Since Sanskrit does not have articles, these could be taken as referring to either an individual or a set of individuals depending on the context. Modern interpreters of Nyāya do not usually raise this question, but seem to assume without argument that an instance is an individual (cf Radhakrishan 1927:86; Staal 1960:634-37). Potter (1963:60-61), however, takes it as a class. He says: " . . . kitchen is the class of all kitchens . . . lake is the class of all lakes". Potter is not specifically talking about the NNs' views, but the notions of agreeing and disagreeing instances, like those of probans and probandum, are the same in this respect for all Indian schools of philosophy.

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vyāpti-pratipādakam udāharaṇam. "'Example' is that which propounds pervasion". *TD 46*.

However, if an instance is taken as a class, it fails to serve the purpose for which it is (primarily at any rate) intended. The purpose of an instance, whether agreeing or disagreeing, is to provide observational support for a pervasion. This should be clear from my discussion of the Nn theory of pervasion (esp $$ 4.14-17, 5.2). But, if an instance is taken as a class especially with an infinite, or even indefinitely large, though finite, membership, it is (physically) impossible to observe all the members. If kitchen and lake are taken to be classes, they would surely be classes with a very large membership that is physically impossible to count. So, any evidence-statement about them could not be an observational report in Hempel's sense. It has to involve quantifiers and must be expressed as, for example

(64) All kitchens having smoke have fire; or symbolically,

(64') $(x)((Kx \ \& \ Sx) \rightarrow Fx)$.

But this, being a universal conditional, is itself a pervasion, and can no more be enlightening regarding the process of induction than the pervasion which it is intended to support, namely,

(65) All things that have smoke have fire; or symbolically,

(65') $(x)(Sx \rightarrow Fx)$.

It only pushes back the question, "How is a pervasion established?" instead of answering it. Hence, in order to make sense of the Nn theory of induction, an instance must be taken as an individual. That it should be so taken is also clear from the elliptical form of 'application' and conclusion ($$ 4.25-29).

$ 5.17 The subject of pervasion engages the attention of the NNs so much that other subjects in their theory of inference pale into insignificance beside it. A huge amount of literature has grown around it. Gaṅgeśa, for example, considers as many as twenty-nine definitions of pervasion and his commentators are equally preoccupied with the subject. Inference, as technically defined by the NNs, is only formal inference as illustrated by IS_2, IO_2, etc. What is today called inductive inference is not regarded by them as inference. Yet, their logical theory presents the strange spectacle that their discussion of induction overshadows that of deduction. This anomaly is to be explained with reference to the Nn belief that inference is a means of true cognition *(pramā)* only. It is, of course, possible to get a true conclusion from valid inference with false premises. But the NNs rule out such a possibility, by confining their attention to only formally valid inferences, and by insisting that all the members of an inference must be true.[19] Thus, an inference for the NNs is by definition sound.[20] They take for granted the notion of the formal validity of an argument, but pay much attention to the truth of the

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[19] Ingalls 1951:34; Goekoop 1967:10; Schayer 1933a:249; Radhakrishnan 1927:78.

[20] Following some logicians, I am using the word 'sound' in a rather technical sense: an inference is sound if and only if it is (a) formally valid, and (b) has only true elements. Cf Copi 1968:25. This sense should be distinguished from another sense of 'sound': a system of derivation (or of rules of inference) is sound, just in case if A is derivable from Γ, A is a consequence of Γ (where A and Γ are, respectively, any formula and any set of formulas of the system in question).

elements. Since the cognition expressed by 'reason' (*hetu*) is supposed to be known through perception (another means of *knowledge*), its truth is assured. Pervasion goes beyond perception, and cannot itself be established, without circularity, by (deductive) inference. It becomes, therefore, necessary for the NNs to know what precisely it is, and how its truth is established. This is how they are led into a prolonged discussion of the subject. True, much of the discussion is influenced by metaphysics. Gaṅgeśa, for instance, rejects all definitions of pervasion based on non-deviation *(avyabhicaritatva)* on the ground that they are not applicable to universally positive pervasions.[21] Also, as noted earlier (§§ 2.8, 4.19, fn 4.60), the NNs do not make any distinction between necessary and contingent sentences. Nevertheless, their overall emphasis is on how contingent (universal) sentences are established and to this extent their discussion of pervasion is properly construed as concerned with induction. The inclusion in the 'example' of an expression referring to an instance is a reminder of this fact (§§ 4.14-16, 4.27, 5.16).

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[21] *TC 2.28-31, 50-52;* Matilal 1968b:532; Goekoop 1967:18. Cp §§ 4.11, 5.1.

CHAPTER VI

FORMS AND FALLACIES OF INFERENCE

$ 6.1 I remarked in the last Chapter (fn 5.4), on the two-fold distinction between a positive inference and a contrapositive inference which is implicit in the three-fold distinction made by the NNs between a universally positive inference, a universally contrapositive inference, and a positive-contrapositive inference. The two-fold distinction cuts across the three-fold distinction: a positive inference may be either universally positive or positive-contrapositive. A contrapositive inference may be either universally contrapositive or positive-contrapositive. This is so because universally positive and universally contrapositive inferences are metaphysical in character ($ 4.11-13), and do not represent independent logical forms (fn 5.4). A universally positive inference is necessarily a positive inference and a universally contrapositive inference is necessarily a contrapositive inference. The distinction between a positive inference and a contrapositive inference is a formal distinction and comes out as such in the Vedāntins' and the Mīmāmsakas' controversy with the NNs with regard to the kinds of inferences to be admitted. In this controversy, the expression 'contrapositive *(vyatireki)* inference' is used to refer indifferently either to what the NNs call 'universally contrapositive' or to what they call 'positive-contrapositive'. Similarly, the expression 'positive *(anvayi)* inference' is used to refer indifferently to either a

universally positive or a positive-contrapositive inference (Datta 1960:228-28, 238-43; Chatterjee 1950:272).[1]

When all the elements of an inference are fully stated as in IO_2, a contrapositive inference is obtained simply by replacing the positive pervasion of a given inference by its contrapositive, and leaving the other elements unchanged (\$ 4.9). However, when the given inference contains elliptical 'application' and conclusion, complications arise: in particular, these ellipses have to be changed from affirmative to negative (or conversely). Such complications can be overcome, as I pointed out earlier (\$\$ 4.25-29), only by ignoring the literal meanings of the elliptical expressions.

\$ 6.2 The NNs pay much attention to the positive inferences but little to contrapositive ones. Their theory of inference is evolved primarily with reference to the former. Nevertheless, the latter also are recognised as a distinct kind (fn 5.4). However, this recognition leads the NNs into certain awkward consequences. Let me spell out these consequences in some detail.

I have maintained earlier (\$ 4.1) that probandum and probans are, according to the NNs, to be determined with reference respectively to thesis and 'reason'. But Goekoop (1967:18, 21-23, 83, 107) has

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[1]The Vedāntins and the Mīmāṃsakas accept only positive inferences (excluding universally positive ones), and include contrapositive inferences in an independent means of knowledge called 'postulation' *(arthāpatti)* (Chatterjee 1950:272; Datta 1960:222-28, 238-43; Radhakrishnan 1927:79). This means that they accept contrapositive inferences and contrapositive pervasions only indirectly.

recently argued that according to Gaṅgeśa, they are to be determined with reference to pervasion. It is indeed true that Gaṅgeśa (*TC 2.91-92*) does say that probans and probandum are so determined, and in fact uses this as a ground for rejecting the twenty-one definitions that he discusses before giving his own final definition *(siddhāntalakṣaṇa)* in terms of relative and demonstrative pronouns (§ 5.1). These definitions, according to him, are circular because they are in terms of probans and probandum, which themselves can only be defined in terms of pervasion. For the same reason, the definitions given by later writers like Viśvanātha and Annaṃbhaṭṭa (discussed in §§ 4.3, 4.9) would be circular. However, despite Gaṅgeśa, the practice of defining pervasion in terms of probans and probandum is quite common among post-Gaṅgeśa NNs,[2] and one wonders if there is not some good reason for this. I believe that there is indeed a good reason, and that it is to be found in connection with the NNs' recognition of contrapositive inferences as a distinct kind.

§ 6.3 Consider again IO_8 (§ 4.29). On Gaṅgeśa's view that probans and probandum are to be determined with reference to pervasion, the probans and the probandum of IO_8 would be *the absence of fire* and *the absence of smoke* respectively. But this would have the following consequences which I think, are not acceptable to the NNs:

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[2]These NNs, though, are not always consistent in their use of terms. While they usually define pervasion in terms of probans and probandum, they also at times identify these with pervadend and pervader. For instance, Annaṃbhaṭṭa says, "The property of the subject's having the probans is the property of the pervadend's occurrence in mountain etc." (fn 4.9), and Viśvanātha observes, "'Consideration' is said to be the cognition of the occurrence in the subject of the pervadend" (fn 4.45).

(i) The 'reason' of IO_8 would no longer be expressive of probans as the NNs claim that it is (fn 4.8). The 'reason' corresponding to *the absence of fire* as the probans would be

(2') Because it (=this mountain) does not have fire (i.e., has the absence of fire),

which is very different from (2) of IO_8.

(ii) The thesis and the conclusion of IO_8 do not express the cognition that the subject has probandum. The thesis and the conclusion corresponding to *the absence of smoke* as the probandum would be

(1') This mountain does not have smoke

which is once again not the same as (1) or (5) (excluding the word 'therefore') of IO_8.

(iii) If *the absence of fire* is taken as probans and *the absence of smoke* as probandum, the corresponding 'application' would be

(4') This mountain does not have fire, and whatever does not have fire does not have smoke.

But not only is (4') different from (4) of IO_8, it cannot have the conclusion of IO_8 as its logical consequence as (4) of IO_8 does. The first conjunct of (4') and the conclusion of IO_8 are contradictories.

Similar difficulties arise also in connection with the traditional western syllogism. The syllogism for instance,

S. 1. All drug-users are dim-witted

2. All hippies are drug-users

∴ 3. All hippies are dim-witted

is valid, being in the mood *Barbara* of the first figure. So is the argument,

S'. 1. No intelligent (= non-dimwitted) persons are drug-users

2. All hippies are drug-users

∴ 3. All hippies are dim-witted.

But (S') is not a syllogism (Keynes (1894:250-53), since it violates an essential requirement, namely, that a syllogism must have three and only three terms. Even if it were admitted to be a syllogism, it would have to be counted invalid because of the syllogistic rule that if a premise be negative, so must the conclusion (Keynes 1894:243). Attempts are made, therefore, to reduce (S') to (S) by subjecting it to certain logical operations, the so-called 'eductions'. For instance, by first 'converting' and then 'obverting' (1) of (S'), (1) of (S) can be obtained, and (S') collapses into (S). In the same manner, IO_8 can be reduced to IO_2. But such attempts are justified only if the inference-form underlying IO_2 is somehow believed to be superior. This belief is inconsistent so long as the inference-form represented by IO_8 is also recognised as independent.

$ 6.4 The difficulties pointed out above regarding a contrapositive inference can all be avoided by taking probans and probandum as determined respectively by 'reason' and thesis. And this is perhaps why, despite Gaṅgeśa, they are quite often so taken by post-Gaṅgeśa NNs, and this is

also why I have maintained that they must be so taken.[3] If probans and probandum are not determined with reference to pervasion, then the definition of pervasion given by Viśvanātha and Annaṃbhaṭṭa would not be circular. Nevertheless, there would still be good reason for defining it in terms of relative and demonstrative pronouns as Gaṅgeśa does, instead of in terms of probans and probandum: such a definition would be completely general, not relative to inference (§ 5.1). After all, pervasion does not have to be an element of inference, though it always can be. What is essential to it is that it be about all the members of a certain class.

Gaṅgeśa's principle of determining probans and probandum leads to these difficulties only with regard to a contrapositive inference. In the case of a positive inference, it does not matter whether probans and probandum are defined with reference to pervasion or with reference to 'reason' and thesis. Gaṅgeśa adopts his principle of determination presumably because he has only positive inference in mind. This is perhaps indicated by his remark that a contrapositive inference is for oneself only.[4]

§ 6.5 In both positive and contrapositive inferences, the subject is an individual (§ 4.1, cp fn 3.33).[5] Also, in both of them, thesis and

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[3] My view means that probans and probandum are not to be always identified with pervadend and pervader respectively, as is done by, besides Goekoop, McDermott (1969:11, fn 39, 61), and perhaps Ingalls (1951: 36). Pervader and pervadend, of course, cannot be defined otherwise than with reference to pervasion (§ 4.8).

[4] *ayaṃ ca vyatireki-prakāraḥ svārtha eva* (cited by Datta 1960:228, fn 1).

[5] Potter (1963:60) regards the subject of an inference as a unit-class. But according to the NNs, uniqueness of an object *(vyaktyabheda)* is an impediment to class-character *(jātibādhaka)* (§ 1.17), which means

'application' are, as pointed out earlier ($$ 3.21, 4.21, 4.23), logically redundant and may be ignored along with the deductively irrelevant instance. Hence, their logical forms may be represented respectively as:

F_1 1. Sa

2. $(x)(Sx \rightarrow Fx)$

$\therefore$ 3. Fa;[6]

F_2 1. Sa

2. $(x)(\sim Fx \rightarrow \sim Sx)$

$\therefore$ 3. Fa

The Nn theory of non-referring expressions ($$ 2.8-9) makes it clear that for them there are no such things as empty classes. Universal conditionals for them, as for Aristotle, therefore, necessarily carry existential import. This import is brought out if (2) of F_1 and (2) of F_2 are represented as

4. $(x)(Sx \rightarrow Fx) \ \& \ (\exists x)Sx$

and

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that an individual, according to them, cannot be treated as a class (fn 1.35). See Goekoop (1967:5) for a different opinion. In modern set theory, a convention is sometimes adopted of identifying a unit-class with its only member when that member is an individual and not a class. See, for example, Quine (1963:32).

[6]Bocheński (1961:440) also suggests the same formulation, though he does not give arguments.

5. $(x)(\sim Fx \rightarrow \sim Sx)\ \&\ (\exists x)\sim Fx$

respectively. However, such representation creates difficulties. The NNs undoubtedly accept (2) of F_1 and (2) of F_2 as logically equivalent, and so the law of contraposition does hold for these pervasions. They also, equally undoubtedly, reject empty classes, so that universal conditionals necessarily have existential import. Yet the NNs would, I think, agree that (4) and (5) are not equivalent; which means that they would agree to reject the law of contraposition which they undoubtedly accept! Hence, instead of representing (2) of F_1 and (2) of F_2 as (4) and (5),[7] I shall stipulate metalinguistically that for the NNs universal conditionals necessarily have existential implication. That is, an adequate interpretation of a universal conditional must assign a non-empty set(s) to the predicate letter(s) occurring in the antecedent of the conditional following the quantifier.

It is obvious that F_1 and F_2 are syllogistic in character (fn 3.26). Even so, they cover only a fragment of the class of syllogistic inferences.

§ 6.6 There is another form of inference, which also the NNs do not discuss much, but which yet emerges in their polemics with the Mīmāṃsakas and Vedāntins. Both the Mīmāṃsakas and the Vedāntins recognise postulation *(arthapātti)* as an additional means of knowledge *(pramāṇa)* (fn 6.1).

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[7] For more details on the difficulties of this representation, see Hempel 1965:16-17; Scheffler 1963:261-63.

One of the examples of postulation is:

P_1 1. Devadatta is alive, and he is not at home

∴ 2. He must be outside.

That Devadatta must be outside is a postulation invoked to account for the two ascertained, yet apparently conflicting, facts, namely, that he is alive and that he is not at home. Among the reasons that the Mīmāṃsakas and the Vedāntins give for treating postulation as an independent means of knowledge and not regarding it as inference are: (a) Postulation arises from a need to reconcile two conflicting data, while this is not so in the case of inference. (b) In postulation one never *feels* that one is inferring. In other words, introspection does not support the view that postulation is inference. (c) Postulation can only be reduced, if at all, to contrapositive inference which is unacceptable (to them) (fn 6.1).[8] The NNs see the weakness of these reasons, and assimilate postulation to inference (Chatterjee 1950:362-65). Viśvanātha, for example, has this to say, *a propos* P_1:

> . . . where being alive is known to be pervaded by being either outside or at home, there, when either (i.e., being outside or being at home) is being proved, being outside shines forth in |conclusion|, since being at home is contradicted.[9]

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[8] For further particulars on the Vedāntins' reasons in support of postulation and their criticism of contrapositive pervasion and contrapositive inference, see Datta 1960:237-42, 222-29; Chatterjee 1950:361-67, 268-72.

[9] . . . *yatra jīvitasya bahiḥsattva-gṛhasattvānyatara-vyāpyatvaṃ gṛhītaṃ tatrānyatara-siddhau jāyamānāyaṃ gṛha-sattva-bādhād bahiḥsattvam anumitau bhāsate (SM 144).*

What Viśvanātha says here amounts to the formulation of P_1 as

P_2 1. Whoever is alive must be either at home or outside

2. Devadatta is alive and he is not at home

∴ 3. He must be outside.

The form of P_2 is

F_3 1. $(x)(Ax \rightarrow (Hx \vee Ox))$

2. $Ad \ \& \sim Hd$

∴ 3. Od.

The NNs also say that postulation is not recognised because its purpose is served by a contrapositive pervasion.[10] They thereby seem to suggest that the purpose is not served by a positive pervasion. This is rather puzzling in view of their own admission that every contrapositive pervasion has also a corresponding positive pervasion and conversely (barring the exceptions noted in $$ 4.11-13); one would have thought that any purpose that is served by a contrapositive pervasion is also served by the corresponding positive pervasion. In fact, in connection with P_1 Viśvanātha mentions a positive pervasion.[11] The pervasion in P_2

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10 *arthāpattis tu naiva pramāṇāntaram iṣyate; vyatireka-vyāpti-buddhyā caritārthā hi sā yataḥ.* "Postulation is not accepted as a separate means of knowledge, because [its] purpose is served by the cognition [that is a] contrapositive pervasion". *BP 144.*

11 *jīvitasya bahiḥsattva-gṛha-sattvānyatara-vyāpyatvam.* See fn 6.9.

can of course be replaced by its contrapositive, but nothing is gained by doing so.

$ 6.7 Another example of postulation considered by Viśvanātha is this:

P_3 1. Devadatta is fat, but he does not eat by day

∴ 2. He must be eating by night.

Viśvanātha explains this example by saying:

> In |The fat Devadatta does not eat by day| etc., since *eating* is the pervader of *fatness*, *eating* is proved, [and] since eating by day is contradicted, eating by night is proved . . . ".[12]

What Viśvanātha says amounts to a chain of two arguments:

P_4 1. Whoever is fat eats

2. Devadatta is fat

∴ 3. Devadatta eats.

P_5 1. Either Devadatta eats by day or he eats by night

2. He does not eat by day

∴ 3. He eats by night.

These two arguments can be combined into a single inference:

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pīno Devadatto divā na bhuṅkte ityādau pīnatvasya bhojana-vyāpya-tvāvagamād bhojana-siddhau divā-bhojana-bādhe rātri-bhojanaṃ siddhyati . . . (SM 144; cf *TD 63,* Athalye:349-50).

P_6 1. Whoever is fat eats by day, or eats by night

2. Devadatta is fat, and does not eat by day

$\therefore$ 3. Devadatta eats by night,

which is exactly parallel to P_2, and has the same form namely F_3. The passage quoted above from Viśvanātha once again suggests that the pervasion involved is positive rather than contrapositive.

Staal (1962a:645) represents what, according to the NNs, is the reasoning involved in postulation in the form of the metatheorem,

$$A \rightarrow (B \text{ v } C),\ A, \sim B \vdash C,$$

and says that the corresponding inference involves the use of a negative premise namely '$\sim B \rightarrow C$'. '$\sim B \rightarrow C$' is, of course, logically equivalent to 'B v C'. But it is not clear to me how '$\sim B \rightarrow C$' is a premise, since its equivalent 'B v C' is only a part of a premise; nor on what basis '$\sim B \rightarrow C$' (or 'B v C') is to be regarded as negative, since both the disjunctives B and C in the examples P_2 and P_6 are positive. Even if '$\sim B \rightarrow C$' were granted to be negative, it would not be a contrapositive pervasion as the NNs require. Again, Staal's theorem suggests that the reduction of postulation to inference is merely a matter of sentential logic; but in so far as the NNs make a reference to pervasion, quantificational logic also is involved. For these reasons, I feel that Staal's representation does not adequately bring out the reasoning involved in postulation.

\$ 6.8 F_1, F_2 and F_3 are the only three inference-forms explicitly recognised by the NNs.[13] It is sometimes suggested that the Indian syllogism is really what Aristotle calls an argument from example. It is obvious that instances of F_1, F_2 and F_3 cannot be called 'arguments from example'. The suggestion does hold, however, with reference to Gautama's version of the syllogism as represented by IO_5 and IO_6[14] (\$\$ 4.25-26). Aristotle's illustration of an argument from example is this:

A 1. The war of Athens against Thebes is evil
2. Because it is an aggressive war on neighbours
3. As the war of Thebes against Phocis is.

Ross 1957:487-88.

Aristotle regards A as dialectical, and it is, in essentials, the same as IO_5, since in IO_5 the last two sentences are redundant.

Ross (1957:488) says that an argument from example is not just one inference, but a combination of two inferences namely,

A_1 1. The war of Thebes against Phocis is evil
2. The war of Thebes against Phocis is an aggressive

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[13] None of these forms, it may be recalled, occurs in the *NS*, though anticipations of F_1 and F_2 in the form of IO_5 and IO_6 do (\$ 4.26). The *NS* (1.1.5) also mentions a different classification of inference into *pūrvavat*, *śeṣavat*, and *sāmānyatodṛṣṭa*. See for an account of this classification Keith 1921:88-92; Chatterjee 1950:266-68; Dhruva 1922:251-85.

[14] Cf Athalye:278, 276-77; Keith 1921:27, 87; Randle 1930:179.

war on neighbours

∴ 3. An aggressive war on neighbours is evil

(which involves the fallacy of illicit minor), and

A_2 1. An aggressive war on neighbours is evil

2. The war of Athens against Thebes is an aggressive war on neighbours

∴ 3. The war of Athens against Thebes is evil.

If an argument from example is taken as a combination of two inferences, IO_5 cannot be an argument from example. But I think that the text supports Ross only conditionally: it is only when an argument from example is expanded that it becomes a combination of two inferences. As it stands, it is just one inference, viz. A. This, I think, is clear from what Aristotle says:

> Example then is inference from part to part (not from part to whole or conversely) when both fall within the same class and one is well known (Warrington 1964:154).

A_1 is an inference from 'part to whole' and A_2 is an inference from 'whole to part'. Only A is an inference from 'part to part'. It may be concluded, therefore, that Gautama's version of the Nyāya syllogism is indeed argument from example.

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§ 6.9 Inference, according to the NNs, is a means of knowledge and as such, is by definition sound. That is, it is not only formally valid,

but also materially justified ($ 5.17). From this it would seem that the NNs would regard an inference as unsound either when it is formally invalid or when it is materially unjustified. In truth, however, they do not even raise the question of formal validity, or invalidity,[15] though the subject of fallacies, like that of pervasion, happens to be one of the most widely discussed in their theory of inference. All the fallacies discussed are material, and concern the truth or falsity of the elements of an inference. This is presumably because the primary concern of the NNs is with truth (which they conceive as correspondence with reality).

The Nyāya term for a fallacy is *'hetvābhāsa'* (lit. '[mere] appearance of probans'). A fallacy is defined as being the object of a true cognition that prevents |conclusion|.[16] Though there is nothing in this definition to exclude formal fallacies, it is in practice taken to mean simply that from false premises no conclusion can be drawn, whether or not the argument is formally valid.

$ 6.10 Since there are three entities in an inference, namely, subject, probans and probandum, naming the fallacies only after one of them (i.e., probans) might seem odd. But the Naiyāyikas, understandably enough, regard probans as of special importance, since it is through probans that a

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[15] Of course, they have no idea of validity as distinct from formal validity.

[16] *anumiti-pratibandhaka-yathārtha-jñāna-viṣayatvaṃ hetvābhasatvaṃ (TD 52)*. This is Gaṅgeśa's definition as well.

connection, or the lack of it, is established between the other two entities. Every fallacy is, therefore, regarded as a breach of one or other of the conditions of a (good) probans *(saddhetu)*. Five such conditions are mentioned: (i) The probans must occur in the subject *(pakṣadharmatā)*. (ii) It must occur only where the probandum occurs *(sapakṣasattva)*. (iii) It must not occur where the probandum does not occur *(vipakṣāsattva)*. (iv) It must not be 'contradicted' by facts *(abādhita-viṣayatva)*. (v) It must not be 'contradicted' by another probans leading to the contradictory conclusion *(asatpratipakṣatva)*. If any of these five conditions is violated, the result is a fallacy.[17] It is clear that the first condition is designed to ensure the truth of 'reason' and the next two conditions that of 'example'. The second and the third conditions are equivalent except in the case of universally positive and universally contrapositive inferences. The second condition is not applicable to universally contrapositive inferences and the third is not applicable to universally positive inferences. The fourth and fifth conditions are logically implied by the first three, and therefore, are really superfluous.

$ 6.11 The NNs recognise five types of fallacies: (i) the fallacy of deviant probans *(savyabhicāra)*; (ii) the fallacy of contrary probans *(viruddha)*; (iii) the fallacy of counter probans *(satpratipakṣa)*; (iv) the fallacy of unproved probans *(asiddha)*; (v) the fallacy of contradicted

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[17] Keith 1921:143; Chatterjee 1950:238-39, 282-83; Radhakrishan 1927:78-79.

probans *(bādhita)* (*TS 52*, cf *BP 71*). Each of these five fallacies violates at least one, but often more than one, of the conditions of a (good) probans. I shall discuss only the most interesting of them, namely, the fallacy of unproved probans.[18] It offends, directly or indirectly, against the first or the second (and the third) of the five conditions.

In order that a probans be 'proved' as such, two basic conditions must be fulfilled: (a) it must occur in the subject; and (b) it must be pervaded by the corresponding probandum. When either of these conditions is not satisfied, a probans is 'unproved'. The first condition may fail to be satisfied either because the subject does not exist, or because, even though it does, the nature of the putative probans is such that it cannot occur in it. Corresponding to these two alternatives, the NNs

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[18] For an account of the other four types of fallacies, see Chatterjee 1950:284-88, 291-93, 143-46, 149-51. Cf Potter 1963:59-74.

In addition to the five fallacies mentioned above, Gautama also discusses three other fallacies of a purely dialectical character. These are: (1) *chala* which consists in two persons deliberately using an expression in two different senses in the same debate; (2) *jāti* which consists in raising irrelevant objections to a thesis; and (3) *nigrahasthāna* which consists in an adversary's preparing ground for his own defeat due either to misunderstanding or to ignorance (Keith 1921: 154-56; Chatterjee 1950:293-96). The NNs hardly discuss these fallacies, perhaps because of their blatantly dialectical character. But they do consider certain other more interesting fallacies usually grouped under *tarka*. The ancient Naiyāyikas recognise eleven kinds of *tarka* of which the NNs are said to accept only five (Athalye:358). These are, as mentioned in fn 4.37, infinite regress *(anavasthā)*, arguing in a circle *(cakraka)*, self-residence *(atmāśraya)*, mutual reliance *(anyonyāśraya)*, *reductio ad absurdum (pramāṇa-bādhitārtha-prasaṅga)*. For some reason or other, however, these are not discussed in connection with inference. See for an account of them, Potter 1963:78-83; *NK s.v. tarka*.

recognise two varieties of the present fallacy, namely, *āśrayāsiddha* (lit. 'unproved because of locus'), and *svarūpāsiddha* (lit. 'unproved because of its own nature'). The examples given of *āśrayāsiddha* are: (1) |A sky-lotus is fragrant because it is a lotus| *(TS 56)*. (2) |The golden mountain has fire because it has smoke| *(SM 72)*.[19] In these cases, since the subject does not exist at all, there is no question of a putative probans occurring in it. The samples of *svarūpāsiddha* are (1) |Sound is a quality because it is occular| *(TS 56)*. (2) |The lake is a substance because it has smoke| *(SM 72)*. In either of these cases the very nature of the putative probans precludes its occurrence in the subject. The property of *being occular* by its nature cannot occur in *sound*, and *smoke* by its nature cannot occur in *the lake*.

$ 6.12 The NNs also recognise a third variety of the fallacy of unproved probans. It consists in the failure of condition (b) mentioned above, and is called *vyāpyatvāsiddha* (lit. 'unproved because of the absence of pervadedness').[20] Whether or not a probans is pervaded by the relevant probandum may be obvious or settled by experience. But the NNs also suggest a rather ingenious device of settling it. The device consists in discovering a condition called 'accident' *(upādhi)*. An accident is

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[19] Arguments of this type are, as pointed out earlier (fn 3.18), enthememtic. When fully expanded, they will contain five sentences. Since the mentioning of all the five sentences is cumbersome, the NNs usually prefer the enthememtic form. A full-fledged syllogism is mentioned very rarely as when all its members are under consideration.

[20] Sometimes this variety is also called *anyathāsiddha* (Chatterjee 1950:291).

defined as that which, while pervading the probandum fails to pervade the probans.[21] For instance, in the example |The mountain has smoke because it has fire| *(TS 56)*, *fire* is probans and *smoke* probandum. That *fire* is not pervaded by *smoke* is obvious, but it can also be demonstrated by finding an accident. The accident in this case is *contact with wet fuel (ārdrendhana-saṃyoga)*. For, it pervades the probandum: where there is smoke there is contact of fire with wet fuel; and it fails to pervade the probans: it is not the case that where there is fire, it is in contact with wet fuel, as is evidenced by a red-hot iron ball. It may not be always easy to discover an accident. But once it is discovered, it conclusively establishes the failure of the pervasion of a probans by the probandum. When a pervasion holds, the set of the loci of probans is included (but not necessarily, properly included) in the set of the loci of probandum, and therefore, there can be no scope for an accident. All and only cases of failures of a pervasion involve the occurrence of an

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[21] *sādhya-vyāpakatve sati sādhanāvyāpaka upādhiḥ (TS 56)*.

Visvanatha also gives the same definition:

> *sādhyasya vyāpako yas tu hetor avyāpakas tathā sa upādhir bhavet.* "That is accident which is the pervader of the probandum and non-pervader of the probans". *BP 138*.

And Gaṅgeśa says,

> *yad vyabhicāritvena sādhanasya sādhya-vyabhicāritvaṃ sa upādhiḥ.* "Accident is that from whose deviation [from probans] [results] the deviation of the probans from the probandum". (Cited in Goekoop 1967:15, and in *NK s.v. upādhi)*.

That is, a probans deviates from the accident if and only if it deviates from the probandum.

accident. And since this third variety of the fallacy of unproved probans is the result of the failure of a pervasion, it is defined as one that involves an accident.[22]

$ 6.13 It is almost a universal practice among modern English writers on Nyāya to regard an accident as that condition which so qualifies a probans as to rectify the failure of a pervasion.[23] The given probans, it is believed, fails, as it stands, to be pervaded by the probandum because it does not incorporate the condition or the accident that would ensure its pervadedness. The pervasion of the given probans by the probandum is false; but it is said to be conditionally true in so far as the addition of the accident to the probans makes it true. Accident then, according to these writers, is a means of generating from a false pervasion a true one.

To say that an accident is a means of generating a true pervasion from a false one is also to say that it is a means of generating a sound inference from an unsound one. For, as pointed out above, this third form of the fallacy of unproved probans consists just in the falsity of pervasion (and this is due to the fact that the set of the loci of probans and the set of the loci of probandum only partially intersect), and if this flaw is removed, the argument that results must be sound. Consider

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[22] *sopādhiko vyāpyatvāsiddhaḥ (TS 56).*

[23] See for instance: Athalye:307, 309, 312; Keith 1921:148; Chatterjee 1950:291; Goekoop 1967:14-15; Radhakrishnan 1927:80.

Annaṃbhaṭṭa's example: |The mountain has moke because it has fire|. By incorporating in the probans the accident, *contact with wet fuel*, one has the true pervasion, |Where there is fire in contact with wet fuel there is smoke|. Hence one can argue validly, |The mountain has smoke because it has fire in contact with wet fuel|.

It is indeed true that in the case of this particular example, the use of accident leads from a false pervasion to a true one, and hence from an unsound inference to a sound one. But, though this example has been a favorite one for the NNs, I think it is mistaken to generalise from it, and to regard an accident as a means of converting an unsound inference into a sound one. There is nothing in the NN texts which justifies such a view of accident. In fact, it is easy to find examples which satisfy the Nn definition of accident, and yet cannot be used to generate a true pervasion from a false one, and hence cannot be used to generate a sound inference from an unsound one. Take for instance, the unsound inference, |This is a cow because it is an animal|. The inference is unsound because the suppressed pervasion namely, |Whatever is an animal is a cow| is obviously false. The property of having a tail satisfies the definition of an accident with reference to this unsound inference: it pervades the probandum *(cow)* but does not pervade the probans *(animal)*. Nevertheless, its incorporation in the probans does not lead to a true pervasion. The pervasion |Whatever is an animal with a tail is a cow| is as false as |Whatever is an animal is a cow|, there being other animals with tails than cows.[24] The NNs are aware that an accident cannot be used

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[24]See Kitagawa 1965:436-30 (the pages are numbered backwards).

as a means of converting an unsound inference into a sound one. They conceive the role of an accident negatively as consisting in demonstrating the unsoundness of a given inference, and not in leading to a sound one.[25] The view, therefore, of modern writers which assigns a positive role to accident does not seem to me to be right. It is presumably prompted by the stereotype example, |The hill has smoke because it has fire|.

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vyabhicārasyānumānam upādhes tu prayojanam. "The utility of an accident lies in [enabling] the inference of deviation [of probans from probandum]". *BP 140.*

upādhis tu vyabhicāra-jñānadvārā vyāpti-jñāna-pratibandhakaḥ. "An accident thwarts, by means of the cognition of deviation, the cognition of pervasion". *TD 57.*

CHRONOLOGICAL CHART OF AUTHORS

Note: 1. Names are listed in English alphabetical order.

2. Names are followed by section numbers in which the authors and their dates are first introduced.

3. Dates are very approximate. See fn 0.13.

No.	Name	Date	Affiliation
1.	Annaṃbhaṭṭa ($ 0.15)	17th century A.D.	Nyāya-Vaiśeṣika
2.	Ānandavardhana ($ 1.15)	9th century A.D.	Grammarian
3.	Bhartṛhari ($ 1.12)	ca 450 A.D.	Grammarian
4.	Devendrabuddhi ($ 0.12)	ca 650 A.D.	Buddhist
5.	Dharmakīrti ($$ 0.7, 0.9)	7th century A.D.	Buddhist
6.	Dharmottara ($ 0.12)	ca 775 A.D.	Buddhist
7.	Dignāga ($$ 0.7-8)	late 5th century A.D.	Buddhist
8.	Gadādhara ($ 0.14)	ca 1599-1703 A.D.	Nyāya-Vaiśeṣika
9.	Gaṅgeśa ($ 0.13)	ca 13th century A.D.	Nyāya-Vaiśeṣika
10.	Gautama ($ 0.4)	ca 200 A.D.	Naiyāyika
11.	Helārāja ($ 2.17)	10th century A.D.	Grammarian
12.	Jagadīśa ($$ 0.14-15)	ca 1610 A.D.	Nyāya-Vaiśeṣika
13.	Jayanta Bhaṭṭa ($ 0.12)	ca 965 A.D.	Naiyāyika
14.	Jinavardhana ($ 1.1)	ca 1400-19 A.D.	Nyāya-Vaiśeṣika
15.	Jinendrabuddhi ($ 0.12)	ca 725 A.D.	Buddhist
16.	Jñānaśrimitra ($ 0.12)	ca 1040 A.D.	Buddhist

No.	Name	Date	Affiliation
17.	Kalyāṇarakṣita ($ 0.12)	ca 829	Buddhist
18.	Kamalaśīla ($ 0.12)	ca 750 A.D.	Buddhist
19.	Kavirāja Viśvanātha ($ 1.15)	14th century A.D.	Poetician
20.	Kātyayāna ($ 1.12)	ca 300 B.C.	Grammarian
21.	Keśava Miśra ($ 0.15)	ca 13th century A.D.	Nyāya-Vaiśeṣika
22.	Kumārila Bhaṭṭa ($ 2.7)	ca 7th century A.D.	Mīmāṃsaka
23.	Laugākṣi Bhaskara ($ 0.15)	17th century A.D.	Nyāya-Vaiśeṣika
24.	Mathurānātha ($ 0.14)	ca 1600-75 A.D.	Nyāya-Vaiśeṣika
25.	Nāgārjuna ($ 0.6)	ca 200 A.D.	Buddhist
26.	Patañjali ($ 1.12)	ca 150 B.C.	Grammarian
27.	Pāṇini ($ 1.12)	ca 400 B.C.	Grammarian
28.	Praśastapāda ($ 0.8)	early 6th century A.D.	Vaiśeṣika
29.	Puṇyarāja (Puñjarāja) ($ 2.17)	15th century A.D.	Grammarian
30.	Raghunātha ($ 0.14)	ca 1475-1550 A.D.	Naiyāyika
31.	Ratnakīrti ($ 0.12)	ca 1075 A.D.	Buddhist
32.	Ratnākaraśānti ($ 0.12)	ca 1040 A.D.	Buddhist
33.	Śabara ($ 1.17)	1st century A.D.	Mīmāṃsaka
34.	Śālikanātha ($ 2.10)	ca 1000 A.D.	Mīmāṃsaka
35.	Śāntarakṣita ($ 0.12)	749 A.D.	Buddhist
36.	Śivāditya ($ 0.12)	late 11th century A.D.	Nyāya-Vaiśeṣika
37.	Śrīdhara ($ 0.12)	ca 991 A.D.	Vaiśeṣika
38.	Trilocana ($ 1.5)	9th century A.D.	Naiyāyika
39.	Udayana ($ 0.12)	ca 1050 A.D.	Nyāya-Vaiśeṣika

No.	Name	Date	Affiliation
40.	Uddyotakara ($$ 0.6, 0.9)	7th century A.D.	Naiyāyika
41.	Vallabha ($ 0.13)	ca 11th century A.D.	Nyāya-Vaiśeṣika
42.	Varadarāja ($ 0.15)	ca 11th century A.D.	Nyāya-Vaiśeṣika
43.	Vasubandhu $$$ 0.7-8)	5th century A.D.	Buddhist
44.	Vācaspati Miśra ($ 0.11)	950 A.D.	Naiyāyika
45.	Vātsyāyana ($ 0.6)	4th century A.D.	Naiyāyika
46.	Vindhyavāsin ($ 1.5)	not later than 4th century A.D.	Sāṃkhya teacher
47.	Viśvanātha ($ 0.15)	17th century A.D.	Nyāya-Vaiśeṣika

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Note: 1. The year of publication mentioned in the entries is not necessarily the year of first publication.

2. Abbreviated items (excepting Nos 8 and 51 below) listed on pp ix-x, are not included.

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