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"On the Method of the Nyaya Research",

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WARSAW UNIVERSITY, POLAND

MATERIALS
OF
THE INTERNATIONAL SEMINAR



ARGUMENT AND REASON
IN INDIAN LOGIC

KAZIMIERZ DOLNY
20-24 JUNE, 2001

WARSAW UNIVERSITY, POLAND
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MATERIALS
OF
THE INTERNATIONAL SEMINAR
ARGUMENT AND REASON
IN INDIAN LOGIC



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Studies on Indian Logic*

STANISŁAW SCHAYER

Translated from the German original by Piotr Balcerowicz

I. The Indian and the Aristotelian Syllogism.
Apart from rare exceptions, among which the opinion of such an expert researcher as P. Masson-Oursel should certainly be reckoned (cf. *La Philosophie Comparée*[†], p. 132), majority of authors who have dealt with the question of Nyāya maintained there could be observed, to a higher or lesser degree, a close structural affinity of the Indian and the Aristotelian syllogism. The Naiyāyika,

* The article was first published in German: Part I: 'Z badań nad logiką indyjską I. (Studien zur indischen Logik. Der indische und der aristotelische Syllogismus)', Presented at the session on 28 June 1932. *Bulletin International de l'Académie Polonaise des Sciences et des Lettres, Classe de Philologie*, Kraków 1932 fasc. 4–6, pp. 98–102. Part II: 'Z badań nad logiką indyjską II. (Studien zur indischen Logik. Altindische Antizipationen der Aussagenlogik)'. *Bulletin International de l'Académie Polonaise des Sciences et des Lettres, Classe de Philologie*, Kraków 1933 fasc. 1–6, pp. 190–96. It was reprinted in: STANISŁAW SCHAYER: *O filozofowaniu Hindusów. Artykuły wybrane*. Edited by Marek Mejor. Polska Akademia Nauk, Komitet Nauk Orientalistycznych, PWN, Warszawa 1988. [= Mejor (1988) 410–421]. The German text was an enlarged and remodelled version of ST. SCHAYER's two communiqués in Polish: (I) 'Z badań nad logiką indyjską. I.' *Sprawozdania Polskiej Akademii Umiejętności*, Kraków 1932, 37, nr 6, pp. 32–33 [= Mejor (1988) 120–121], and (II) 'Z badań nad logiką indyjską. II. Indyjskie antycypacje rachunku zdań,' *Sprawozdania Polskiej Akademii Umiejętności*, Kraków 1933, 38, nr 2, pp. 19–22. [= Mejor (1988) 122–125]. Occasional insertions in the text in square brackets are important addenda taken from the Polish versions that are *not found* in German text. They are always followed by the page number of the first edition / page number of Mejor edition.—P.B.

The first comprehensive, and up to the present moment one of most fundamental works on Aristotelian syllogistics is the book by JAN ŁUKASIEWICZ: *Aristotle's Syllogistic from the Standpoint of Modern Formal Logic*, Oxford 1951. [Revised edition: Oxford 1957]. Łukasiewicz must have had a clear idea of Aristotelian and Stoic logic as early as in 1927, for most of the ideas incorporated much later in his book were presented at the Second Polish Philosophical Congress (Warszawa 1927) as well as in Łukasiewicz's highly critical review of Franz Weidauer's *Zur Syllogistik* (*Ruch Filozoficzny*, fasc. 11, 1928). The results of Łukasiewicz's research were widely known and discussed in philosophically oriented milieu in Poland and were known to Stanisław Schayer.—P.B.

[†] Paris 1923 [transl. into English: *Comparative Philosophy*, London 1926].—P.B.

says RADHAKRISHNAN in *Indian Philosophy*[†] (Vol. 2, p. 83), 'regarded Barbara as typical of all syllogistic reasoning.' Similar view is advocated by TH. STCHERBATSKY in *Buddhist Logic*[§] (Vol. 1, p. 26): 'In the last three [members], if we drop the example, we will have a *strictly* [italics—Schayer] Aristotelian syllogism, its first figure.' And likewise ATHALYE, *Tarka-saṅgraha*^{*}, p. 236b ff., 265 ff., as well as VIDYĀBHŪṢAṆA in *History of Indian Logic*[†], p. 497 ff. The present paper should very briefly prove why such a conception should be rejected.

1. The necessary prerequisite to be at all able to tackle the issue of similarity or difference between the Indian and the Aristotelian syllogism is the correct theoretical understanding of the Aristotelian syllogism. One will certainly not acquire this understanding from manuals of 'philosophical' logic, for instance, in ERDMANN and SIGWART. What Aristotelian logic really is—that it is not, contrary to the well-known claim expressed by Kant, a finished theory of logic but it rather represents only its fragment, i.e., an ancient form of the modern calculus of names; that not only empty terms but also no individual names (e.g., 'the mortal Socrates') whatsoever can be substituted for variables S, M and P; and that, eventually, the authentic syllogism, as it was formulated by Aristotle himself in *Analitica Priora* I, 4[‡], does not consist of three, but of *one* sentence which asserts the relation of implication between, on the one hand, two instances of inclusion: SaM and MaP, and, on the other, the inclusion: SaP—was more or less unknown to philosophers until recently. A 'reliable perspective' from which not only the achievements of Aristotle but also of the whole history of European and Oriental logic in general can be critically evaluated and dully appreciated was first created by modern mathematical logic (logistic), cf. for instance H. SCHOLZ: *Die Geschichte der Logik*, Berlin 1931 [reprinted: 1959—P.B.]. The comparison of *Nyāya* with the *Organon* can only contribute to a better understanding of the Indian controversy, provided our point of departure is not the traditionally caricatured, but



[†] SARVEPALLI RADHAKRISHNAN: *Indian Philosophy*, 2 Vols., London 1923, 1927.—P.B.

[§] THEODORE STCHERBATSKY: *Buddhist Logic*, Vol. I & II, Издательство Академии Наук СССР, Ленинград 1930. [First Indian Edition: Motilal Banarsidass, Delhi 1993].—P.B.

^{*} *Tarka-saṅgraha* edited with *Dīpikā* and Govardhana's *Nyāya-bodhinī*, by Y.V. ATHALYE and translated by M.R. BODAS, with English notes. Bombay Sanskrit and Prakrit Series 55, Bombay 1897, 1918, 1930. [Revised by PUSALKAR 1963].—P.B.

[†] SATISH CHANDRA VIDYĀBHŪṢAṆA: *History of Indian Logic*, Calcutta 1920. [Reprinted: Motilal Banarsidass, Delhi, 1988.].—P.B.

[‡] Aristotle: *Prior and Posterior Analytics*, a revised Text with Introduction and Commentary by W. D. ROSS, At the Clarendon Press, Oxford 1949; Book I, Ch. 4: 25b–26b.—P.B.

the authentic Aristotle, as he was accurately examined and demonstrated with full understanding by J. ŁUKASIEWICZ for the first time, cf. his *Elementy logiki matematycznej* [*Elements of Mathematical Logic*], Warszawa 1929, p. 15 ff.

2. As soon as this condition is met, a number of essential antitheses between the genuine Barbara figure and the Indian standard version will automatically be noticed.

a) The Indian syllogism is by no means a logical theorem, rather it is a combination of two inference rules, viz. of *upanaya* and *nigamana*. The *upanaya* rule corresponds to the modern rule of substitution, and allows the substitution of a concrete value = the *pakṣa* = 'this particular mountain here' for an indefinite *yatra yatra* in a universal proposition: *yatra yatra dhūmas, tatra tatra vahniḥ*. In this way, from the proposition $(x). \phi x \supset \psi x$ = 'for every x , if there is smoke in x , then there is fire in x ', we arrive at a proposition $\phi a \supset \psi a$ = 'if there is smoke in a , then there is fire in a '. This transformational formula is not explicitly stated in the Indian example, because Indian logic does not attach any importance to the completeness of proof; however, the words *tathā cāyam* indicate this step with sufficient clarity. [The first part of conclusion (in Indian terminology the statement of the so-called *pakṣa-dharmatā*) is tantamount to WHITEHEAD-RUSSELL's formula: *10.26: $(z). \phi z \supset \psi z: \phi x: \supset \psi x$. The second part corresponds to the Stoic *modus ponendo ponens*: 'If a fact ϕ occurs in place A , then a fact ψ occurs in place A ; a fact ϕ occurs in place A , so a fact ψ occurs in place A .' (p. 32/120)] The *nigamana* rule is equivalent to the modern rule of derivation and permits us to eliminate the *hetu* = ϕa , the truth of which has already been recognised, from the implication $\phi a \supset \psi a$, obtained with the help of *upanaya*, and to assert the truth of *sādhya* = ψa .

The difference between the logical theorem and the logical inference rule is of both fundamental and essential significance, cf. ŁUKASIEWICZ, *op. cit.*, p. 19 ff., and CARNAP, *Abriss der Logistik*[§], p. 10 ff. As soon as we decide, however, to disregard this difference in order to comprise the whole Indian syllogism in a single thesis, what we arrive at is the proposition, well-known from RUSSELL's theory of apparent variables: $(x). \phi x \supset \psi x: \phi a: \supset \psi a$ = 'if, for each and every value of the variable x , the propositional function ϕ implies the propositional function ψ , then the propositional function ϕ implies the propositional function ψ also in case of the value $x = a$.'

b) Thanks to the above analysis we consequently win an important perspective to grasp the precise meaning of the Indian technical terms. Thus, *pakṣa* is the individual variable a , which is substituted for x in ϕx and ψx . The condition for this



[§] RUDOLF CARNAP: *Abriss der Logistik, Schriften zur wissenschaftlichen Weltauffassung*, Vol. II, Springer, Wien 1929.—P.B.

operation is called *pakṣa-dharmatā* = *hetoh pakṣa-vṛttitvam*, i.e., 'the occurrence of the *hetu* in the *pakṣa*,' which can be rendered, to use our symbols, as follows: the fact that a = 'this particular mountain here' is a variable of the same propositional function ϕ which occurs as the implicans ϕx in the implication $\phi x \supset \psi x$. *Hetu* is the proposition ϕa , that has already been recognised to be true, whereas *sādhya* is the conclusion ψa drawn with the help of *nigamana*. It is evident beyond any doubt that the elements of the Indian proof, viz., *hetu*, *pakṣa* and *sādhya*, are by no means identical with the three terms of the Aristotelian syllogism.

c) The Aristotelian syllogism is composed exclusively of propositions of the form: SaP, SeP, SiP and SoP. The Indian syllogism in no way conforms with such a form of proposition: in addition to the formulation *yo yo dhūmavān, so so vahnimān*, Indian textbooks indiscriminately use the formulation *yatra yatra dhūmas, tatra tatra vahnih*. These two variants are not at all equivalent from the point of view of formal logic, inasmuch as they employ the word *asti*, that should be supplied in each case, either as a copula or in the sense of the verb 'exists', respectively. The structure of the sentence '*yatra yatra ...*' completely rules out any candid attempt to reduce the Indian syllogism to any form of either the genuine Aristotelian or the 'traditional' syllogism whatsoever.

d) Finally, there is another important difference: in the Aristotelian syllogism all the three terms S, M and P are general terms or, according to another view, class names, at any rate they are not individual names (cf. LUKASIEWICZ, *op. cit.*, p. 23, [and H. SCHOLZ, *Die Geschichte der Logik*, p. 39] (p. 33/121)). In contradistinction to this universal principle, in the Indian syllogism a particular thing, e.g., 'this particular mountain here,' may occur as the subject of an inferential formula (as *pakṣa*), in case of which Dignāga introduces an additional condition, not entirely understandable to us, namely that it has to be a particular thing that belongs to a *ny* class (cf. G. TUCCI, *The Nyāya-mukha**, p. 7). Accordingly, there are instances when the *sādhya* can be represented as SeP = 'S is an element of the class P'. That would correspond to the 'traditional' inference with the *terminus discretus sive singularis*, nonetheless, as far as the genuine Aristotle's syllogistics is concerned, such propositions as SeP and SaP certainly do not have the same value (cf. H. SCHOLZ, *op. cit.*, pp. 39, 68). In the area of European logic there have been attempts in recent years to define individual names as class names, viz., as names of classes with a single element, yet such an approach is hardly useful for the interpretation of Indian logic, insofar as it was rejected *expressis verbis* by the Indians themselves in the first place. In the famous verse from the *Kiraṇāvalī*, Udayana opens the list of six reasons that preclude the notion of class (*jāti-bādhaka*) with 'uniqueness of an individual



* GIUSEPPE TUCCI: *The Nyāya-mukha of Dignāga. The oldest Buddhist Text on Logic, after Chinese and Tibetan Materials*. Heidelberg 1930.—P.B.

thing': the cosmic ether exists solely in one copy and therefore possesses no *jāti* (cf. *Muktāvalī*, ed. *Haridās Sanskrit Grantha-malā*, p. 8, as well as STRAUSS[†], p. 6 and ATHALYE, p. 92).

3. If we try to summarise everything what has been said so far, it becomes clear that the Indian concept of inference can on no account be reconciled with the authentic Aristotelian syllogism, and only with much difficulty with the 'traditional' syllogistics. On the contrary, to do justice to the spirit of Indian logic and its potential of growth, we should regard it as a prescientific anticipation of some forms of inference known to modern logic (BERTRAND RUSSELL's theory of apparent variables, DAVID HILBERT's functional calculus of the first order). Indology must free itself from the false conviction that the Aristotelian or the traditional syllogistics is a suitable basis to investigate issues connected with *Nyāya*. [Structural distinctiveness demonstrated so far does not obviously exclude the possibility of formulating a conclusion after the manner of, and equivalent in its contents to the Barbara mood: 'everything smoky is fiery, this mountain here is smoky, therefore this mountain here is fiery.' The history of logic, however, is not concerned with the 'contents,' but only and exclusively with the 'form'. The prevalent 'Barbarisation' of the Indian syllogism is henceforth an unacceptable method of scientific analysis and should once and for ever disappear from European monographs. (p. 33/121)]

II. Ancient Indian anticipations of sentential logic. To the most significant achievements of modern scientific logic belongs the differentiation between the calculus of names and the sentential calculus. What the differentiation implies should be easily understood even to a layman: only names can be substituted for all values in case of the calculus of names, whereas the sentential calculus permits exclusively the substitution of sentences. Both branches of logic are exemplified in Greek philosophy. In Aristotle's syllogistics we can immediately recognise the calculus of names, but one of the most extraordinary discoveries, for which we are indebted to JAN LUKASIEWICZ, is that the Stoic dialectics represents an ancient form of the sentential calculus. It is superfluous to say that this clarification laid foundations for critical historical study of Occidental logic (alas, PRANTL's famous work[‡] does not deserve this title any longer). For an Indologist who is interested in similar problems in the context of Indian culture it would be natural to pose a question whether we could find some elements of a sentential theory in the *Nyāya*



[†] *Viśvanātha Nyāyasiddhānta Pañcānana*, transl. into German by OTTO STRAUSS, *Abhandlungen für die Kunde des Morgenlandes* 16,1, 1922.—P.B.

[‡] CARL PRANTL: *Geschichte der Logik im Abendlande*, Vols. I–IV, 1855–70. [Reprinted: 1925, 1955].—P.B.

literature as well. It is highly improbable to encounter a logical theory in India that would closely resemble Chrysippus' dialectics, first of all, because Indian thinkers never reached the level of the Hellenistic logic and, secondly, because the 'nominal style' typical of Indian languages as well as the possibility to express any sentence through abstract forms ending in *-tva* and *-tā*¹ made the differentiation between 'sentences' and 'names' particularly difficult. In any case, rudiments and prescientific anticipations of sentential logic can be found in India as well. A few illustrations will be briefly discussed in subsequent paragraphs.

1. The oldest Indian text in the case of which we have good reasons to suppose that it betrays acquaintance of its author with a few theorems of the sentential calculus is *Kathā-vatthu*. The treatise discusses heretical theses by following a stereotypical pattern, that was described by Shwe Zan Aung, *Points of Controversy*, p. xlviii, as follows: 'If *A* is *B*, then *C* is *D*; but *C* is not *D*, therefore *A* is not *B*'. As we can see, the above formula coincides with the Stoic *modus tollendo tollens*, although Shwe Zan Aung does not articulate it, and besides, by unnecessary introduction of individual variables, he creates a basically false impression that what we are confronted here with is a relation between the four terms *A*, *B*, *C* and *D*. As a matter of fact, the elements that are applied in the logic of *Kathā-vatthu* are definitely not individual variables but propositional variables, and, consequently, the whole discussion proceeds according to the following pattern:

'Theravādin: Is it true that *p*?

The Opponent: Yes, it is true $\vdash p/$.

Theravādin: Is it true that *q*?

The Opponent: No, it is not true $\neg q/$.

Theravādin: So, acknowledge the defeat: (1) if it is true that *p*, then it is true that $q \vdash p \supset q/$, (2) the thesis that *p* is true, but *q* is not true, is false $\neg(p \cdot \neg q)/$, (3) if it is not true that *q*, then it is not true that $p \neg q \supset \neg p/$, (4) the thesis that *p* is true, but *q* is not true, is not true $\neg(p \cdot \neg q)/$.

The author of *Kathā-vatthu* is content with these four statements and considers it superfluous to demonstrate the complete inference *modo tollente* [*modus tollendo tollens* (p. 19/122)]: $p \supset q \cdot \neg q \supset \neg p$. Likewise he does not say *expressis verbis*, although he must have had it in mind, that the theses $p \supset q$, $\neg(p \cdot \neg q)$ and $\neg q \supset \neg p$ should be regarded as equivalent. The equivalence $p \supset q \equiv \neg(p \cdot \neg q)$ is well known to every logician as 'the definition of implication', whereas the equivalence $p \supset q \equiv \neg q \supset \neg p$ is the important law of transposition [See KOTARBIŃSKI, *Elementy teorii poznania, logiki formalnej i metodologii nauk*,

¹ E.g., *śabdasya nityatvaṃ* can easily be taken as the 'name' of an 'ideal object': 'permanence of the sound;' still, it is equivalent to the 'sentence', viz., to the 'fact that...'.



pp. 177, 185* (p. 19/122)]. I am convinced that we can, with all probability, take it for granted that the author of *Kathā-vatthu* knew these two laws of logic.

2) Some more interesting details relevant to our subject are contained in Buddhaghosa's commentary [to *Kathā-vatthu*]. Buddhaghosa calls the inference from the premiss $p \supset q$ 'direct' [inference] (*anuloma*), and the inference from the premiss $\sim q \supset \sim p$ 'inverse' [inference (p. 19/122)] (*paṭiloma*). Further, he paraphrases the 'direct' schema in the following way: 'Since in case of the accepted thesis 1 you do not accept thesis 2, but thesis 2, which is not accepted, cannot be linked (*na saṁdhiyati*) to the [accepted thesis] 1, therefore—since you are confronted with an error—you have to admit this.' The expression *na saṁdhiyati* cannot but mean here the logical 'incompatibility' (inconsistency). Hence, Buddhaghosa's explanation can be reduced to a theorem that would correspond to the following formula: $p/\sim q.\sim q. \supset .\sim p =$ 'if p is inconsistent with q , and if q is not true, then p is not true.' At the same time it should be emphasized that the indication of inconsistency in Buddhaghosa's commentary is supposed to rephrase the theses $p \supset q$, $\sim q \supset \sim p$ and $\sim(p.\sim q)$ occurring in the original main text. In other words, Buddhaghosa knew that the three theses: ' p is inconsistent with not- q ,' 'if p , then q ' and 'it is not true that p and not- q ,' are equivalent.

In addition to this, Buddhaghosa's explanation contains some terminological material that clearly shows apagogic and hypothetical character of the logic of *Kathā-vatthu*. Thus, $p = \textit{thāpanā}$ is the opponent's thesis, which is taken by the Theravādin as an *apodosis*[†] of a conditional period. This proposition p , assumed entirely hypothetically, implies a conclusion $q = \textit{pāpanā}$, which is inadmissible to the opponent. In case the inadmissibility is proved, what follows is the 'imposition' (*āropanā*) of defeat in accordance with the *modus tollendo tollens* or an equivalent formulation.

3. The apagogic syllogism is a conventional instrument of academic discussion (*vāda*). It allows us to deduce, from the opponent's thesis, a consequence which demonstrates the falsehood of the consequence, and to infer the falsehood of the thesis itself from the falsehood of the consequence. In the age of scholastic synthesis this type of indirect proof was given the designation of *tarka*, with an explicit



* The pages 177, 185 correspond to pp. 179, 189 of the 2nd revised edition: *Ossolineum*, 1961.—P.B.

[†] Polish text reads: 'antecedent of a conditional clause.' In rhetoric, ἀπόδοσις (Lat., *finis, consequens*) is the consequent of a complex rhetoric period (περίοδος; Lat., *periodus, cursus, numerus*) with an antecedent (πρόθεσις; Lat., *principium, antecedens*). Aristotle uses the term ἀπόδοσις in the sense of 'definition, explanation, generalisation', viz., a kind of a consequent derived from observation of individual cases, cf. Τόπικα 108b 9, 20 = *Aristotelis Topica et Sophistici Elenchi*, recensuit brevique adnotatione critica instruxit W. D. ROSS, Oxford University Press, 1958.—P.B.

emphasis that the role of *tarka* is not merely negative criticism (*vitaṇḍā*, *dūṣaṇa*) at the opponent, but a positive corroboration of one's own thesis. As a matter of fact, it is only possible when one admits legitimacy of the transition from the thesis: 'it is not true that *S* is *P*,' to the thesis: 'it is true that *S* is not-*P*.' This problem gave a stimulus to an interesting [and lively (p. 20/123)] debate in India.

Its starting point is marked by the contradiction levied by the Mādhyamika against the method of indirect proof. The sole absolute norm of cognition is the mystic intuition through which the saints cognise the unreality of all distinct entities (*sarva-bhāva-svabhāva-sūnyatā*). Discursive thinking is by definition a false way of thinking engrossed in error (*vikalpa* = *avidyā*). This rejection of realistic logic does not thereby exclude a possibility of a purely negative dialectics which would reduce all theses *ad absurdum* and which would emancipate the mind from the illusion of conceptual constructions. The dialectics rejects the transition from $\sim(S \text{ is } P)$ to $(S \text{ is } \sim P)$, because it denies the reality of all subjects [or separate entities (p. 20/123)] that might possibly be predicated of. One can neither predicate of the son of a barren woman that he is black nor that he is not black; and because, according to the Mādhyamika teaching, all objects are unreal in the same way as 'the son of a barren woman,' all thinking and judgements are eventually reducible to the fourfold negation [tetralemma] (*catuskoṭi*): [it is not true that *S* is *P*, it is not true that *S* is not-*P*, it is not true that *S* is *P* and not-*P*, it is not true that *S* is neither *P* and not-*P* (p. 20/123)] = $\sim p$ and $\sim(\sim p)$ and $\sim(p.\sim p)$ and $\sim[\sim p.\sim(\sim p)]$. In short, true are only purely negative predications of the form: 'it is not true that *T*', viz., predications that simply negate the thesis *T*, without implying the contrary thesis $\sim T$. [At the same time the Mādhyamika emphatically declares that he confines himself merely to negating rival theses, and that such negations do not entail any acceptance on his part of the contrary thesis. (p. 20/123)] The Mādhyamika attaches much value to this peculiarity of negative dialectics, cf. *Vigraha-vyāvartanī*[†], verse 30; *Prasanna-padā*[§], p. 13, 16 ff. Indeed, the issue reflects a sharp contrast between the metalogic [= negative dialectics (p. 20/123)] of the Mādhyamika and the method of *tarka*.

4. The theory of purely negative prepositions possesses to a certain degree its own terminology. The rival thesis which is hypothetically admitted by the dialectician is called *prasaṅga-vākya*, lit., 'the statement of eventuality'. The demonstration of the falsehood of the rival thesis through reduction to an 'undesired consequence' is designated 'the proof of eventuality' = *prasaṅga-*



[†] *Vigrahavyāvartanī* by Nāgārjuna, Translation from the Chinese and Tibetan Text, in: GIUSEPPE TUCCI: *Pre-Diñnāga Buddhist Texts on Logic from Chinese Sources*. Gaekwad's Oriental Series No. XLIX, Oriental Institute, Baroda 1929.—P.B.

[§] Candrakīrti: *Prasanna-padā Madhyamaka-vṛtti*, ed. by L. DE LA VALLÉE POUSSIN, *Bibliotheca Buddhica* Vol. IV, St. Petersburg 1903–13.—P.B.

sādhana. It is easily recognisable that the whole proof follows the schema of *modus tollendo tollens*.

The consequence which is undesired for the opponent and which ensues from a 'statement of eventuality' does not necessarily have to be pure logical absurdity. Rather, it can be a meaningful thesis which seems for some reason or another inadmissible to the opponent. The Indian dialectics distinguishes here a peculiar case known as *ati-prasaṅga* = the 'hyper-eventuality' whose 'undesired consequence' is based on the fact that it is identical with the 'possibility of everything' (*sarva-sambhava*). [The meaning of this term is explained by Vācaspatimiśra, *Nyāya-kaṇikā*, pp. 27 and 28 (cf. STCHERBATSKY, *Buddhist Logic*, Vol. 2, p. 239, n. 1): *ati-prasaṅga* = *sarva-sambhava* = 'entailment of everything'. (p. 21/124)]. The formal structure of such proofs is not absolutely clear, but one would immediately associate it with some kind of anticipation of 'the characteristic of falsehood,'* already known to Christian scholastics in Middle Ages, i.e., with more or less the following formula: 'if p and not- p , thus if p , then q ' / $p \sim p: \supset p \supset q$ / = from two contradictory propositions ensues any arbitrary proposition. [Thus, our case represents much more interesting and less simple reasoning: if the thesis T implies its own negation not- T , then any other thesis T' is implied by thesis T . (p. 21/124)] In this case, there is still another and less interesting interpretation possible², which I would like to delineate here briefly: let a 'restrictive condition' N (*niyamaka*) hold good, as a consequence of which ϕx yields a true proposition only for certain values of x . Then, any arbitrary thesis T is propounded with the implication that ϕx yields a true proposition also for such values of x which do not satisfy the condition N . Both the premisses: (1) ϕx holds good only for such x -s which satisfy the condition N , and (2) ϕx holds good also for such values of x -s which do not satisfy the condition N , entail the 'undesired consequence' of *ati-prasaṅga*, viz., the predicament of *sarva-sambhava* = *sarveṣāṃ*, *sarvatra*, *sarvadā sambhava* = the thesis that ϕx yields truth for everything, everywhere and always. STCHERBATSKY explains the term *ati-prasaṅga* as 'a generalized *deductio* (sic!) *ad absurdum*' (*Nirvāṇa*[†], p. 235), and as 'giving up every uniformity' as well as 'possibility of everything' (*Buddhist Logic*, Vol. 2, p. 239); cf. also, SYLVAIN LÉVI's rendering



* Viz., $\sim p. \supset p \supset q$.—P.B.

² Subsequent observations supplement my remarks in the *Sprawozdania XXXVIII.2*, p. 21. [= ST. SCHAYER: *Z badań and logikę indyjską. II. Indyjskie antycypacje rachunku zdań* in *Sprawozdania Polskiej Akademii Umiejętności*, Kraków 1933, 38, nr 2, pp. 19–22. = Mejer (1988) 122–125—P.B.].

[†] THEODORE STCHERBATSKY: *The Conception of Buddhist Nirvāṇa (With Sanskrit Text of Madhyamaka-Kārikā)*, Leningrad 1927 Reprinted: Motilal Banarsidass, Second Revised and Enlarged Edition, Delhi 1977 [First Indian Edition: 1968; Appendix: 'Technical Terms', p. 28.].—P.B.

as 'faute de raisonnement par dépassement d'extension' (*La Trentaine*[§], p. 66), and H. JACOBI's translation 'sonst wäre eben alles möglich' (*Trīmśikā-vijñāpti*[‡], p. 6). Clearly, the problem of *ati-prasaṅga* deserves closer investigation.

Not all Buddhists were so radically opposed to *tarka* as the Mādhyamika. In other words, not all of them subscribed to the teaching of absolute and universal 'unpredicability' (*avācyaṭā*, *anirvacanīyatva*). That was connected with their metaphysical fundamental tenets.

As it is widely known, the Sarvāstivādin and the Theravādin postulated the reality of simple, elementary substances, or *dharma*s, which manifest themselves in single moments of reality and thereby generate the empirical illusion of the world of things and people. The *dharma*s as real substances are indeed 'predicable,' [(*Abhidharma* provides their positive definitions) (p. 21/124)], that is to say, they possess their own *sva-lakṣaṇa*s, viz., their individual intrinsic nature, or—according to the Sautrāntika 'dynamic' view of substance—they are endowed with their own individual momentary 'effective mode', their definable *artha-kriyā-kāritva*. On the other hand, illusory, unreal objects, or false hypostases such as 'the world', 'the soul,' etc., are 'unpredicable'. In this way the paradox of 'unmanifested points' (*avyākṛta-vastu*) is solved at the same time.

Of different opinion is the Pudgalavādin. He maintains that, in addition to the predicable *dharma*s, there is an unpredicable, yet real Self, called [*ātman* or (p. 21/124)] *pudgala*, a kind of *sui generis* transcendent entity that—although it manifests itself empirically due to its dependence on psycho-physical elements (*skandha*)—is essentially not definable in view of both its identity with and difference from these elements.

The teaching of simultaneous reality and unpredicability of the *pudgala* is vehemently criticised by all remaining Buddhist schools, e.g., by Kamalaśīla in his *Pañjika* to *Tattva-saṃgraha*, cf. my translation in *Rocznik Orientalistyczny*, 1934, VIII, p. 68-93 [= Mejer (1988) 433-458—P.B.]. Kamalaśīla's criticism is noteworthy because it allows us to clearly comprehend the background of the controversy: the reducibility of propositional negation to the predicative negation. Kamalaśīla's argumentation is generally as follows: if the *pudgala* is a real object, then the negation of the assertion 'the *pudgala* is identical = is not different from the *skandhas*,' must *implicite* entail the affirmation: 'the *pudgala* is not identical = is different from the *skandhas*'. The latter thesis is, however, a positive statement



[§] *Deux traités de Vasubandhu, Viṃśatikā (La Vingtaine) et Trīmśikā (La Trentaine), 1 Partie – Texte, Sthiramati's Bhāṣya*. Ed. by SYLVAIN LÉVI, Bibliothèque de l'École des Hautes Études, Paris 1925.—P.B.

[‡] HERMANN JACOBI: 'Trīmśikāvijñāpti des Vasubandhu mit Bhāṣya des ācārya Sthiramati,' *Beiträge zur Indischen Sprachwissenschaft und Religionsgeschichte* 7, Stuttgart 1932: 1-64.—P.B.

about the *pudgala* ('personality'); therefore, if the *pudgala* is a real object, it cannot at the same time be unpredicable. And vice versa, if the *pudgala* is unpredicable, in other words, if it is not true that it is identical with the *skandhas*, and it is not true that it is not different from the *skandhas*, [and it is not true that it is and it is not different from the *skandhas* (p. 22/125),] etc., that is only possible if the *pudgala* is no object at all³ but merely a fiction such as a hare's horn, the son of a barren woman, etc.

The opinion that the legitimacy of the transition from the propositional negation to the predicative negation depends on the reality of the subject is a significant logical discovery. [It was an interesting and noteworthy anticipation of the corresponding thesis in LEŚNIEWSKI's 'ontology' $\Pi(A, B) \{A \text{ est } B' = [\Sigma x(A \text{ est } x) \cdot (A \text{ est } B)]\}$ (cf. Kotarbiński, *op. cit.*, p. 231[§]. (p. 22/125)] The same problem attracted the attention of the Greeks as well. Aristotle (*Analitica Priora* I, 40*) examines the question whether the expressions τὸ μὴ εἶναι τοῦδ' and εἶναι μὴ τοῦτο[†] have the same meaning; likewise, the Stoic logic took heed of the equivocality of the negation. How vital this problem is for modern logic can be assessed from KOTARBIŃSKI's *Elements of Theory of Knowledge, Formal Logic and Methodology of Sciences*, p. 223, 231 ff.[‡]. It is truly remarkable for Indian thought that it endeavoured to raise and solve this *par excellence* formal logical issue in close dependence on metaphysical problems. Thus, the correlation between logic and metaphysics was in India no less profound than in Greece.



³ Also Candrakīrti is of the opinion that 'the unpredicable cannot be anything real.' Cf. *Madhyamakāvatāra*, p. 269: *brjod-du-med-pa-la rdzas-su yod-pa-ñid mi-srid-pa*. [*Madhyamakāvatāra and Bhāṣya of Candrakīrti*, ed. by L. DE LA VALLÉE POUSSIN, *Bibliotheca Buddhica* 9, 1912.—P.B.]

[§] *Elementy teorii poznania, logiki formalnej i metodologii nauk*, 2nd revised edition: Ossolineum, 1961: p. 232, *Defintion* 3.—P.B.

* W. D. ROSS' edition: *Αναλυτικά Πρότερα* 51b–52b (Ch. I, 46).—P.B.

[†] 'Not to be this' and 'to be not this' respectively.—P.B.

[‡] *Elementy teorii poznania, logiki formalnej i metodologii nauk*, 2nd revised edition: Ossolineum, 1961: pp. 232–3, 242–3.—P.B.

On the Method of the *Nyāya* Research*

STANISŁAW SCHAYER

Translated from the German original by Piotr Balcerowicz

A number of senior and junior researchers have been engaged in the enquiry into the history of Indian logic in recent times. To them we owe the fact that we begin nowadays to discern historical connections and gradually appreciate individual contributions of Indian thinkers, especially of the great Buddhist masters Vasubandhu, Asaṅga, Dīnāga and Dharmakīrti. Chinese and Tibetan translations have been made available and new light has been shed on the much debated question concerning the Buddhist and Brahmanical logic.¹ This

* The German original was published under the title 'Über die Methode der Nyāya-Forschung'; in: O. Stein and W. Gambert (eds.): *Festschrift für Moritz Winternitz*, Leipzig 1933, pp. 247–257. It was reprinted in: STANISŁAW SCHAYER: *O filozofowaniu Hindusów. Artykuły wybrane*. Edited by Marek Mejer. Polska Akademia Nauk, Komitet Nauk Orientalistycznych, PWN, Warszawa 1988. [= Mejer (1988) 422–432]. All remarks in square brackets throughout the article are the translator's additions.—P.B.

¹ I mention only the most important works published in the years 1926–1932: V. BHATTACHARYA: Introduction to the Edition of *Nyāya-praveśa*, Tibetan Text, Baroda 1927; The *Nyāya-praveśa* of Dīnāga, IHQ. III (1927). A. B. DHURVA: Introduction to the Edition of *Nyāya-praveśa*, Sanskrit Text with Commentaries, Baroda 1930. — H.R.R. IYENGAR: *Vāda-vidhi*, JBORS. (1926); Kumāṛila and Dīnāga, IHQ. III (1927); Vasubandhu and the *Vāda-vidhi*, IHQ. V (1929). — H. JACOBI: Über das Alter der *Manimekhalai*, ZII. V (1927). — A.B. KEITH: 'Vasubandhu and the Vāda-vidhi,' IHQ. IV (1928); 'The Authorship of the Nyāyapraveśa,' IHQ. IV (1928). — N.D. MIRONOW: 'Dignāga's Nyāyapraveśa and Haribhadra's Commentary on it,' Festgabe für Richard Garbe, Erlangen 1927; Nyāyapraveśa of Dīnāga I. Sanskrit Text edited and reconstructed, T'oung Pao, Leiden 1931. — H.N. RANDLE: *Fragments from Dīnāga*, London 1931; *Indian Logic in the Early Schools*, Bombay 1931. — W. RUBEN: 'Zur Frühgeschichte der indischen Philosophie,' Festgabe Hermann Jacobi, Bonn 1926; *Die Nyāyasūtra*, Leipzig 1928. — St. STASIAK: 'Fallacies and their Classification,' RO. VI (1929). — Th. STCHERBATSKY: *Buddhist Logic*, Vol. I, 1932, Vol. II, 1930 (*Bibliotheca Buddhica* XXVI). [Vol. I & II, Издательство Академии Наук СССР, Ленинград 1930. First Indian Edition: Motilal Banarsidass, Delhi 1993.—P.B.] — M.I. TUBJANSKI: 'On the Authorship of Nyāyapraveśa,' Bull. de l'Acad. des Sc. de l'URSS, 1926. — G. TUCCI: 'The Vāda-vidhi,' IHQ. IV (1928); 'Buddhist Logic Before Dīnāga,' JRAS. 1929; *Pre-Dīnāga Buddhist Texts on Logic from Chinese Sources*, Baroda 1929; *The Nyāyamukha of Dīnāga*, Heidelberg 1930; 'On Some Aspects of the Doctrines of Maitreya-nātha and Asaṅga,' Calcutta 1930. — H. UH: 'Indo Tetsugaku shi' (History of Indian Philosophy), Vol. V, p. 387 ff.; 'Seshin no inmosetsu' (The Logic of Vasubandhu), *Journal of the Taisho University* (1930).

gratifying enrichment of our philological and historical knowledge does not, however, correspond to the simultaneous growth of our theoretical knowledge. We still do not have any satisfactory picture of Indian theories of inference, and what one can find in accessible publications on the subject of Indian logic is either completely unclear and imprecise or directly false and misleading. There can be no doubt as to what the reasons of this disappointing situation are. It is basically due to the fact that the Indologists who have so far been dealing with the formal logical problems of *Nyāya* are not adequately familiar with European logic. Even the works of STCHERBATSKY cannot be acquitted of guilt. It suffices to look up the indices of names to both volumes of the monumental *Buddhist Logic* to be amazed at the truly rare erudition and knowledge of philosophical literature, unusual for an Indologist; at the same time, however, one cannot but notice that exclusively philosophers are quoted as representatives of Occidental logic. Such 'philosophical' logic as it was cultivated by ERDMANN, LOTZE, COHEN, SIGWART, etc., can hardly be considered nowadays a suitable basis for a critical evaluation of Indian *Nyāya*. In last more than fifty years, strictly scientific logic has been developed that legitimately deserves such a designation; it is the symbolic (mathematical) logic, that was anticipated by LEIBNIZ, paved the way for by BOOLE and SCHRÖDER, and validated by FREGE and RUSSELL.² It is equally impossible—in the same sense and for the same reason—to conceive of historical research of Indian logic without any knowledge of rudiments of this symbolic logic as the history of Indian mathematics is unthinkable without any positive knowledge of modern mathematics, or the history of Indian linguistics without any positive knowledge of modern linguistics. The precursory merits of earlier scholars such as ATHALYE, JACOBI, SUALI, etc., associated with the study of *Nyāya* are beyond any criticism, and nothing is as far from my intentions as the wish to depreciate the value of heretofore achievements as unsuccessful and worthless. Every generation has its own goals to accomplish: after the industry and scholarship of pre-eminent philologists have disclosed sources for the study of the history of formal logic in India and made provisional orientation possible, it is now time to approach *Nyāya* texts with professional logical—and not merely with philosophical—competence.³

Thus, the aim of the subsequent paragraphs is to provide a concise justification of the above postulate.

² Cf. esp. H. SCHOLZ: *Geschichte der Logik*, Berlin 1931 (Geschichte der Philosophie in Längsschnitten, Heft 4).

³ As regards this, I would like to draw the reader's attention to JAN ŁUKASIEWICZ's observation in the appendix to his work 'Philosophische Bemerkungen zu mehrwertigen Systemen des Aussagenkalküls,' *Comptes rendus des séances de la Société des Sciences et des Lettres de Varsovie* XXIII (1930) Cl. III, p. 51 ff. [Reprinted in: JAN ŁUKASIEWICZ: *Z zagadnień logiki i filozofii*, PWN, Warszawa 1961.—P.B.].



In order to prevent any possible misunderstanding, I would like, at the very outset, to clarify in what sense and to what degree the knowledge of symbolic logic can contribute to a deeper and better understanding of Indian theory of inference. In the first place, it should be emphasised that only a part of the issues debated in the *Nyāya-sāstra*⁴, viz., the theory of *anumāna* [inference], belongs to the scope of logic in the modern sense, whereas all the remaining topics such as the theory of *pramāṇas* [norm of cognition], the examination of *pratyakṣa* [perception], the problem of *jāti* [the class] and *sāmānya* [the universal], the question concerning the relation between the word and the object, etc., pertain partly to psychology, partly to epistemology and metaphysics, and finally to semantics. Formal logic has directly nothing to do with all these topics and leaves them freely to philosophers. However, the theory of *anumāna* as well—despite its crucial differentiation between *svārtha-anumāna* [the inference for oneself], as the internal process of reasoning, and *parārtha-anumāna* [the inference for others], as the inference ‘for others’ formulated verbally—is not so sharply, as logic demands, distinguished from epistemological and psychological speculations. That can easily be explained away by the fact that the preoccupation of Indian authors with the problem of the theory of inference is not primarily formal logical. The objective they aim at is to derive true conclusions from true premises, and that is why the *prasiddhatva* [recognition] of *pratiñā* [the thesis] is an obvious precondition of Indian syllogistics. At the same time, it demands that syllogism should contain the necessary minimum in order to convince the hearer of the correctness of the inference. In case of amateurs⁵, all tree terms, viz., *pakṣa*, *hetu* and *dṛṣṭānta* should be stated, whereas for experts a single *hetu* is enough. No importance is attached to the logical completeness of proof. Even in the period of final synthesis, so far as we can assess now, Indian authors were not aware of the fact that it is possible to investigate purely structural relations between logical formulas with constants and variables, without any concern whatsoever about the truth or falsehood of propositions derivable from these formulas by substitution of particular values for the variables.

Another difficulty which hinders any strictly formal analysis of the theory of *anumāna* is connected with the phenomenon that in Indian logic its laws were formulated not with the help of symbolic language, but were either paraphrased with *yo*, *yatra*, *vidhi*, *vacana*, *artha*, *vastu*, etc., or expressed in paradigm illustrations. The shortcoming of both these methods of description as compared to the symbolic representation with letters, prevalent since the times of Aristotle, is that they do not reveal the structure of laws of logic very clearly and leave much room for various interpretations. When Nāgārjuna (*Kārikā* XIV, 5b)

⁴ Cf. STCHERBATSKY, *op. cit.*, p. 1.

⁵ Cf. *Nyāya-praveśa-vṛtti-pañjikā*, p. 43, lines 21–22: *avyutpanna-vineya-gaṇam adhikṛtya samastānām sādhanatvam*.



propounds a thesis: *yat-pratītya ca yat, tasmād anyan nōpapadyate* = 'what is dependent on what, with respect to this it cannot be anything else,' it is a perspicuous paraphrase of the symbolical formula: $(x,y).xRy. \supset \sim(x \neq y)$ = 'For all values of the variables x and y , if x stands in relation R to y , then it is false that x and y are not identical with each other.' Such lucid formulations as the one quoted above, however, are exceptional, and it is enough to translate the verses 340–342 of *Tattva-saṁgraha*⁶ to see for oneself how high is the degree of possible ambiguity and intricacy of such a 'periphrastic' method of description. The ambiguity of paradigm illustration is of different kind. One might have an impression that basically it is irrelevant, if in the Aristotelian syllogism we say, for instance, 'all people are mortal,' instead of τὸ Α παντὶ τῷ Β ὑπάρχει*. We can safely concede that, provided that we exactly know what should be taken as a constant and what should be taken as a variable in the proposition 'all people are mortal.' The formula τὸ Α παντὶ τῷ Β ὑπάρχει teaches us that it concerns the relation of inclusion between the class A and the class B, and that is why we know that in the proposition 'all people are mortal,' 'people' and 'mortal' are variables. In Indian syllogistics the relations are definitely not so obvious, and it is not easy to decide, when we have only philological instruments at our disposal, whether in the paradigm illustration of the fire on the mountain the variables are 'the mountain,' 'the smoke' and 'the fire', or rather propositions: 'wherever there is smoke,' 'wherever there is fire' and 'there is smoke on the mountain.' When it comes to this, Indian authors leave us in the lurch, inasmuch as they themselves furnish us generally with various interpretations as equally possible⁷ and, as a rule, they do not distinguish with sufficient clarity between an object and a proposition about an object.

If we try to summarise everything what has been said so far, it becomes evident beyond any doubt that we should not presuppose the same level of abstract formal thinking in India as in Greece. The approach to formal logical problems in *Nyāya* texts never went beyond the prescientific stage of development, and no Indian



⁶ Cf. ST. SCHAYER: 'Kamalaśīlas Kritik des Pudgalavāda,' *Rocznik Orientalistyczny* VIII (1932), p. 75 [mistaken for p. 76—P.B.]. [= Mejer (1988) 433–458, p. 441—P.B.].

* 'A is predicated of every B,' in *Ἀναλυτικά Πρότερα* 25b, Ch. 4 (Aristotle: *Prior and Posterior Analytics*, a revised Text with Introduction and Commentary by W. D. ROSS, At the Clarendon Press, Oxford 1949).—P.B.

⁷ According to Diñnāga (Haribhadra) *viśaya* [the object] of *sādhana* [a proof] is *dharma-viśiṣṭo dharmin* [property-possessor characterised by a property]. Dharmakīrti admits three interpretations: (a) *dharmin* [property-possessor], (b) *dharmin saha dharmena* [property-possessor together with the property], (c) *dharma* [property]. Cf. *Nyāya-bindu*, p. 20 [*Nyāya-bindu-ṭīkā of Dharmottara with Nyāya-bindu of Dharmakīrti*. Ed. by TH. STCHERBATSKY, BB 7. Reprint: Biblio Verlag, Osnabrück 1970—P.B.]; Th. STCHERBATSKY, *op. cit.*, p. 235, and Th. STCHERBATSKY: Vol. II, p. 133.



theory—in contradistinction to Aristotle's syllogistics⁸—can be represented in strictly formal manner either as an independent system as such or as a subdivision of another, more comprehensive system.

Given the above provides an answer to the question what the *Nyāya* research should not expect from the knowledge of modern logic, we are obliged now to estimate positive weight of this knowledge. In a few words, it consists in the fact that (1) we get rid of false suggestions of traditional, philosophical logic, and (2) we acquire an objective, strictly scientific standard of a critical evaluation of Indian achievements.

In the first place, the following remark should be made: according to the well-known observation of KANT in 'The Preface to the Second Edition' of *the Critique [of Pure Reason]*^{*}, the traditional logic is a kind of science that 'until now has been unable to make a step forward, and therefore, to all appearances, it seems to be finished and complete.' This opinion, which has recently been referred to also by a distinguished logician and at the same time prominent expert in the ancient logic,⁹ is an evidence of a great authority of the author of the *Organon*, but at the same time of unsatisfactoriness of formal logical scholarship of the philosophers of modern times. Indeed, what KANT and his successors thought to be Aristotelian logic was merely a caricatured Pseudo-Aristotle¹⁰. Even the best experts in the history of logic, headed by PRANTL, were more or less unaware of the fact that the genuine syllogism consists of one conditional sentence, not of two premisses connected with the conclusion with the word 'therefore';¹¹ that in the genuine syllogism only general terms, and no individual

⁸ On formalised and axiomatised interpretations of Aristotle's syllogistics cf. esp.: KAZIMIERZ AJDUKIEWICZ: 'Założenia logiki tradycyjnej,' *Przegląd Filozoficzny* (1927); DAVID HILBERT and WILHELM ACKERMANN: *Grundzüge der theoretischen Logik*, Springer, Berlin 1928; JAN ŁUKASIEWICZ: *Elementy logiki matematycznej*, Komisja Wydawnicza Koła Matematyczno-Fizycznego Sluchaczów Uniwersytetu Warszawskiego, Vol. 18, Warszawa 1929.

^{*} Immanuel Kant: *Kritik der Reinen Vernunft*. 1787: Zweite, hin und wieder verbesserte Auflage, p. 7 = *Werke in sechs Bänder*, Band 2, Könnemann, Köln 1995, p. 25.—P.B.

⁹ ŁUKASIEWICZ: *Elementy logiki matematycznej*, p. 16.

¹⁰ Notably failed was KANT's attempt to reduce the syllogism to the principle: *nota notae est nota rei ipsius*.

¹¹ The difference is of crucial significance. The genuine Aristotelian syllogism: εἰ γὰρ τὸ Α κατὰ παντὸς τοῦ Β, καὶ τὸ Β κατὰ παντὸς τοῦ Γ, ἀνάγκη τὸ Α κατὰ παντὸς τοῦ Γ κατηγορεῖσθαι ['Because if P is predicated of every R, and every R is predicated of every S, then P must be predicated of every S.'], is a formal logical theorem, the truth of which is irrespective of particular values of A, B and Γ. As opposed to this, the traditional syllogism with two premisses and a conclusion is a kind of 'inference rule,' which decrees that, as soon as one accepts the premisses in the given form, he is justified in accepting the conclusion of the given form. 'To accept' and to 'be justified' are extra-logical, symbolically inexpressible terms. They do not occur in the genuine syllogism at all.



names such as 'Socrates', can be inserted in place of the subject;¹² and that, finally, Aristotelian logic was not a universal and finished theory but—without any intention to depreciate its high historical value—merely its meagre fragment. Under such circumstances one should not wonder that also Indologists saw the only possible interpretative basis of *Nyāya* problems in the traditionally misunderstood syllogistics, that they equated the terms *pakṣa*, *hetu* and *sādhya* with *terminus minor*, *medius* and *major*, and that they took the Indian syllogism as a whole as a stylistic variant of the Barbara mood. Modern logic clears up all these errors and misinterpretations. It informs us about large diversity of logical systems and makes us sensitive to such problems encountered in Indian texts which discerning researchers used to overlook; it also casts fresh light on problems which researchers did notice in the past but were unable to formulate correctly nor to understand. In order to be able to make discoveries in any field, one has to have, in the first place, an idea which eventualities are at all possible. Anyone who, out of many logical theories, knows only Aristotle's syllogistics in its traditional dress, will naturally recognise in the whole Indian tradition nothing but analogies to Aristotle. The knowledge of modern logic opens a new perspective. Immediately it becomes conspicuous that Indian texts anticipate a range of theses which in part have no relevance to Aristotle but rather foreshadow Stoic¹³ dialectics and the sentential calculus. A critical evaluation of such intuitive anticipations is an important groundwork of a comprehensive history of logic.

Thus we have reached the second point of our reply. Logic is a specific science of accuracy and demands, analogous to its sister science, mathematics, that its history should be judged in keeping with an objective standard and be represented as the history of discoveries and of positive progress. Accordingly, in order to evaluate achievements of Indian authors as anticipations of scientific logic in a critical manner, what an Indologist needs is 'a reliable perspective' to which the history of Indian theories could relate to and from which they could be surveyed. Nowadays, it is beyond any doubt that this 'reliable perspective' can be provided exclusively by the modern, symbolic or mathematical logic, not by its traditional, philosophical counterpart. DEUSSEN's¹⁴ demand, who—referring to Aristotle, *De Coelo*, I. 10*—expects that a historian of philosophy should be a judge, instead of



¹² It was in the syllogistics of PETRUS RAMUS for that first time that a *terminus discretus sive singularis* could be substituted for the subject. Cf. H. SCHOLZ, *op. cit.*, p. 39 and 68.

¹³ It was JAN ŁUKASIEWICZ who proved that the Stoic logic is an ancient form of the sentential calculus and from the Aristotelian syllogistics 'is as different as arithmetic from geometry,' cf. 'Philosophische Bemerkungen...', p. 77 and *Elementy logiki...*, p. 15 ff.

¹⁴ PAUL DEUSSEN: *Allgemeine Geschichte der Philosophie* [6 Vols., 1920–27], vol. I, p. 32.

* Περὶ οὐρανοῦ 279b; (1) in: E. BEKKER (ed.): *Aristotelis Opera*, Berolini, Academia Borussica 1981, pp. 268–313. [Reprinted: 1960]; (2) CARL PRANTL (ed.): *Aristotelis De caelo et De generatione et corruptione*, Lipsiae in aedibus Teubneri, 1881. (3) W.K.C. GUTHRIE (ed.): *Aristotle, On the Heavens*, with an English translation, Harvard Univ. Press, Cambridge (Mass.) 1960.—P.B.

being a party, can hardly be satisfied. A historian of logic may, however, be a δῖαιτητής ['arbiter, judge'], provided he is well acquainted with logic.

To what extent the *Nyāya* research can profit from the knowledge of modern logic can easily be demonstrated with the help of concrete examples. That is why I shall give an exact formal logical analysis of the standard example of the smoky mountain at the end of my attempt.¹⁵

As it has just been emphasised, it is not easy to decide whether Indian authors regarded elements of syllogism as names or as propositions. A wish to explore this question has as its precondition a clarification what the Indian syllogism as such is, in other words, how it should be interpreted from the standpoint of modern logic. At least this question can be answered without much difficulty. If we first put aside the difference, which in itself is not at all superficial, between the two formulations *yo yo dhūmavān*, so 'gnimān and *yatra yatra dhūmas*, *tatra tatrâgniḥ*, and stick to the latter one, the whole example can be represented more or less in the following way:

- | | | |
|--|-----------------------------|---|
| 1. <i>pratiññā</i> | ψa | There is fire in <i>a</i> (= this mountain here). |
| 2. <i>hetu</i> | ϕa | There is smoke in <i>a</i> (= this mountain here). |
| 3. demonstration of <i>vyāpti</i> | $(a).\phi x \supset \psi x$ | For any place <i>x</i> , the rule applies: if there is smoke in <i>x</i> , then there is also fire in <i>x</i> . |
| 4. <i>upanaya</i> = demonstration of <i>pakṣa-dharmatā</i> | $\phi a \supset \psi a$ | The rule applies also to $x = a$ (to the <i>pakṣa</i>). |
| 5. <i>nigamana</i> = demonstration of <i>sādhya</i> | ψa | Since the rule applies also to $x = a$ and the proposition ϕa is true, therefore also the proposition ψa is true. |

When we express this proof correctly in one conditional sentence, the result will be a theorem well known from Russellian 'theory of apparent variables': $(x).\phi x \supset \psi x: \phi a: \supset \psi a^\dagger$ = 'if, for each and every value of the variable *x*, the propositional function ϕ implies the propositional function ψ , then the propositional function ϕ implies the propositional function ψ also in case of the value $x = a$.' In our example ϕ stands for 'there is smoke in...', ψ for 'there is fire on...', *a* for 'this mountain here'. This formulation contains at the same time plain hints for a critical interpretation of the Indian terms: *upanaya* =



¹⁵ I repeat here partly the findings which I included in my paper 'Der indische und der aristotelische Syllogismus', *Bulletin de l'Academie Polonaise des Sciences et des Lettres, Classe de Philologie*, Cracovie 1932, p. 99 ff. More examples of the application of the method demonstrated above are to be found in my article 'Anfänge der Aussagenlogik in Indien', *Bulletin* 1933. [Both papers were reprinted in: STANISLAW SCHAYER: *O filozofowaniu Hindusów. Artykuły wybrane*. Edited by Marek Mejor. Polska Akademia Nauk, Komitet Nauk Orientalistycznych, PWN, Warszawa 1988, pp. 410–421.—P.B.]

[†] In the original wrongly: $(x).\psi x \supset \phi x: \phi a: \supset \psi a$.—P.B.

demonstration of *pakṣa-dharmatā* is the inference rule of substitution, which allows the substitution of a concrete value = the *pakṣa* = 'this particular mountain here' for an indefinite *yatra yatra* in a universal proposition: *yatra yatra dhūmas, tatra tatrāgniḥ*. The resulting proposition $\phi a \supset \psi a$, which we obtain by applying this rule, is not formulated explicitly in the Indian syllogism, because Indian logic does not attach any importance to the completeness of proof; however, the words *tathā cāyam* indicate this step with sufficient clarity. The *nigamana* rule corresponds to the inference rule of derivation¹⁶ and permits us to eliminate the *hetu* = ϕa , the truth of which has already been recognised on the basis of the implication $\phi a \supset \psi a$, and to assert the truth of *sādhya* = ψa . The terms *hetu* and *sādhya* are propositions, *pakṣa* is an individual variable (*a*, which is substituted for *x* in ϕx and ψx); *pakṣa-dharmatā* = *hetoḥ pakṣa-vṛttitvaṃ* = 'the fact that *a* = 'this mountain here' is a variable of the same propositional function ϕ which occurs as the implicans ϕx in the implication $\phi x \supset \psi x$.

Thanks to the above analysis we consequently win an important perspective to answer the question about the relationship between the Indian and the Aristotelian syllogisms. If we keep in mind what has previously been said about the genuine Aristotelian syllogism, we immediately obtain the following list of essential antitheses:

The Aristotelian syllogism:

1. is a logical theorem formulated in one conditional sentence;
2. consists exclusively of propositions of the form SaP, SeP, SiP, SoP;
3. is based, on the one hand, on the implication of two subsumptions SaM · MaP, and, on the other, on a subsumption SaP: SaM · MaP. \supset SaP.
4. no individual names are allowed to be substituted for the variables S, M and P.

The Indian syllogism:

1. is a combination of inference rules;
2. consists of such propositions in which *asti* should be supplied either in the sense of a copula or in the sense of the predicate 'exists';¹⁷
3. is based, on the one hand, on the implication of two propositions $\phi x \supset \psi x$ and ϕa , and, on the other, on the proposition ψa : $(x).\phi x \supset \psi x: \phi a: \supset \psi a$;
4. one may—and in the Buddhist logic: one must—substitute an individual name for the variable *a*.¹⁸



¹⁶ The Stoic *modus ponens* $p \supset q : p : \supset q$ corresponds in a way to this rule but cannot replace it.

¹⁷ On the importance of this difference see H. SCHOLZ, *op. cit.*, p. 60, and H. WEIL: *Philosophie der Mathematik*, p. 39.

¹⁸ In point of fact, with an interesting condition that it has to be a particular thing that belongs to any class, otherwise one would not be able to provide a homogenous example nor to form any universal rules, cf. G. TUCCI, *The Nyāya-mukha*, p. 7. [GIUSEPPE TUCCI: *The Nyāya-mukha of Dignāga. The oldest Buddhist Text on Logic, after Chinese and Tibetan Materials*. Heidelberg 1930.—P.B.]

All these differences enumerated above are equally important and decisive from the viewpoint of formal logic; the third one deserves attention, inasmuch as it *ad oculos* demonstrates the illegitimacy of the common identification of *pakṣa*, *hetu* and *sādhya* with the three terms of the Aristotelian syllogism. In the Indian stock example, the relationship between two subsumptions is completely out of question¹⁹, and an attempt to represent the whole inference with the help of EULER's diagrams should be nowadays rejected as entirely erroneous. Even if ATHALYE²⁰, VIDYĀBHŪṢAṆA²¹, and—quite recently—STCHERBATSKY²² were convinced that the Indian syllogism can be reduced to the Barbara mood, it is simply a misunderstanding that should once and forever disappear from Indological literature.

I would conclude with a few remarks on the notion of 'anticipation'. 'To anticipate' literally means 'to foresee, preconceive' and one should hold to this meaning: the Indian syllogistics is a kind of 'foresight, preconception' of some forms of inference known to modern logic, and not a kind of 'analogy', insofar as the latter would presuppose a similarity or, at least, comparability of their levels of historical development, which in fact is not there. We do not compare Indian and modern logic in order to examine individual differences along with similarities, we evaluate Indian logic from the standpoint of modern logic in order to determine what is at all logical in it the way we understand it. We should begin with this question, for the understanding of *Nyāya* depends on it. Description of specifically Indian peculiarity, of what could be called 'the style of Indian thinking', is a task for the future; it can be the final result, but certainly not the starting point of the *Nyāya* research.



¹⁹ The point was correctly observed in P. MASSON-OURSSEL: *La Philosophie Comparée*, Paris 1923, p. 133. [Transl. into English: *Comparative Philosophy*, London 1926.—P.B.]

²⁰ *Tarka-saṅgraha*, p. 233 ff. [Edited with *Dīpikā* and Govardhana's *Nyāya-bodhinī*, by Y.V. ATHALYE and translated by M.R. BODAS, with English notes. Bombay Sanskrit and Prakrit Series 55, Bombay 1897, 1918, 1930. Revised by PUSALKAR 1963.—P.B.]

²¹ SATISH CHANDRA VIDYĀBHŪṢAṆA: *History of Indian Logic*, Calcutta 1920. [Reprinted: Motilal Banarsidass, Delhi, 1988.—P.B.]

²² *Op. cit.*, vol. I, p. 26.

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Studies on Indian Logic*

STANISŁAW SCHAYER

Translated from the Polish original by Piotr Balcerowicz

I. The Indian and the Aristotelian Syllogism. Except for rare exceptions, among which the opinion of such an expert researcher as P. Masson Oursel should certainly be reckoned (cf. *La Philosophie Comparée*[§], p. 132), majority of authors who have dealt with the question of *nyāya* maintained there could be observed, to a higher or lesser degree, a close structural affinity of the Indian and the Aristotelian syllogism. The Naiyāyika, says Radhakrishnan in *Indian Philosophy*[†] (Vol. 2, p. 83), 'regarded Barbara as typical of all syllogistic

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The first comprehensive, and up to the present moment one of most fundamental works on Aristotelian syllogistics is the book by Jan Łukasiewicz: *Aristotle's Syllogistic from the Standpoint of Modern Formal Logic*, Oxford 1951. [Revised edition: Oxford 1957]. Łukasiewicz must have had a clear idea of Aristotelian and Stoic logic as early as in 1927, for most of the ideas incorporated much later in his book were presented at the Second Polish Philosophical Congress (Warszawa 1927) as well as in Łukasiewicz's highly critical review of Franz Weidauer's *Zur Syllogistik* (*Ruch Filozoficzny*, fasc. 11, 1928). The results of Łukasiewicz's research were widely known and discussed in philosophically oriented milieu in Poland. For instance, Tadeusz Kotarbiński in his illustrious volume *Elementy teorii poznania, logiki formalnej i metodologii nauk* (*Elements of Theory of Knowledge, Formal Logic and Methodology of Sciences*), Lwów 1929 [2nd revised edition: Ossolineum, Wrocław-Warszawa-Kraków 1961], extensively avails himself of Łukasiewicz's studies, and Kotarbiński's work was known to and occasionally quoted by Stanisław Schayer (e.g., below p. 9, as well as in his *Ausgewählte Kapitel aus der Prasannapadā*, Kraków 1931). Thus, we can safely assume that Stanisław Schayer must have known Łukasiewicz's research on Aristotelian syllogism. (Cf. his reference to Łukasiewicz's *Elementy logiki matematycznej* in the present paper, *vide infra* p. 2)—P.B.

[§] Paris 1923 [transl. into English: *Comparative Philosophy*, London 1926].—P.B.

[†] Sarvepalli Radhakrishnan: *Indian Philosophy*, 2 Vols., London 1923, 1927.—P.B.

reasoning.' Similar view is advocated by Th. Stcherbatsky in *Buddhist Logic*[§] (Vol. 1, p. 26): 'In the last three [members], if we drop the example, we will have a *strictly* (italics—Schayer) Aristotelian syllogism, its first figure.' And likewise Athalye, *Tarka-saṅgraha*[†], p. 236b ff., 265 ff., as well as Vidyābhūṣaṇa in *History of Indian Logic*^{*}, p. 497 ff. The present paper should very briefly prove why such a conception should be rejected.

1. The necessary prerequisite to be at all able to tackle the issue of similarity or difference between the Indian and the Aristotelian syllogism is the correct theoretical understanding of the Aristotelian syllogism. One will certainly not acquire this understanding from manuals of 'philosophical' logic, for instance, in Erdmann and Sigwart. What Aristotelian logic really is—that it is not, contrary to the well-known claim expressed by Kant, a finished theory of logic but it rather represents only its fragment, i.e., an ancient form of the modern calculus of names, that not only empty terms but also no individual names (e.g., 'the mortal Socrates') whatsoever can be substituted for variables S, M and P, and that, eventually, the authentic syllogism, as it was formulated by Aristotle himself in *Analitica Priora* I, 4[†], does not consist of three, but of *one* sentence which asserts the relation of implication between, on the one hand, two instances of inclusion: SaM and MaP, and, on the other, the inclusion: SaP—was more or less unknown to philosophers until recently. A 'reliable perspective' from which not only the achievements of Aristotle but also of the whole history of European and Oriental logic in general can be critically evaluated and dully appreciated was first created by modern mathematical logic (logistic), cf. for instance H. Scholz: *Die Geschichte der Logik*, Berlin 1931 [reprinted: 1959—P.B.]. The comparison of *nyāya* with the *Organon* can only contribute to a better understanding of the Indian controversy, provided our point of departure is not the traditionally caricatured, but the authentic Aristotle, as he was accurately examined and demonstrated with full understanding by J. Łukasiewicz for the first time, cf. his *Elementy logiki matematycznej* [*Elements of Mathematical Logic*], Warszawa 1929, p. 15 ff.

2. As soon as this condition is met, a number of essential antitheses between the genuine Barbara figure and the Indian standard version will automatically be noticed.

a) The Indian syllogism is by no means a logical theorem, rather it is a combination of two inference rules, viz. of *upanaya* and *nigamana*. The *upanaya* rule corresponds to the modern rule of substitution, and allows the substitution of a concrete value = the *pakṣa* = 'this particular mountain here' for an indefinite *yatra yatra* in a universal proposition: *yatra yatra dhūmas, tatra tatra vahniḥ*. In this way, from the proposition $(x). \phi x \supset \psi x$ = 'for every *x*, if there is smoke in *x*, then there is fire in *x*', we arrive at a proposition $\phi a \supset \psi a$ = 'if there is smoke in *a*, then there is fire in *a*'.

[§] Theodore Stcherbatsky: *Buddhist Logic*, Vol. I & II, Izdatelstvo Akademii Nauk SSSR, Leningrad 1930. [First Indian Edition: Motilal Banarsidass, Delhi 1993].—P.B.

[†] *Tarka-saṅgraha* edited with *Dīpikā* and Govardhana's *Nyāya-bodhinī*, by Y.V. Athalye and translated by M.R. Bodas, with English notes. Bombay Sanskrit and Prakrit Series 55, Bombay 1897, 1918, 1930. [Revised by Pusalkar 1963].—P.B.

^{*} Satish Chandra Vidyābhūṣaṇa: *History of Indian Logic*, Calcutta 1920. [Reprinted: Motilal Banarsidass, Delhi, 1988.].—P.B.

[†] Aristotle: *Prior and Posterior Analytics*, a revised Text with Introduction and Commentary by W. D. Ross, At the Clarendon Press, Oxford 1949; Book I, Ch. 4: 25b-26b.—P.B.

This transformational formula is not explicitly stated in the Indian example, because the Indian logic does not attach any importance to the completeness of proof; however, the words *tathā cāyam* indicate this step with sufficient clarity. [The first part of conclusion (in Indian terminology the statement of the so-called *pakṣa-dharmatā*) is tantamount to Whitehead-Russell's formula: *10.26: $(z). \phi z \supset \psi z$: ϕx : $\supset \psi x$. The second part corresponds to the Stoic *modus ponendo ponens*: 'If a fact ϕ occurs in place A , then a fact ψ occurs in place A ; a fact ϕ occurs in place A , so a fact ψ occurs in place A .[§]] The *nigamana* rule is equivalent to the modern rule of derivation and permits us to eliminate the *hetu* = ϕa , the truth of which has already been recognised, from the implication $\phi a \supset \psi a$, obtained with the help of *upanaya*, and to assert the truth of *sādhya* = ψa .

The difference between the logical theorem and the logical inference rule is of both fundamental and essential significance, cf. Łukasiewicz, *op. cit.*, p. 19 ff., and Carnap, *Abriss der Logistik*[‡], p. 10 ff. As soon as we decide, however, to disregard this difference in order to comprise the whole Indian syllogism in a single thesis, what we arrive at is the proposition, well-known from Russell's theory of apparent variables: $(x). \phi x \supset \psi x$: ϕa : $\supset \psi a$ = 'if, for each and every value of the variable x , the propositional function ϕ implies the propositional function ψ , then the propositional function ϕ implies the propositional function ψ also in case of the value $x = a$.'

b) Thanks to the above analysis we consequently win an important perspective to grasp the precise meaning of the Indian technical terms. Thus, *pakṣa* is the individual variable a , which is substituted for x in ϕx and ψx . The condition for this operation is called *pakṣa-dharmatā* = *hetoḥ pakṣa-vṛttitvaṃ*, i.e., 'the occurrence of the *hetu* in the *pakṣa*,' which can be rendered, to use our symbols, as follows: the fact that a = 'this particular mountain here' is a variable of the same propositional function ϕ that occurs in the implication $\phi x \supset \psi x$ as the implicans ϕx . *Hetu* is the proposition ϕa , that has already been recognised to be true, whereas *sādhya* is the conclusion ψa drawn with the help of *nigamana*. It is evident beyond doubt that the elements of the Indian proof, viz., *hetu*, *pakṣa* and *sādhya*, are by no means identical with the three terms of the Aristotelian syllogism.

c) The Aristotelian syllogism is composed exclusively of propositions of the form: SaP, SeP, SiP and SoP. The Indian syllogism in no way conforms with such a form of proposition: in addition to the formulation *yo yo dhūmavān, so so vahnimān*, Indian textbooks indiscriminately use the formulation *yatra yatra dhūmas, tatra tatra vahnih*. These two variants are not at all equivalent from the point of view of formal logic, inasmuch as they employ the word *asti*, that should be supplied in each case, either as a copula or in the sense of the verb 'exists', respectively. The structure of the sentence '*yatra yatra ...*' completely rules out any candid attempt to reduce the Indian syllogism to any form of either the genuine Aristotelian or the 'traditional' syllogism whatsoever.

d) Finally, there is another important difference: in the Aristotelian syllogism all the three terms S, M and P are universal terms or, according to another view, class names, at any rate they are not individual names (cf. Łukasiewicz, *op. cit.*, p. 23, [and H. Scholz, *Die Geschichte der Logik*, p. 39][§]). In contradistinction to this uni-

[§] Insertion from the Polish version, p. 32. [= Mejer (1988) 120].—P.B.

[‡] Rudolf Carnap: *Abriss der Logistik, Schriften zur wissenschaftlichen Weltauffassung*, Vol. II, Springer, Wien 1929.—P.B.

[§] Insertion from the Polish version, p. 33. [= Mejer (1988) 121].—P.B.

versal principle, in the Indian syllogism a particular thing, e.g., ‘this particular mountain here,’ may occur as the subject of an inferential formula (as *pakṣa*), in case of which Dignāga introduces an additional condition, not entirely understandable to us, namely that it has to be a particular thing that belongs to a single class (cf. G. Tucci, *The Nyāya-mukha**, p. 7). Accordingly, there are instances when the *sādhya* can be represented as SeP = ‘S is an element of the class P’. That would correspond to the ‘traditional’ inference with the *terminus discretus sive singularis*, nonetheless, as far as the genuine Aristotle’s syllogistics is concerned, such propositions as SeP and SaP certainly do not have the same value (cf. H. Scholz, *op. cit.*, pp. 39, 68). In the area of European logic there have been attempts in recent years to define individual names as class names, viz., as names of classes with a single element, yet such an approach is hardly useful for the interpretation of Indian logic, insofar as it was rejected *expressis verbis* by the Indians themselves in the first place. In the famous verse from the *Kiraṇāvalī*, Udayana opens the list of six reasons that preclude the notion of class (*jāti-bādhaka*) with ‘uniqueness of an individual thing’: the cosmic ether exists solely in one copy and therefore possesses no *jāti* (cf. *Muktāvalī*, ed. *Haridās Sanskrit Grantha-malā*, p. 8, as well as Strauß???, p. 6 and Athalye, p. 92).

3. If we try to summarise everything what has been said so far, it becomes clear that the Indian concept of inference can on no account be reconciled with the authentic Aristotelian syllogism, and only with much difficulty with the ‘traditional’ syllogistics. On the contrary, to do justice to the spirit of Indian logic and its potential of growth, we should regard it as a prescientific anticipation of some forms of inference known to modern logic (Bertrand Russell’s theory of apparent variables, David Hilbert’s functional calculus of the first order). Indology must free itself from the false conviction that the Aristotelian or the traditional syllogistics is a suitable basis to investigate issues connected with *nyāya*. [Structural distinctiveness demonstrated so far does not obviously exclude the possibility of formulating a conclusion after the manner of, and equivalent in its contents to the Barbara mood: ‘everything smoky is fiery, this mountain here is smoky, therefore this mountain here is fiery.’ The history of logic, however, is not concerned with the ‘contents,’ but only and exclusively with the ‘form.’ The prevalent ‘Barbarisation’ of Indian syllogism is henceforth an unacceptable method of scientific analysis and should once and for ever disappear from European monographs.][§]

II. Ancient Indian anticipations of sentential logic. To the most significant achievements of modern scientific logic belongs the differentiation between the calculus of names and the sentential calculus. What the differentiation implies should be easily understood even to a layman: only names can be substituted for all values in case of the calculus of names, whereas the sentential calculus permits exclusively the substitution of sentences. Both branches of logic are exemplified in Greek philosophy. In Aristotle’s syllogistics we can immediately recognise the calculus of names, but one of the most extraordinary discoveries, for which we are indebted to Jan Łukasiewicz, is that the Stoic dialectics represents an ancient form of the sentential calculus. It is superfluous to say that this clarification laid foundations for critical historical study of Occidental

* Giuseppe Tucci: *The Nyāya-mukha of Dignāga. The oldest Buddhist Text on Logic, after Chinese and Tibetan Materials*. Heidelberg 1930.

§ Insertion from the Polish version, p. 33. [= Mejer (1988) 121].—P.B.

logic (alas, Prantl's famous work[§] does not deserve this title any longer). For an Indologist who is interested in similar problems in the context of Indian culture it would be natural to pose a question whether we could find some elements of a sentential theory in the *nyāya* literature as well. It is highly improbable to encounter a logical theory in India that would closely resemble Chrysippus' dialectics, first of all, because Indian thinkers never reached the level of the Hellenistic logic and, secondly, because the 'nominal style' typical of Indian languages as well as the possibility to express any sentence through abstract forms ending in *-tva* and *-tā*¹ made the differentiation between 'sentences' and 'names' particularly difficult. In any case, rudiments and prescientific anticipations of sentential logic can be found in India as well. A few illustrations will be briefly discussed in subsequent paragraphs.

1. The oldest Indian text in the case of which we have good reasons to suppose that it betrays acquaintance of its author with a few theorems of the sentential calculus is *Kathā-vatthu*. The treatise discusses heretical theses by following a stereotypical pattern, that was described by Shwe Zan Aung, *Points of Controversy*, p. xlviii as follows: 'If *A* is *B*, then *C* is *D*; but *C* is not *D*, therefore *A* is not *B*'. As we can see, the above formula coincides with the Stoic *modus tollendo tollens*, although Shwe Zan Aung does not articulate it, and besides, by unnecessary introduction of individual variables, he creates a basically false impression that what we are confronted here with is a relation between the four terms *A*, *B*, *C* and *D*. As a matter of fact, the elements that are applied in the logic of *Kathā-vatthu* are definitely not individual variables but propositional variables, and, consequently, the whole discussion proceeds according to the following pattern:

Theravādin: Is it true that *p*?

The Opponent: Yes, it is true /1.*p*/.

Theravādin: Is it true that *q*?

The Opponent: No, it is not true /~*q*/.

Theravādin: So, acknowledge the defeat: (1) if it is true that *p*, then it is true that *q* /*p* ⊃ *q*/, (2) the thesis that *p* is true, but *q* is not true, is false /~(*p*. ~*q*)/, (3) if it is not true that *q*, then it is not true that *p* /~*q* ⊃ ~*p*/, (4) the thesis that *p* is true, but *q* is not true, is not true /~(*p*. ~*q*)/.

The author of *Kathā-vatthu* is content with these four statements and considers it superfluous to demonstrate the complete inference *modo tollente* [*modus tollendo tollens*][§]: *p* ⊃ *q*. ~*q*. ⊃ ~*p*. Likewise he does not say *expressis verbis*, although he must have had it in mind, that the theses *p* ⊃ *q*, ~(*p*. ~*q*) and ~*q* ⊃ ~*p* should be regarded as equivalent. The equivalence *p* ⊃ *q*. ≡ ~(*p*. ~*q*) is well known to every logician as 'the definition of implication', whereas the equivalence *p* ⊃ *q*. ≡ ~*q* ⊃ ~*p* is the important law of transposition [See Kotarbiński, *Elementy teorii poznania, logiki formalnej i metodologii nauk*, pp. 177, 185]*. I am convinced that we can,

[§] Carl Prantl: *Geschichte der Logik im Abendlande*, Vols. I-IV, 1855-70. [Reprinted: 1925, 1955].

¹ E.g., *śabdasya nityatvaṃ* can easily be taken as the 'name' of an 'ideal object': 'permanence of the sound;' still, it is equivalent to the 'sentence', viz., to the 'fact that...'.
[§] Thus is the Polish version, p. 19. [= Mejer (1988) 122].

* Insertion from the Polish version, p. 19. [= Mejer (1988) 122]. The pages 177, 185 correspond to pp. 179, 189 of the 2nd revised edition: *Ossolineum*, 1961.—P.B.

with all probability, take it for granted that the author of *Kathā-vatthu* knew these two laws of logic.

2) Some more interesting details relevant to our subject are contained in Buddhaghosa's commentary [to *Kathā-vatthu*]. Buddhaghosa calls the inference from the premiss $p \supset q$ 'direct' [inference] (*anuloma*), and the inference from the premiss $\sim q \supset \sim p$ 'inverse' [inference][†] (*paṭiloma*). Further, he paraphrases the 'direct' schema in the following way: 'Since in case of the accepted thesis 1 you do not accept thesis 2, but thesis 2, which is not accepted, cannot be linked (*na saṁdhīyati*) to the [accepted thesis] 1, therefore—since you are confronted with an error—you have to admit this.' The expression *na saṁdhīyati* cannot but mean here the logical 'incompatibility' (inconsistency). Hence, Buddhaghosa's explanation can be reduced to a theorem that would correspond to the following formula: $p/\sim q.\sim q.\supset.\sim p =$ 'if p is inconsistent with q , and if q is not true, then p is not true.' At the same time it should be emphasized that the indication of inconsistency in Buddhaghosa's commentary is supposed to rephrase the theses $p \supset q$, $\sim q \supset \sim p$ and $\sim(p.\sim q)$ occurring in the original main text. In other words, Buddhaghosa knew that the three theses: ' p is inconsistent with not- q ,' 'if p , then q ' and 'it is not true that p and not- q ,' are equivalent.

Buddhaghosa's explanation contains additionally some terminological material that clearly shows apagogic and hypothetical character of the logic of *Kathā-vatthu*. Thus, $p = \textit{thāpanā}$ is the opponent's thesis, which is taken by the Theravādin as an *apodosis*[‡] of a conditional period. This proposition p , assumed entirely hypothetically, implies a conclusion $q = \textit{pāpanā}$, which is inadmissible to the opponent. In case the inadmissibility is proved, what follows is the 'imposition' (*āropanā*) of defeat in accordance with the *modus tollendo tollens* or an equivalent formulation.

3. The apagogic syllogism is a conventional instrument of scholarly discussion (*vāda*). It allows us to deduce, from the opponent's thesis, a consequence which demonstrates the falsehood of the consequence, and to infer the falsehood of the thesis itself from the falsehood of the consequence. In the age of scholastic synthesis this type of indirect proof was given the designation of *tarka*, with an explicit emphasis that the role of *tarka* is not merely negative criticism (*vitaṇḍā*, *dūṣaṇā*) at the opponent, but a positive corroboration of one's own thesis. As a matter of fact, it is only possible when one admits legitimacy of the transition from the thesis: 'it is not true that S is P ,' to the thesis: 'it is true that S is not- P .' This problem gave a stimulus to an interesting [and lively] debate in India.

Its starting point is marked by the contradiction levied by the Mādhyamika against the method of indirect proof. The sole absolute norm of cognition is the mystic intuition through which the saints cognise the unreality of all distinct entities (*sarva-bhāva-svabhāva-śūnyatā*). Discursive thinking is by definition a false way of thinking engrossed in error (*vikalpa = avidyā*). This rejection of realistic logic does

[†] Insertions from the Polish version, p. 19. [= Mejer (1988) 122] .—P.B.

[‡] Polish text reads: 'antecedent of a conditional clause.' In rhetoric, ἀπόδοσις (Lat., *finis, consequens*) is the consequent of a complex rhetoric period (περίοδος; Lat., *periodus, cursus, numerus*) with an antecedent (πρόθεσις; Lat., *principium, antecedens*). Aristotle uses the term ἀπόδοσις in the sense of 'definition, explanation, generalisation,' viz., a kind of a consequent derived from observation of individual cases, cf. Τόπικα 108b 9, 20 = *Aristotelis Topica et Sophistici Elenchi*, recensuit brevisque adnotatione critica instruxit W. D. Ross, Oxford University Press, 1958.—P.B.

not thereby exclude a possibility of a purely negative dialectics which would reduce all theses *ad absurdum* and which would emancipate the mind from the illusion of conceptual constructions. The dialectics rejects the transition from $\sim(S \text{ is } P)$ to $(S \text{ is } \sim P)$, because it denies the reality of all subjects [or separate entities]* that might possibly be predicated of. One can neither predicate of the son of a barren woman that he is black nor that he is not black; and because, according to the Mādhyamika teaching, all objects are unreal in the same way as ‘the son of a barren woman,’ all thinking and judgements are eventually reducible to the fourfold negation [tetralemma] (*catus-koṭi*): [it is not true that $S \text{ is } P$, it is not true that $S \text{ is not-}P$, it is not true that $S \text{ is } P \text{ and not-}P$, it is not true that $S \text{ is neither } P \text{ and not-}P$][†] = $\sim p$ and $\sim(\sim p)$ and $\sim(p.\sim p)$ and $\sim[\sim p.\sim(\sim p)]$. In short, true are only purely negative predications of the form: ‘it is not true that T ’, viz., predications that simply negate the thesis T , without implying the contrary thesis $\sim T$. [At the same time the Mādhyamika emphatically declares that he confines himself merely to negating rival theses, and that such negations do not entail any acceptance on his part of the contrary thesis.][‡] The Mādhyamika attaches much value to this peculiarity of negative dialectics, cf. *Vigraha-vyāvartanī*[§], verse 30; *Prasanna-padā*^{*}, p. 13, 16 ff. Indeed, the issue reflects a sharp contrast between the metalogic [= negative dialectics] of the Mādhyamika and the method of *tarka*.

4. The theory of purely negative prepositions possesses to a certain degree its own terminology. The rival thesis which is hypothetically admitted by the dialectician is called *prasaṅga-vākya*, lit., ‘the statement of eventuality’. The demonstration of the falsehood of the rival thesis through reduction to an ‘undesired consequence’ is designated ‘the proof of eventuality’ = *prasaṅga-sādhana*. It is easily recognisable that the whole proof follows the schema of *modus tollendo tollens*.

The consequence which is undesired for the opponent and which ensues from a ‘statement of eventuality’ does not necessarily have to be pure logical absurdity. Rather, it can be a meaningful thesis which seems for some reason or another inadmissible to the opponent. The Indian dialectics distinguishes here a peculiar case known as *ati-prasaṅga* = the ‘hyper-eventuality’ whose ‘undesired consequence’ is based on the fact that it is identical with the ‘possibility of everything’ (*sarva-sambhava*). [The meaning of this term is explained by Vācaspatimiśra, *Nyāya-kanikā*, pp. 27 and 28 (cf. Stcherbatsky, *Buddhist Logic*, Vol. 2, p. 239, n. 1): *ati-prasaṅga* = *sarva-sambhava* = ‘entailment of everything.’][†] The formal structure of such proofs is not absolutely clear, but one would immediately associate it with any kind of anticipation ‘characterisation of falsehood,’* already known to Christian scholastics in Middle Ages, i.e., with more or less the following formula: ‘if p and not- p , thus if p , then q ’ / $p.\sim p : \supset .p \supset q$ / = from two contradictory propositions en-

* Insertion from the Polish version, p. 20. [= Mejer (1988) 123].—P.B.

† Insertion from the Polish version, p. 20. [= Mejer (1988) 123].—P.B.

‡ Insertion from the Polish version, p. 20. [= Mejer (1988) 123].—P.B.

§ *Vigrahavyāvartanī* by Nāgārjuna, *Translation from the Chinese and Tibetan Text*, in: Giuseppe Tucci: *Pre-Diñnāga Buddhist Texts on Logic from Chinese Sources*. Gackwad’s Oriental Series No. XLIX, Oriental Institute, Baroda 1929.—P.B.

* Candrakīrti: *Prasanna-padā Madhyamaka-vṛtti*, ed. by L. de La Vallée Poussin, *Bibliotheca Buddhica* Vol. IV, St. Petersburg 1903-13.—P.B.

† Insertion from the Polish version, p. 21. [= Mejer (1988) 124].—P.B.

* Viz., $\sim p. \supset p \supset q$.—P.B.

sues any arbitrary proposition. [Thus, our case represents much more interesting and less simple reasoning: if the thesis *T* implies its own negation not-*T*, then any other thesis *T'* is implied by thesis *T*.][§] In this case, there is still another and less interesting interpretation possible², which I would like to delineate here briefly: let a 'restrictive condition' *N* (*niyamaka*) hold good, as a consequence of which ϕx yields a true proposition only for certain values of *x*. Then, any arbitrary thesis *T* is propounded with the implication that ϕx yields a true proposition also for such values of *x* which do not satisfy the condition *N*. Both the premisses: (1) ϕx holds good only for such *x*-s which satisfy the condition *N*, and (2) ϕx holds good also for such values of *x*-s which do not satisfy the condition *N*, entail the 'undesired consequence' of *ati-prasaṅga*, viz., the predicament of *sarva-saṁbhava* = *sarveṣāṁ, sarvatra, sarvadā saṁbhava* = the thesis that ϕx yields truth for everything, everywhere and always. Stcherbatsky explains the term *ati-prasaṅga* as 'a generalized *deductio* (sic!) *ad absurdum*' (*Nirvāṇa*[†], p. 235), and as 'giving up every uniformity' as well as 'possibility of everything' (*Buddhist Logic*, Vol. 2, p. 239); cf. also, Sylvain Lévi's rendering as 'faute de raisonnement par dépassement d'extension' (*La Trentaine*???, p. 66), and H. Jacobi's translation 'sonst wäre eben alles möglich' (*Trīṁśikā-vijñāpti*^{*}, p. 6). Clearly, the problem of *ati-prasaṅga* deserves closer investigation.

Not all Buddhists were so radically opposed to *tarka* as the Mādhyamika. In other words, not all of them subscribed to the teaching of absolute and universal 'unpredicability' (*avācyaṭā, anirvacanīyatva*). That was connected with their metaphysical fundamental tenets.

As it is widely known, the Sarvāstivādin and the Theravādin postulated the reality of simple, elementary substances, or *dharma*s, which manifest themselves in single moments of reality and thereby generate the empirical illusion of the world of things and people. The *dharma*s as real substances are indeed 'predicable,' [(*Abhidharma* provides their positive definitions)][§], that is to say, they possess their own *sva-lakṣaṇa*s, viz., their individual intrinsic nature, or—according to the Sautrāntika 'dynamic' view of substance—they are endowed with their own individual momentary 'effective mode', their definable *artha-kriyā-kāritva*. On the other hand, illusory, unreal objects, or false hypostases such as 'the world', 'the soul,' etc., are 'unpredicable.' In this way the paradox of 'unmanifested points' (*avyākṛta-vastu*) is solved at the same time.

[§] Insertion from the Polish version, p. 21. [= Mejer (1988) 124].—P.B.

² Subsequent observations supplement my remarks in the *Sprawozdania XXXVIII.2*, p. 21. [St. Schayer: *Z badań and logikę indyjską. II. Indyjskie antycypacje rachunku zdań* in *Sprawozdania Polskiej Akademii Umiejętności*, Kraków 1933, 38, nr 2, pp. 19-22. = Mejer (1988) 122-125—P.B.].

[†] Theodore Stcherbatsky: *The Conception of Buddhist Nirvāṇa* (With Sanskrit Text of *Madhyamaka-Kārikā*), Leningrad 1927 Reprinted: Motilal Banarsidass, Second Revised and Enlarged Edition, Delhi 1977 [First Indian Edition: 1968; Appendix: 'Technical Terms', p. 28.].—P.B.

^{*} Hermann Jacobi: *Trīṁśikā-vijñāpti* translated into German with Sthiramati's Commentary???, *Beiträge zur Indischen Sprachwissenschaft und Religionsgeschichte* 7, Stuttgart 1932.—P.B.

[§] Insertion from the Polish version, p. 21. [= Mejer (1988) 124].—P.B.

Of different opinion is the Pudgalavādin. He maintains that, in addition to the predicable *dharmas*, there is an unpredicable, yet real Self, called [*ātman* or] *pudgala*, a kind of *sui generis* transcendent entity that—although it manifests itself empirically due to its dependence on psycho-physical elements (*skandha*)—is essentially not definable in view of both its identity with and difference from these elements.

The teaching of simultaneous reality and unpredicability of the *pudgala* is vehemently criticised by all remaining Buddhist schools, e.g., by Kamalaśīla in his *Pañjika to Tattva-saṃgraha*, cf. my translation in *Rocznik Orientalistyczny*, 1934, VIII, p. 68-93 [= Mejer (1988) 433-458—P.B.]. Kamalaśīla's criticism is noteworthy because it allows us to clearly comprehend the background of the controversy: the reducibility of propositional negation to the predicative negation. Kamalaśīla's argumentation is generally as follows: if the *pudgala* is a real object, then the negation of the assertion 'the *pudgala* is identical = not different from the *skandhas*,' must *implicite* entail the affirmation: 'the *pudgala* is not identical = different from the *skandhas*.' The latter thesis is, however, a positive statement about the *pudgala* ('personality'); therefore, if the *pudgala* is a real object, it cannot at the same time be unpredicable. And vice versa, if the *pudgala* is unpredicable, in other words, if it is not true that it is identical with the *skandhas*, and it is not true that it is not different from the *skandhas*, [and it is not true that it is and it is not different from the *skandhas*,]^{*} etc., that is only possible if the *pudgala* is no object at all³ but merely a fiction such as a hare's horn, the son of a barren woman, etc.

The opinion that the legitimacy of the transition from the propositional negation to the predicative negation depends on the reality of the subject is a significant logical discovery. [It was an interesting and noteworthy anticipation of the corresponding thesis in Leśniewski's 'ontology' $\Pi(A, B) \{A \text{ est } B\} = [\sum x (A \text{ est } x) \cdot (A \text{ est } B)]$] (cf. Kotarbiński, *op. cit.*, p. 231[§].) The same problem attracted the attention of the Greeks as well. Aristotle (*Analitica Priora* I, 40[†]) examines the question whether the expressions τὸ μὴ εἶναι τοῦτι and εἶναι μὴ τοῦτο[‡] have the same meaning; likewise, the Stoic logic took heed of the equivocality of the negation. How vital this problem is for modern logic can be assessed from Kotarbiński's *Elements of Theory of Knowledge, Formal Logic and Methodology of Sciences*, p. 223, 231 ff.^{*} It is truly remarkable for Indian thought that it endeavoured to raise and solve this *par excellence* formal logical issue in close dependence on metaphysical problems. Thus, the correlation between logic and metaphysics was in India no less profound than in Greece.

^{*} Insertion from the Polish version, p. 22. [= Mejer (1988) 125].—P.B.

³ Also Candrakīrti is of the opinion that 'the unpredicable cannot be anything real.' Cf. *Madhyamakāvatāra*, p. 269: *brjod-du-med-pala rdzas-su yod-pa-ñid mi-srid-pa*. [*Madhyamakāvatāra and Bhāṣya of Candrakīrti*, ed. by Louis de la Vallée Poussin, Bibliotheca Buddhica 9, 1912.—P.B.]

[§] *Elementy teorii poznania, logiki formalnej i metodologii nauk*, 2nd revised edition: Ossolineum, 1961: p. 232, Defintion 3.—P.B.

^{*} Insertion from the Polish version, p. 22. [= Mejer (1988) 125].—P.B.

[†] W. D. Ross' edition: *Ἀναλυτικὰ Πρότερα* 51b-52b (Ch. I, 46).—P.B.

[‡] 'Not to be this' and 'to be not this' respectively.—P.B.

^{*} *Elementy teorii poznania, logiki formalnej i metodologii nauk*, 2nd revised edition: Ossolineum, 1961: pp. 232-3, 242-3.—P.B.

On the Method of the Nyāya research*

STANISŁAW SCHAYER

Translated from the Polish original by Piotr Balcerowicz

A number of senior and junior researchers have been engaged in the enquiry into the history of Indian logic in recent times. To them we owe that fact that we begin nowadays to discern historical connections and gradually appreciate individual contributions of Indian thinkers, especially of the great Buddhist masters Vasubandhu, Asaṅga, Dīṇnāga and Dharmakīrti. Chinese and Tibetan translations have been made available and new light has been shed on the much debated question concerning the Buddhist and Brahmanical logic.¹ This gratifying enrichment of our philological and historical knowledge does not, however, correspond to the simultaneous growth of our theoretical knowledge. We still not have any satisfactory

* The German original was published as 'Über die Methode der Nyāya-Forschung'; Festschrift für Moritz Winternitz, Leipzig 1933, pp. 247-257. It was reprinted in: Stanisław Schayer: *O filozofowaniu hindusów. Artykuły wybrane*. Edited by Marek Mejer. Polska Akademia Nauk, Komitet Nauk Orientalistycznych, PWN, Warszawa 1988. [= Mejer (1988) 422-432]. All remarks in square brackets throughout the article are the translator's additions.

¹ I mention only the most important works published in the years 1926-1932: V. BHATTACHARYA: Introduction to the Edition of *Nyāya-praveśa*, Tibetan Text, Baroda 1927; The *Nyāya-praveśa* of Dīṇnāga, IHQ. III (1927). A. B. DHURVA: Introduction to the Edition of *Nyāya-praveśa*, Sanskrit Text with Commentaries, Baroda 1930. — H.R.R. IYENGAR: *Vāda-vidhi*, JBORS. (1926); Kumārila and Dīṇnāga, IHQ. III (1927); Vasubandhu and the *Vāda-vidhi*, IHQ. V (1929). — H. JACOBI: Über das Alter der *Manimekhalai*, ZII. V (1927). — A.B. KEITH: 'Vasubandhu and the Vādavidhi,' IHQ. IV (1928); 'The Authorship of the Nyāyapraveśa,' IHQ. IV (1928). — N.D. MIRONOW: 'Dignāga's Nyāyapraveśa and Haribhadra's Commentary on it,' Festgabe für Richard Garbe, Erlangen 1927; Nyāyapraveśa of Dīṇnāga I. Sanskrit Text edited and reconstructed. T'oung Pao, Leiden 1931. — H.N. RANDLE: *Fragments from Dīṇnāga*, London 1931; *Indian Logic in the Early Schools*, Bombay 1931. — W. RUBEN: 'Zur Frühgeschichte der indischen Philosophie,' Festgabe Hermann Jacobi, Bonn 1926; *Die Nyāyasūtra*, Leipzig 1928. — St. STASIAK: 'Fallacies and their Classification,' RO. VI (1929). — Th. STCHERBATSKY: *Buddhist Logic*, Vol. I, 1932, Vol. II, 1930 (Bibl. Buddh. XXVI). [Vol. I & II, Izdatelstvo Akademii Nauk SSSR, Leningrad 1930. First Indian Edition: Motilal Banarsidass, Delhi 1993.-P.B.] — M.I. TUBJANSKI: 'On the Authorship of Nyāyapraveśa,' Bull. de l'Acad. des Sc. de l'URSS, 1926. — G. TUCCI: 'The Vādavidhi,' IHQ. IV (1928); 'Buddhist Logic Before Dīṇnāga,' JRAS. 1929; *Pre-Dīṇnāga Buddhist Texts on Logic from Chinese Sources*, Baroda 1929; *The Nyāyamukha of Dīṇnāga*, Heidelberg 1930; 'On Some Aspects of the Doctrines of Maitreyanātha and Asaṅga,' Calcutta 1930. — H. UI: 'Indo Tetsugaku shi' (History of Indian Philosophy), Vol. V, p. 387 ff.; 'Seshin no inmosetsu' (The Logic of Vasubandhu), Journal of the Taisho University (1930).

picture of Indian theories of inference, and what one can find in accessible publications on the subject of Indian logic is either completely unclear and imprecise or directly false and misleading. There can be no doubt as to what the reasons of this disappointing situation are. It is basically due to the fact that the Indologists who have so far been dealing with the formal logical problems of Nyāya are not adequately familiar with European logic. Even the works of STCHERBATSKY cannot be acquitted of guilt. It suffices to look up the indices of names to both volumes of the monumental *Buddhist Logic* to be amazed at the truly rare erudition and knowledge of philosophical literature, unusual for an Indologist; at the same time, however, one cannot but notice that exclusively philosophers are quoted as representatives of Occidental logic. Such 'philosophical' logic as it was cultivated by ERDMANN, LOTZE, COHEN, SIGWART, etc., can hardly be considered nowadays a suitable basis for a critical evaluation of Indian Nyāya. In more than fifty years strictly scientific logic has been developed that legitimately deserves such a designation; it is the symbolic (mathematical) logic, that was anticipated by LEIBNIZ, paved the way for by BOOLE and SCHRÖDER, and validated by FREGE and RUSSELL.² It is equally impossible—in the same sense and for the same reason—to conceive of historical research of Indian logic without any knowledge of rudiments of this symbolic logic as the history of Indian mathematics is unthinkable without any positive knowledge of modern mathematics, or the history of Indian linguistics without any positive knowledge of modern linguistics. The precursory merits of earlier scholars such as ATHALYE, JACOBI, SUALI, etc., associated with the study of Nyāya are beyond any criticism, and nothing is as far from my intentions as the wish to depreciate the value of heretofore achievements as unsuccessful and worthless. Every generation has its own goals to accomplish: after the industry and scholarship of pre-eminent philologists have disclosed sources for the study of the history of formal logic in India and made provisional orientation possible, it is now time to approach Nyāya texts with professional logical—and not merely with philosophical—competence.³

Thus, the aim of the subsequent paragraphs is to provide a concise justification of the above postulate.

In order to prevent any possible misunderstanding, I would like, at the very outset, to clarify in what sense and to what degree the knowledge of symbolic logic can contribute to a deeper and better understanding of Indian theory of inference. In the first place, it should be emphasised that only a part of the issues debated in the *Nyāya-sāstra*⁴, viz., the theory of *anumāna* [inference], belongs to the scope of logic in the modern sense, whereas all the remaining topics such as the theory of *pramāṇas* [norm of cognition], the examination of *pratyakṣa* [perception], the problem of *jāti* [the class] and *sāmānya* [the universal], the question concerning the relation between the word and the object, etc., pertain partly to psychology, partly to epistemology and metaphysics, and finally to semantics. Formal logic has di-

² Cf. esp. H. SCHOLZ: *Geschichte der Logik*, Berlin 1931 (*Geschichte der Philosophie in Längsschnitten*, Heft 4).

³ As regards this, I would like to draw the reader's attention to JAN ŁUKASIEWICZ's observation in the appendix to his work 'Philosophische Bemerkungen zu mehrwertigen Systemen des Aussagenkalküls,' *Comptes rendus des séances de la Société des Sciences et des Lettres de Varsovie* XXIII (1930) Cl. III, p. 51 ff. [Reprinted in: JAN ŁUKASIEWICZ: *Z zagadnień logiki i filozofii*, PWN, Warszawa 1961].

⁴ Cf. STCHERBATSKY, *op. cit.*, p. 1.

rectly nothing to do with all these topics and leaves them freely to philosophers. However, the theory of *anumāna* as well—despite its crucial differentiation between *svārtha-anumāna* [the inference for oneself], as the internal process of reasoning, and *parārtha-anumāna* [the inference for others], as the inference ‘for others’ formulated verbally—is not so sharply, as logic demands, distinguished from epistemological and psychological speculations. That can easily be explained away by the fact that the preoccupation of Indian authors with the problem of the theory of inference is not primarily formal logical. The objective they aim at is to derive true conclusions from true premises, and that is why the *prasiddhatva* [recognition] of *pratijñā* [the thesis] is an obvious precondition of Indian syllogistics. At the same time, it demands that syllogism should contain the necessary minimum in order to convince the hearer of the correctness of the inference. In case of amateurs⁵, all tree terms, viz., *pakṣa*, *hetu* and *dṛṣṭānta* should be stated, whereas for experts a single *hetu* is enough. No importance is attached to the logical completeness of proof. Even in the period of final synthesis, so far as we can assess now, Indian authors were not aware of the fact that it is possible to investigate purely structural relations between logical formulas with constants and variables, without any concern whatsoever about the truth or falsehood of propositions derivable from these formulas by substitution of particular values for the variables.

Another difficulty which hinders any strictly formal analysis of the theory of *anumāna* is connected with the phenomenon that in Indian logic its laws were formulated not with the help of symbolic language, but were either paraphrased with *yo, yatra, vidhi, vacana, artha, vastu*, etc., or expressed in paradigm illustrations. The shortcoming of both these methods description as compared to the symbolic representation with letters, prevalent since the times of Aristotle, is that they do not reveal the structure of laws of logic very clearly and leave much room for various interpretations. When Nāgārjuna (*Kārikā* XIV, 5b) propounds a thesis: *yat-pratītya ca yat, tasmād anyan nōpapadyate* = ‘what is dependent on what, with respect to this it cannot be anything else,’ it is a perspicuous paraphrase of the symbolical formula: $(x,y).xRy. \supset \sim(x \neq y)$ = ‘For all values of the variables x and y , if x stands in relation R to y , then it is false that x and y are not identical with each other.’ Such lucid formulations as the one quoted above, however, are exceptional, and it is enough to translate the verses 340-342 of *Tattva-saṃgraha*⁶ to see for oneself how high is the degree of possible ambiguity and intricacy of such a ‘periphrastic’ method of description. The ambiguity of paradigm illustration is of different kind. One might have an impression that basically it is irrelevant if in the Aristotelian syllogism we say, for instance, ‘all people are mortal,’ instead of τὸ Α παντὶ τῷ Β ὑπάρχει*. We can safely concede that, provided that we exactly know what should be taken as a constant and what should be taken as a variable in the proposition ‘all people are mortal.’ The formula τὸ Α παντὶ τῷ Β ὑπάρχει teaches us that it concerns the relation of inclusion between the class A and the class B, and that is why

⁵ Cf. *Nyāya-praveśa-vṛtti-pañjikā*, p. 43, lines 21-22: *avyutpanna-vineya-gaṇam adhikṛtya samastānām sādhanatvam*.

⁶ Cf. ST. SCHAYER: ‘Kamalaśīlas Kritik des Pudgalavāda,’ *Rocznik Orientalistyczny* VIII (1932), p. 75 [mistaken for p. 76]. [= Mejer (1988) 433-458, p. 441].

* ‘ A is predicated of every B ,’ in *Αναλυτικά Πρότερα* 25b, Ch. 4 (Aristotle: *Prior and Posterior Analytics*, a revised Text with Introduction and Commentary by W. D. Ross, At the Clarendon Press, Oxford 1949).—P.B.

we know that in the proposition ‘all people are mortal,’ ‘people’ and ‘mortal’ are variables. In Indian syllogistics the relations are definitely not so obvious, and it is not easy to decide, when we have only philological instruments at our disposal, whether in the paradigm illustration of the fire on the mountain the variables are the mountain, the smoke and the fire, or rather propositions ‘wherever there is smoke,’ ‘wherever there is fire’ and ‘there is smoke on the mountain.’ When it comes to this, Indian authors leave us in the lurch, inasmuch as they themselves furnish us generally with various interpretations as equally possible⁷ and, as a rule, they do not distinguish with sufficient clarity between an object and a proposition about an object.

If we try to summarise everything what has been said so far, it becomes evident beyond any doubt that we should not presuppose the same level of abstract formal thinking in India as in Greece. The approach to formal logical problems in Nyāya texts never went beyond the prescientific stage of development, and no Indian theory—in contradistinction to Aristotle’s syllogistics⁸—can be represented in strictly formal manner either as an independent system as such or as a subdivision of another, more comprehensive system.

Given the above provides an answer to the question what the Nyāya research should not expect from the knowledge of modern logic, we are obliged now estimate positive weight of this knowledge. In a few words, it consists in the fact that (1) we get rid of false suggestions of traditional, philosophical logic, and (2) we acquire an objective, strictly scientific standard of a critical evaluation of Indian achievements.

In the first place, the following remark should be made: according to the well-known observation of KANT in ‘The Preface to the Second Edition’ of *the Critique [of Pure Reason]*, the traditional logic is a kind of science that ‘until now has been unable to make a step forward, and therefore, to all appearances, it seems to be finished and complete.’ This opinion, which has recently been also expressed by an distinguished logician and at the same time a prominent expert in the ancient logic,⁹ is an evidence of a great authority of the author of the *Organon*, but at the same time of unsatisfactoriness of formal logical scholarship of the philosophers of the modern times. Indeed, what KANT and his successors thought to be Aristotelian

⁷ According to Diñnāga (Haribhadra) *viśaya* [the object] of *sādhana* [a proof] is *dharmā-viśiṣṭo dharmin* [property-possessor characterised by a property]. Dharmakīrti admits three interpretations: (a) *dharmin* [property-possessor], (b) *dharmin saha dharmena* [property-possessor together with the property], (c) *dharmā* [property]. Cf. *Nyāya-bindu*, p. 20 [*Nyāya-bindu-ṭīkā of Dharmottara with Nyāya-bindu of Dharmakīrti*. Ed. by Th. Stcherbatsky, *BB* 7. Reprint: Biblio Verlag, Osnabrück 1970]; Th. STCHERBATSKY, *op. cit.*, p. 235, and Th. STCHERBATSKY: Vol. II, p. 133.

⁸ On formalised and axiomatised interpretations of Aristotle’s syllogistics cf. esp.: KAZIMIERZ AJDUKIEWICZ: ‘Założenia logiki tradycyjnej,’ *Przegląd Filozoficzny* (1927); DAVID HILBERT and WILHELM ACKERMANN: *Grundzüge der theoretischen Logik*, Springer, Berlin 1928; JAN ŁUKASIEWICZ: *Elementy logiki matematycznej*, Komisja Wydawnicza Koła Matematyczno-Fizycznego Słuchaczy Uniwersytetu Warszawskiego, Vol. 18, Warszawa 1929.

* Immanuel Kant: *Kritik der Reinen Vernunft*. 1787: Zweite, hin und wieder verbesserte Auflage, p. 7 = *Werke in sechs Bänder*, Band 2, Köncmann, Köln 1995, p. 25.—P.B.

⁹ ŁUKASIEWICZ: *Elementy logiki matematycznej*, p. 16.

logic was merely a caricatured Pseudo-Aristotle¹⁰. Even the best experts in the history of logic, headed by PRANTL, were more or less unaware of the fact that the genuine syllogism consists of one conditional sentence and not of two premisses connected with the conclusion with the word ‘therefore’,¹¹ that in the genuine syllogism only general terms, and no individual names such as ‘Socrates,’ can be inserted in place of the subject,¹² and that, finally, Aristotelian logic was not a universal and finished theory but—without any intention to depreciate its high historical value—merely a meagre fragment. Under such circumstances one should not wonder that also Indologists saw the only possible interpretative basis of *Nyāya* problems in the traditionally misunderstood syllogistics, that they equated the terms *pakṣa*, *hetu* and *sādhya* with *terminus minor*, *medius* and *major*, and that they took the Indian syllogism as a whole as a stylistic variant of the Barbara mood. Modern logic clears up all these errors and misinterpretations. It informs us about large diversity of logical systems and makes us sensitive to such problems encountered in Indian texts which discerning researchers used to overlook; it also casts fresh light on problems which researchers did notice in the past but were unable formulate correctly nor to understand. In order to be able to make discoveries in any field, one has to have, in the first place, an idea which eventualities are at all possible. Anyone who, out of many logical theories, knows only Aristotle’s syllogistics in its traditional dress, will naturally recognise nothing but analogies to Aristotle in the whole Indian tradition. The knowledge of modern logic opens a new perspective. Immediately it becomes conspicuous that Indian texts anticipate a range of theses which in part have not relevance to Aristotle but rather foreshadow Stoic¹³ dialectics and the sentential calculus. A critical evaluation of such intuitive anticipations is an important groundwork of a comprehensive history of logic.

Thus we have reached the second point of our reply. Logic is a specific science of accuracy and demands, analogous to its sister science mathematics, that its history should be judged in keeping with an objective standard and be represented as the history of discoveries as of positive progress. Accordingly, in order to evaluate critically achievements of Indian authors as anticipations of scientific logic, what an Indologist needs is ‘a reliable perspective’ to which the history of Indian theories

¹⁰ Notably failed was KANT’s attempt to reduce the syllogism to the principle: *nota notae est nota rei ipsius*.

¹¹ The difference is of crucial significance. The genuine Aristotelian syllogism: εἰ γὰρ τὸ Α κατὰ παντὸς τοῦ Β, καὶ τὸ Β κατὰ παντὸς τοῦ Γ, ἀνάγκη τὸ Α κατὰ παντὸς τοῦ Γ κατηγορεῖσθαι, is a formal logical theorem, the truth of which is irrespective of particular values of A, B and Γ. As opposed to this, the traditional syllogism with two premisses and a conclusion is a kind of ‘inference rule,’ which decrees that, as soon as one accepts the premisses in the given form, he is justified in accepting the conclusion of the given form. ‘To accept’ and to ‘be justified’ are extra-logical, symbolically inexpressible terms. They do not occur in the genuine syllogism at all.

¹² It was in the syllogistics of PETRUS RAMUS for that first time that a *terminus discretus sive singularis* could be substituted for the subject. Cf. H. SCHOLZ, *op. cit.*, p. 39 and 68.

¹³ It was JAN ŁUKASIEWICZ who proved that the Stoic logic is an ancient form of the sentential calculus and from the Aristotelian syllogistics ‘is as different as arithmetic from geometry,’ cf. ‘Philosophische Bemerkungen...’, p. 77 and *Elementy logiki...*, p. 15 ff.

could relate to and from which they could be surveyed. Nowadays, it is beyond any doubt that this ‘reliable perspective’ can be provided exclusively by the modern, symbolic or mathematical logic, not by its traditional, philosophical counterpart. DEUSSEN’s¹⁴ demand, who—referring to Aristotle, *De Coelo*, I. 10*—expects that a historian of philosophy should be a judge, instead of being a party, can hardly be satisfied. A historian of logic may, however, be a διατητής, provided he is well acquainted with logic.

To what extent the Nyāya research can profit from the knowledge of modern logic can easily be demonstrated with the help of concrete examples. That is why I shall give an exact formal logical analysis of the standard example of the smoky mountain at the end of my attempt.¹⁵

As it has just been emphasised, it is not easy to decide whether Indian authors regarded elements of syllogism as names or as propositions. A wish to explore this question has as its precondition a clarification what the Indian syllogism as such is, in other words, how it should be interpreted from the standpoint of modern logic. At least this question can be answered without much difficulty. If we first put aside the difference, which in itself is not at all superficial, between the two formulations *yo yo dhūmavān*, so ‘*gnimān* and *yatra yatra dhūmas*, *tatra tatrāgniḥ*, and stick to the latter one, the whole example can be represented more or less in the following way:

1. <i>pratijñā</i>	ψa	There is fire in <i>a</i> (= this mountain here).
2. <i>hetu</i>	ϕa	There is smoke in <i>a</i> (= this mountain here).
3. demonstration of <i>vyāpti</i>	$(a). \phi x \supset \psi x$	For any place <i>x</i> , the rule applies: if there is smoke in <i>x</i> , then there is also fire in <i>x</i> .
4. <i>upanaya</i> = demonstration of <i>pakṣa-dharmatā</i>	$\phi a \supset \psi a$	The rule applies also to $x = a$ (to the <i>pakṣa</i>).
5. <i>nigamana</i> = demonstration of <i>sādhya</i>	ψa	Since the rule applies also to $x = a$ and the proposition ϕa is true, therefore also the proposition ψa is true.

¹⁴ PAUL DEUSSEN: *Allgemeine Geschichte der Philosophie*, [6 Vols., 1920-27], vol. I, p. 32.

* Περὶ οὐρανοῦ 279b; (1) in: E. Bekker (ed.): *Aristotelis Opera*, Berolini, Academia Borussica 1981, pp. 268-313. [Reprinted: 1960]; (2) Carl Prantl (ed.): *Aristotelis De caelo et De generatione et corruptione*, Lipsiae in aedibus Teubneri, 1881. (3) W.K.C. Guthrie (ed.): *Aristotle, On the Heavens*, with an English translation, Harvard Univ. Press, Cambridge (Mass.) 1960.—P.B.

¹⁵ I repeat here partly the findings which I included in my paper ‘Der indische und der aristotelische Syllogismus’, *Bulletin de l’Académie Polonaise des Sciences et des Lettres, Classe de Philologie*, Cracovie 1932, p. 99 ff. More examples of the application of the method demonstrated above are to be found in my article ‘Anfänge der Aussagenlogik in Indien’. *Bulletin* 1933. [Both papers were in: Stanisław Schayer: *O filozofowaniu hindusów. Artykuły wybrane*. Edited by Marek Mejer. Polska Akademia Nauk, Komitet Nauk Orientalistycznych, PWN, Warszawa 1988, pp. 410-421. Their English translation is published in the present volume, pp. ???-???—P.B.]

When we express this proof correctly in one conditional sentence, the result will be theorem a well known from Russellian ‘theory of apparent variables’: $(x).\phi x \supset \psi x: \phi a: \supset \psi a$ [†] = ‘if, for each and every value of the variable x , the propositional function ϕ implies the propositional function ψ , then the propositional function ϕ implies the propositional function ψ also in case of the value $x = a$.’ In our example ϕ stands for ‘there is smoke in...’, ψ for ‘there is fire on...’, a for ‘this mountain here’. This formulation contains at the same time plain hints for a critical interpretation of the Indian terms: *upanaya* = demonstration of *pakṣa-dharmatā* is the inference rule of substitution, which allows the substitution of a concrete value = the *pakṣa* = ‘this particular mountain here’ for an indefinite *yatra yatra* in a universal proposition: *yatra yatra dhūmas, tatra tatrāgniḥ*. The resulting proposition $\phi a \supset \psi a$, which we get by application of this rule, is not formulated explicitly in the Indian syllogism, because Indian logic does not attach any importance to the completeness of proof; however, the words *tathā cāyam* indicate this step with sufficient clarity. The *nigamana* rule corresponds to the inference rule of derivation¹⁶ permits us to eliminate the *hetu* = ϕa , the truth of which has already been recognised on the basis of the implication $\phi a \supset \psi a$, and to assert the truth of *sādhya* = ψa . The terms *hetu* and *sādhya* are propositions, *pakṣa* is an individual variable (a , which is substituted for x in ϕx and ψx); *pakṣa-dharmatā* = *hetoh pakṣa-vṛttitvam* = ‘the fact that a = ‘this mountain here’ is a variable of the same propositional function ϕ which occurs as the implicans ϕx in the implication $\phi x \supset \psi x$.

Thanks to the above analysis we consequently win an important perspective to answer the question about the relationship between the Indian and the Aristotelian syllogisms. If we keep in mind what has previously been said about the genuine Aristotelian syllogism, we immediately obtain the following list of essential antitheses:

The Aristotelian syllogism:

1. is a logical theorem formulated in one conditional sentence;
2. consists exclusively of propositions of the form SaP, SeP, SiP, SoP;
3. is based, on the one hand, on the implication of two subsumptions SaM · MaP, and, on the other, on a subsumption:
SaP: SaM·MaP.⊃.SaP.
4. no individual names are allowed to be substituted for the variables S, M and P.

The Indian syllogism:

1. is a combination of inference rules;
2. consists of such propositions in which *asti* should be supplied either in the sense of a copula or in the sense of the predicate ‘exists’;¹⁷
3. is based, on the one hand, on the implication of two propositions: $\phi x \supset \psi x$ and ϕa , and, on the other, on the proposition:
 $\psi a: (x).\phi x \supset \psi x: \phi a: \supset \psi a$;
4. one may—and in the Buddhist logic: one must—substitute an individual name for the variable a .¹⁸

[†] In the original wrongly: $(x).\psi x \supset \phi x: \phi a: \supset \psi a$.—P.B.

¹⁶ The Stoic *modus ponens* $p \supset q . p: \supset .q$ corresponds in a way to this rule but cannot replace it.

¹⁷ On the importance of this difference see H. SCHOLZ, *op. cit.*, p. 60, and H. WEIL: *Philosophie der Mathematik*, p. 39.

¹⁸ In point of fact, with an interesting condition that it has to be a particular thing that belongs to any class, otherwise one would not be able to provide a homogenous exam-

All these differences enumerated above are equally important and decisive from the viewpoint of formal logic; the third one deserves attention, inasmuch as it *ad oculos* demonstrates illegitimacy of the common identification of *pakṣa*, *hetu* and *sādhya* with the three terms of the Aristotelian syllogism. In the Indian stock example, the relationship between two subsumptions is completely out of question¹⁹, and an attempt to represent the whole inference with the help of EULER's diagrams should be nowadays rejected as entirely erroneous. Even if ATHALYE²⁰, VIDYĀBHŪṢAṆA²¹, and—quite recently— STCHERBATSKY²² were convinced that the Indian syllogism can be reduced to the Barbara mood, it is simply a misunderstanding that should once and forever disappear from Indological literature.

I would conclude with a few remarks on the notion of 'anticipation'. 'To anticipate' literally means 'to foresee, preconceive' and one should hold to this meaning: the Indian syllogistics is a kind of 'foresight, preconception' of some forms of inference known to modern logic, and not a kind of 'analogy', insofar as it would presuppose a similarity or, at least, comparability of their levels of historical development, which in fact is not there. We do not compare Indian and modern logic in order to examine individual differences along with similarities, we evaluate Indian logic from the standpoint of modern logic in order to determine what is at all logical in it the way we understand it. We should begin with this question, for the understanding of Nyāya depends on it. Description of specifically Indian peculiarity, of what could be called 'the style of Indian thinking', is a task for the future; it can be the final result, but certainly not the starting point of the Nyāya research.

ple nor to form any universal rules, cf. G. Tucci, *The Nyāya-mukha*, p. 7. [Giuseppe Tucci: *The Nyāya-mukha of Dignāga. The oldest Buddhist Text on Logic, after Chinese and Tibetan Materials*. Heidelberg 1930.—P.B.]

¹⁹ The point was correctly observed in P. MASSON-OURSSEL: *La Philosophie Comparée*, Paris 1923, p. 133 [transl. into English: *Comparative Philosophy*, London 1926].—P.B.

²⁰ *Tarka-saṅgraha*, p. 233 ff. [Edited with *Dīpikā* and Govardhana's *Nyāya-bodhinī*, by Y.V. Athalye and translated by M.R. Bodas, with English notes. Bombay Sanskrit and Prakrit Series 55, Bombay 1897, 1918, 1930. Revised by Pusalkar 1963.—P.B.]

²¹ Satish Chandra Vidyābhūṣaṇa: *History of Indian Logic*, Calcutta 1920. [Reprinted: Motilal Banarsidass, Delhi, 1988.—P.B.]

²² *Op. cit.*, vol. I, p. 26.