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IT IS THE JUDGING THAT MATTERS *

Comparison, they say, is odious. If, however, it is intellectually stimulating, if it leads to a philosophical progress and if one does not confuse the issues, then engaging in it is not academically harmful. But the mode in which many textbook writers on *Nyāya-Vaiśeṣika* compare and contrast various concepts involved in *Anumānakhaṇḍa* with those of Western logic is not only intellectually unconvincing to a reflective mind but also the resultant piece of work is, upon analysis, seen to have some serious factual inaccuracies, and hence academically unacceptable. Accordingly, Jagat Pal's article *Nyāya* Inference : Deductive or Inductive' *('Indian Philosophical Quarterly', Vol. XX, No. 3)* in which he disagrees with Sharma, Radhakrishnan and Hiriyanna, is, although belated, welcome. Had he thrashed this topic earlier, many students of elementary logic and philosophy would have been on their guard while liberally attaching labels like 'deductive' and 'inductive' to an instance of *Nyāya anumāna*.

The purpose of my paper is to support the general idea involved in Jagat Pal's article. viz., The *Nyāya* inference cannot be lebelled as "Deductive" or "Inductive". But I have done so in the light of a few theoretical discussions involved in mathematical logic.

I have divided this paper into seven small parts. Part I has concentrated on the notion of syntactic relation involved in a formal

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logical system. In Part II, the focus of attention is the concept of semantic relation and its connection with the syntax. In Parts III, IV and V, I have discussed the development of the *Anumānakhaṇḍa* of *Nyāya-Vaiśeṣikas*. And finally in Parts VI and VII, I have tried to make the reader realise that there are no good grounds to compare the predominantly epistemological system of the *Nyāya - Vaiśeṣikas* with the formal systems of Western logic and hence comparison is odious.

I

Surely there are many logics. They all deal with arguments. But even a commoner in his day-to-day states of affairs takes recourse to arguments. All arguments, however, do not explicitly leap to the eye wearing neat little tags "premises" and "conclusion". Many a time one is required to extract arguments from discourses used by persons. And here what matters is how one judges an argument - whether it be a logician who does the judging or a person who is innocent of all logic. There are many different ways in which arguments may be judged. To elucidate this point, I will at once begin with the notion of formal language.

A natural language is an interpreted one. On the other hand, a formal language is capable of being completely defined or specified *without* reference to any interpretation in spite of the fact that it may be given an interpretation. If it is not capable of being defined without any reference to interpretation, then the language is not a formal language. What I mean to say is illustrated below : Suppose the alphabet of the system S' (read : "S Prime") is constituted by the following marks : A, B, C, ⊃, ~, (and). They are *merely marks*. They do not carry any meaning : they are uniterpreted. (I could have used □, ○, △, @, ▽, ✳ and ∠ as constituting the alphabet. They too are marks.) A finite sequence of these marks is called a formula, or an expression, of S', By this definition, AB~ is a formula of S'; and so are B~A, (AB), A~⊃AB(and the like. However, there is a proper subset of the formulae of S' called the set of well-formed formulae (wffe) of S' and this we now determine by laying down a recursive definition of "wff" :

(a) Mark 'A' standing by itself is a wff of S'; so is 'B'.
(b) If '$\mathcal{A}$' is a wff of S', so is ~($\mathcal{A}$) (Note that I am here using a metalogical symbol - script letter '$\mathcal{A}$' - to talk about the object language symbols.)
(c) If '$\mathcal{A}$' is wff of S' and if '$\mathcal{B}$' is a wff of S', then ($\mathcal{A}$)⊃($\mathcal{B}$) also is a wff of S'.
(d) The formulae which are well-formed according to the above (a), (b) and (c) alone are well formed formulae of S'. (Extremal Clause)

(Again note that the notion of wff is system-relative.) Here is an effective procedure which would enable one to decide whather or not a formula is a wff of S'.

Problem : Are A ⊃A, B ⊃ ~~B, B ⊃(A⊃B), A~ and (A⊃B)~ wffe of S' ? While answering for the first three in the affirmative and for the last two in the negative, a slight reflection on to the problem and its solution would make one realise that what one judges is merely a certain type of relation among the marks of S'. No meaning is involved here. No interpretation has yet gone into the picture. B⊃ (A⊃B) is merely a sequence of seven marks of S'. These marks stand in a particular relation. This relation is called SYNTACTIC relation, and the language of S' is a FORMAL LANGUAGE. Let us call this language L' (read : 'L prime'). L' and L" (read : 'L double prime') would be two different formal languages if the set of wffe of L" is not exactly the same as the set of wffe of L'. Inversely, if they are same, then L' and L" are not two different formal languages. Thus logicians tend to identify a formal language with the set of its wffe. (Note that strictly speaking, a formula is an abstract object; a mark or a set of marks is a token of a formula.)

We move a step forward. A proper subset of the set of wffe may be chosen by the logician as the set of axioms of S'. Here is a tendency to build an axiomatic theory. Suppose one of the axioms chosen of S' is (A⊃(B⊃C)) ⊃((A⊃B)⊃(A⊃C)). What is significant to note is that we are still at the syntactic level. (One may have an axiom schemata set instead of an axiom set. e.g., $(\mathcal{A} \supset (\mathcal{B} \supset \mathcal{C})) \supset ((\mathcal{A} \supset \mathcal{B}) \supset (\mathcal{A} \supset \mathcal{C}))$ is an axiom schema which would generate infinite number of axioms.)

Then, n number (n > 1) of rules of inference are introduced as *merely a finite set of relations among the wffe of S'.* Thus what is specified is a *deductive apparatus* for L' and what we now have in hand is a *formal system.* See the summary in the table below :

Table 1 :

1.	L' = { all wffe of L' }
2.	{wffe of L'} determined by specifying [the alphabet of L'] and [recursive df. of 'wff']
3.	[{Axioms} + {Transformation Rules}] = Deductive Apparatus
4.	[L' + Deductive Apparatus] = Formal System S'

Once having got clear the notion of a formal system, one should comprehend the notion of proof *in / within* a formal system. A proof in a formal (axiom) system is a sequence of wffe of formal language of that formal system which would satisfy purely syntactic requirements and which would not involve any meaning. To be more specific, a proof in S' is a finite (but non-empty) string or sequence of wffe of S' such that each formula of that sequence is (a) : an axiom of S' or (b) : an immediate consequence of the preceding formulae in the sequence by the rule of inference of S'. The proof is a proof of the last formula in the string. Let me illustrate it as follows :

Suppose S' has $B \supset (A \supset B)$ and $(A \supset (B \supset C)) \supset ((A \supset B) \supset (A \supset C))$ as axiom schemata AS1 and AS2, respectively. Suppose further that the transformation rule of S' is : "B is the direct consequence of $A \supset B$ and A." Now consider the proof of wff $A \supset A$:

1) : $(A \supset ((A \supset A) \supset A)) \supset ((A \supset (A \supset A)) \supset (A \supset A))$ [Instance of AS2)

2) : $A \supset ((A \supset A) \supset A)$ [Instance of AS1]

3) : $(A \supset (A \supset A)) \supset (A \supset A)$ [1, 2, by Transformation Rule]

4) : $A \supset (A \supset A)$ [Instance of AS1]

5) : $A \supset A$ [3, 4, by Transformation Rule]

Thus $\vdash_{S'} A \supset A$ (Reading : $A \supset A$ is a *syntactic* consequence in S', or is *deducible* in S', from zero hypothesis.)

(Note : The numerals in parentheses and the "justifications" in the box brackets do not form any part of the proof.)

(Note : S' in $\vdash_{S'}$ indicates that the notion of proof is system-relative.) And as there exists a proof of $A \supset A$ *in* S', $A \supset A$ is a theorem in S'. A theorem *of (in / within)* a formal system is a wff of the formal language of that system that would satisfy certain purely syntactic requirements and would not involve any meaning. To be more precise, a wff F is a theorem of S' if and only if (iff) there is some proof *(as defined above)* in S' whose last formula is F. (The above notion of proof is labelled by some logicians as Categorical Proof to distinguish it from the notion of a Hypothetical Proof / Derivation. A hypothetical proof is a finite (but non-empty) sequence / string of wffe of S' such that each one of which is either an axiom of S' or an immediate consequence of the two preceding formulae in the sequence by the rule of inference of S' or a wff of S' which is a hypothesis. Thus when we say that wff F is a theorem of S' if there is some proof in S' whose last formula is F, what we have in mind is a *Categorical Proof* and not a Hypothetical Proof.)

Not all formal systems, however, are axiomatic. Logicians now a days prefer aximoless systems (Natural Deduction Systems) and which involve only transformation rules satisfying purely syntactic requirements. Suppose S" (read : 'S double prime') is a formal system and p, q, r, $\sim$, v and $\supset$ constitute its alphabet. The logician lays down a recursive definition of 'wff' of S" and has two transformation rules :

R1 : "q is a direct consequence of p $\supset$ q and p. "

R2 : "q is a direct consequence of p v q and $\sim$ p."

Problem : "Is r a syntactic consequence in S" of the formulae

$\sim$ p, $\sim$ p $\supset$ (q v r) and $\sim$q ?"

Solution : Yes, it is; the proof is as follows :

$\sim p$

$\sim p \supset (q \vee r)$

$\sim q$

$q \vee r$

r

Thus, $\sim p,\ \sim p \supset (q \vee r), \sim q \vdash_{S'} r$

(I could have written the proof as :
" $\sim p \ \ \sim p \supset (q \vee r) \ \sim q \ \ q \vee r \ \ r$")

II

From $\mathcal{A} \vdash_{S'} \mathcal{B}$, we now turn our attention to $\mathcal{A} \models_{S'} \mathcal{B}$. While the former reads as " *B* is a *syntactic* consequence is S' of *A*" the reading of the latter is "B is a SEMANTIC consequence in S' of A". Meaning of $\mathcal{A} \models_{S'} \mathcal{B}$: "For every interpretation of the language of S' which makes *A* true, also makes *B* true; i.e., there is no interpretation in the language of S' which makes '*A*' true and '*B*' false.

Explanation : While *syntactic* relation is concerned with formal languages or formal systems *without* essential regard to their interpretation, *semantic* relation is concerned with the *interpretation* of formal languages. While syntactic relation is the relation among different symbols / marks of the formal language, semantic relation is the relation between a symbol / mark and what that mark stands for or designates. Let us augment our list of marks of L' by adding • and v, and also modify the recursive definition of 'wff' so as to make $A \vee \sim A$ and $\sim (A \cdot \sim A)$ wffe of L'.

The reading of $A \vee \sim A \models_{S'} \sim (A \cdot \sim A)$

would be : " $\sim(A . \sim A)$ is a *semantic* consequence in S' of $A \vee \sim A$" . Now judge the logician's *interpretation;* call it I' (Reading: "I prime.")

Table 2 : Interpretation I'

Mark 'A' is a propositional letter of S'.
A proposition is either true or false, but not both.
~ is the sign of negation; it is a propositional operator.
The negation of a true proposition is false.
The negation of a false proposition is true.
• is the sign of conjuction; it is a propositional operator.
v is the sign of disjunction; it is a propositional operator.
A conjunction is true if all its conjuncts are true; otherwise, false.
A disjunction is true even if one of its disjuncts is true; otherwise, false.

On I', A v ~A turns out to be true; and I' also makes ~(A•~A) true. Therefore, A v ~A $\models_{S}$ ~ (A• ~A).

Let us be more specific about the definition of 'Interpretation of L' : 'Definition : 'Interpretation of L' ' may be defined as an assignment of one or other of the truth values - truth, falsity - to each propositional symbol of L' and an assignment to the connectives / operators of L' of their conventional truth-functional meanings.

Thus we have introduced *semantics* for L' which relates each symbol or a group of symbols to the abstract entities - Truth and Falsity. (Note : Truth and Falsity are abstract objects. They are not linguistic symbols but objects denoted by symbols.)

Thus given L', either we may specify a deductive apparatus for it or we may define the concept of an interpretation of L' or we may do both. That is, we may delve into the Proof Theory or the Model Theory or develop both. ("An interpretation I is a model of a formula of L iff the formula is true for I.") A logician my deal with either its syntactic relations or its semantic relations or both. And it is desirable that the syntax of a system coincides with its semantics. A logician does aspire for a formal system in which the wffe which are syntactically valid alone are semantically valid. (Definition of 'Semantic Validity of Logical Truth' : $\models_{L'} A$ "Formula A comes out as true for all possible interpretations assigned to the symbols of language L".) In fact this would be a necessary condition for the *Soundness* of a formal system. S' is "sound" (in the weak sense) iff ($\vdash_{S'} A \supset \models_{L'} A$) (i.e., if '*A*' is a theorem in S', then 'A' is a tautology (logical truth) of L'). Again, S' is "sound" (in the strong sense) iff ($A \vdash_{S'} B \supset A \models_{S'} B$).

Let us now consider what I had stated earlier : "There are many different ways in which arguments may be judged". The earlier approach among logicians was to talk about "types" of arguments - Deductive and Inductive. Given an argument *A* /∴ *B*, they would raise the question : "Is this argument deductive or inductive ?" The tendency was to have water-tight compartments. Some of the modern logicians, however, prefer to say not that there are two types of arguments, deductive and inductive, but that the arguments can be judged by deductive or inductive criteria / standards. Given an argument *A* /∴ *B*, it may be assessed as deductively valid or deductively invalid but inductively strong or neither. As noted, the notion of validity is system-relative, and within a system, validity can be defined both syntactically and semantically. If $A \vdash_{S'} B$ and if $A \models_{S'} B$, then the argument is *deductively valid* in S' both syntactically and semantically. In assessing the argument by deductive standard, what we judge is whether or not '*B*' follows of necessity from '*A*' and while judging the inductive strength of *A* / ∴ *B*, we judge whether '*A*' gives a certain degree of support to '*B*'. It may be less than conclusive support. An argument is inductively strong if it is improbable that its premises should be true and its conclusion false. Judged in this way, it would follow that if *A* /∴*B* is *deductively valid,* then it is also *inductively strong.* If we are judging its deductive validity, we would say that '*B*' follows of necessity from '*A*' in S' and that there is no I' in S' which would make '*A*' true and '*B*' false. If we are judging the inductive strength of this very argument, we would say that here the probability of '*A*' being true and '*B*' false is zero.

Argument : ' If Sucharita was travelling in the Ladies' Special train,
α She jumped out while seeing the smoke in the

compartment; and as she was travelling in the said train, she jumped out while seeing that smoke.'

The specific argument form, viz., p⊃q, p /∴ q, of α is valid in as much as it does not have a single substitution instance having true premises and false conclusion. A finite truth table for it would represent all possible (infinite) substitution instances of it and would enable us to "see" that α is valid. The reductio ad absurdum approach would, on the other hand, enable us to "see" that accepting the premises of α as true and rejecting the conclusion as false would yield an inconsistency / contradiction.

p ⊃ q	p	q
T T F F	T	F

Thus the argument

$S \supset J$
S
$\therefore J$ is valid

$S \supset J, S \vdash_x J$

Also S⊃J, S $\vdash_x$ J in accordance with the rule of inference which is accepted by many propositional Axiom Systems and many Axiomless (Natural Deduction) Systems too, and which is labelled usually as Modus Ponens or Detachment, the reading of which is "q is a syntactic consequence in system x of p⊃q and p". Thus while judging α by deductive standard, we would say that it is *deductively valid* both *syntactically as well as semantically*. But while judging the same argument by employing the inductive standard, we would say that the *probability* of its premises being true and its conclusion false is zero, and hence it is *inductively strong*.

***Argument* ℬ : "If Rehana was one of the five ladies in the First Class compartment of that train, then she jumped out while seeing the smoke. So did Arnavaz, Tehmina and Meenakshi, if they were the co-travellers. Therefore if Sucharita is the fifth lady of the group, then she too jumped out."**

R ⊃ J	A ⊃ J	T ⊃ J	M ⊃ J	S ⊃ J
F T F	F T F	F T F	F T F	T F F

$\mathcal{B}$ is deductively invalid but inductively strong. While judging $\mathcal{B}$ by employing the deductive standard, we would say that the conclusion does not follow of necessity from the premises. Accepting the premises as true and rejecting the conclusion as false does not yield any contradiction. But while judging the same argument by employing the inductive standard, we would say that the *probability* of the premises being true and the conclusion being false is low. The premises give *"high degree"* of support to the conclusion. Accordingly, $\mathcal{B}$ is *inductively strong*.

Argument : "Sucharita had once reacted with fear five years back.
Γ Therefore if she jumped out of the compartment today, then she is said to have phobic reactions."

Not only is Γ deductively invalid, it is also inductively weak. The premise gives a low degree of support to the conclusion.

WHERE DO THE NYĀYA-VAIŚEṢIKAS STAND IN *THIS* NETWORK ?
DO THEY FIND A PLACE TO STAND ON *THIS* PLATFORM ?

We need to examine their theory closely.

III

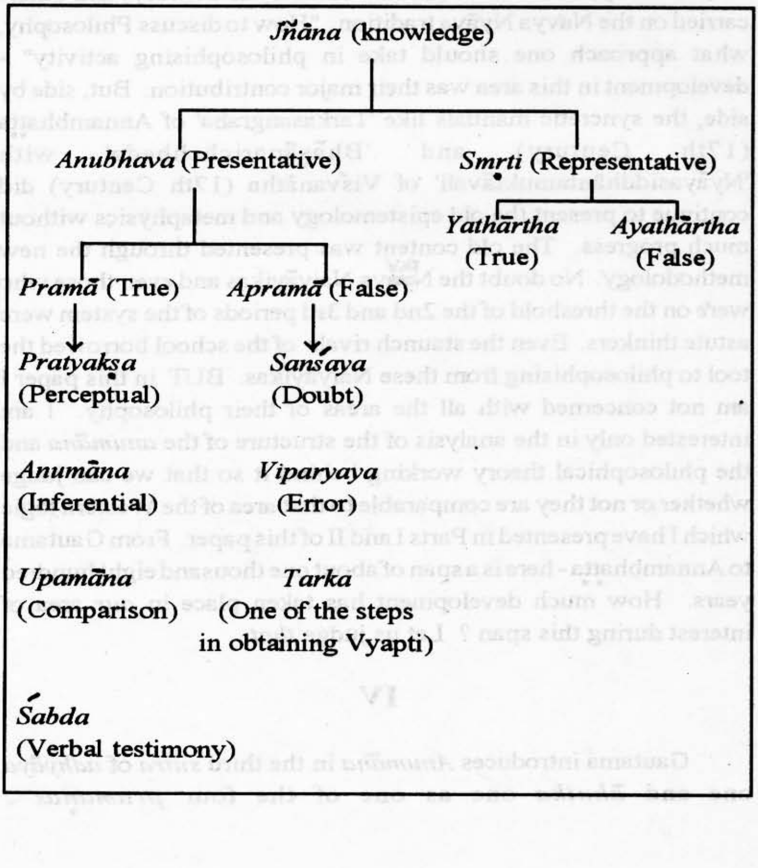
A good way to judge the Nyāya-Vaiśeṣika system (as some scholars have rightly done) is to study it in three stages : The pre-Dignāga period, the conflict period and the post-Dignāga period. The first is the period of origin (c.300 B.C. to 5th Century A. D,) which may include Kaṇāda, Gautama, Vātsyāyana and Praśastapāda. The second period (5th C. A. D. to 11th Century A. D.) is the period in which the system grew dynamically while defending its realistic standpoint against the attacks of the rivals, especially the Buddhist Dignāga school. Very many concepts introduced by the *sūtrakāra* Gautama (C. 200 B.C.) evolved and took different shapes when they were discussed by Uddyotakāra (end of the 6th Century A.D.) This evolution went on through Jayantabhaṭṭa (begining of the 9th Century A. D.), Bhāsarvajña, the Ekadeśin Naiyāyika (close of the

9th Century), Vyomaśiva, Vāchaspatimiśra (flourished 841 A.D.), Śridhara and Udayanāchārya (both belonging to the close of the 10th century.) The picture again changed when Śivāditya (10th Century) officially united the Nyāya and the Vaikeṣika to form the syncretic Nyāya-Vaiśeṣika system. And then with the introduction of the Navya Nyāya in the 12th century A. D. through 'Tattvachintāmaṇi' of Gangeśa, there was a shift of attention; ***methodology*** became the focus. The Bauddhas had already disappeared from India during 11th century A.D. They were not here to keep the Nyāya-Vaiśeṣikas on their toes; and therefore the methaphysics of the system decayed. From 11th century to about 17th century, we have the third period, the post-Dignāga period. Vardhamāna (12th Century), Jayadeva Pakṣadhara (15th Century), Raghunāth Siromaṇi (beginning of the 16th Century).Gadādhara (middle of the 17th Century) and others carried on the Navya Nyāya tradition. "How to discuss Philosophy, what approach one should take in philosophising activity" - development in this area was their major contribution. But, side by side, the syncretic manuals like 'Tarkasangraha' of Annambhaṭṭa (17th Century) and 'Bhāṣāparichchheda' with 'Nyāyasiddhāntamuktāvali' of Viśvanātha (17th Century) did continue to present the old epistemology and metaphysics without much progress. The old content was presented through the new methodology. No doubt the Navya Naiyāyikas and even those who were on the threshold of the 2nd and 3rd periods of the system were astute thinkers. Even the staunch rivals of the school borrowed the tool to philosophising from these Naiyāyikas. BUT in this paper I am not concerned with all the areas of their philosophy. I am interested only in the analysis of the structure of the *anumāna* and the philosophical theory working behind it so that we can judge whether or not they are comparable to that area of the Western logic which I have presented in Parts I and II of this paper. From Gautama to Annambhaṭṭa - here is a span of about one thousand eight hundred years. How much development has taken place in *our* area of interest during this span ? Let us judge *that*.

IV

Gautama introduces *Anumāna* in the third *sūtra* of *adhyāya* one and *āhnika* one as one of the four *pramaṇas* :

"Pratyakṣānumānopamānaśabdahpramāṇani." (1/1/3) He regards *anumāna* as a *pramāṇa*. This is a very significant statement in our context. The word *Pramāna* is understood as a means to *true* knowledge. (Unlike many thinkers, the Nyāya philosophers do admit the distinction between true and false instances of knowledge.) And once *anumāna* is regarded as a *pramāna,* it would follow on their ground that there is no such thing like "false inferential knowledge"! If *anumāna* (or any other *pramāṇa*) operates, the result has to be true knowledge; and if error arises, then we would be forced to say that no *pramāṇa* has operated. On the Nyāya ground, one can talk about false knowledge but one cannot talk about false inferential knowledge. This is because, ex-hypothese, *anumāna* falls under *pramā* while *Viparyaya* (error) falls under *Apramā*. See Table III below :



1/1/3 as quoted above is the beginning of the analysis of the sixteen epistemological topics enumerated in the very first *sūtra*: "*Pramāṇa, Prameya, Sanśaya Prayojana, Dṛṣṭānta, Siddhānta, Avayava, Tarka, Nirṇaya, Vāda, Jalpa, Vitaṇḍā, Hetvābhāsa, Chhala, Jāti, Nigrahasthanānām tattvajñānāt niśreyasa adhigamah.*" (1/1/1) Judge the context. Gautama says: "It is through the correct understanding of the nature of these sixteen epistemological "categories" (*Pramāṇa*, etc.) that one attains the Highest Good / *Mokṣa* / Liberation." See the ulterior motive. The fifth *sūtra* mentions three kinds of *anumāna*: ". . . *trividham anumānam Pūrvavat Śeṣavat Sāmānyatodṛṣṭam cha*" (1/1/5). And it is only in the 32nd *sūtra* that Gautama introduces the constituents of reasoning: "*Pratijñā, Hetu, Udāharaṇa, Upanaya Nigamanāni avayavah*" (1/1/32). Analysis of these is in the *sūtras* 33 through 39. The 33rd *sūtra* reads as: "*Sādhya nirdeśah pratijñā*" - "*Pratijñā* is the declaration of the sādhya". As an example of theis we may have the assertion: "*Parvato Vahnimān*". *Vahni* (fire) the extension of which is to be demonstrated on the *parvatah* (mountain), is the sādhya. The 34th *sūtra* defines 'hetu', the second *avayava*; "*Udāharaṇa sādharmyāt sādhyasādhanam hetuh*" (1/1/34). "Hetu is the *sādhana* (which makes known) the *sādhya* through its similarity to the *udharaṇa*." Notice an important point. Gautaa says: "*Hetu* is the *sādhana*". He does not say that *vyāpti* is the *sādhana;* he does not consider *parāmarśa* as the *sādhana*; he says "*Hetu* is the *sādhana*". Glimpses of *vyāpti* can be seen much later - in '*Vātsyāyana bhāṣya*'. There is a span of about 500 yaers between Gautama and Vātsyāyana. Anumāna in 'Nyāyasūtra' is still in its infancy. As an example of this second *avayava*, we may have the assertion: "*Dhoomāt*". We assert the existence of fire on the mountain because of the presence of smoke there. But how does the *hetu* (the presence of smoke on the mountain) work as the *sādhana* or *sādhya*? The *sūtra* answers: "*Udāharaṇa sādharmyāt*" - "through its similarity to the *udharaṇa*". The 35th sutra continues the point. "*Tathā vaidharmyāt*" (1/1/35) - "And also through dissimilarity". A lake is an instance which is dissimilar (because of the absence of smoke). Thus the kitchen hearth has been observed to have smoke and fire; but the lake has been observed to have the absence of both. In this way, it is reasoned that the mountain like the kitchen hearth has the presence of fire as there is the presence of smoke. Again, unlike the lake, the mountain has the presence of fire as there is no absence of smoke!

As the second *avayava, hetu,* is defined in terms of *udharaṇa,* the onus to define '*udharaṇa*' itself is very much there on Gautama. And this leads us to his 36th sutra: "*Sādhyā sādharmyāt tat dharma bhāvaḥ dṛṣṭānta udāharaṇam.*" (1/1/36) "*Udharaṇa* is that *dṛṣṭānta* which possesses a property of the sadhya, by similarity." As a concrete instance of *udāharana,* we may take the assertion: "*Yathā mahanaseḥ*". Thus the kitchen hearth (*udāharaṇa*) is the *dṛṣṭānta* which possesses smoke, a property of fire (*sādhya*), as on *parvataḥ*. Notice what Gautama says: "*Udāharaṇa* IS a *dṛṣṭānta*; he does not say that *Udāharaṇa* is the combination of *vyāpti vākya* and a *dṛṣṭānta*! He identifies *udāharana* with *dṛṣṭānta*. And what is a *dṛṣṭānta*? His definition in the 25th *sūtra* reads as follows: "*Laukika parīkṣāṇām yasminārthe buddhi sāmyam sa dṛṣṭānta*" (1/1/25) "*Dṛṣṭānta* is that instance about which an ordinary man and an expert entertain the same views." Thus the *vādin* and the *prativādin* both agree that *mahānasaḥ* is an instance where smoke and fire both are found.

After *udāharaṇa* comes *upanaya,* the fourth *avayava,* and this is defined in the 38th *sūtra*: "*Udharaṇa apekṣah tathā iti upasaṁhāra na tathā iti vā sādhyasya upanayaḥ*" (1/1/38) - "With reference to the udāharaṇa of the sādhya when we sum up (our assertions in the form) "Like it" or "Unlike it", it is *Upanaya.*" To illustrate: If "*Yathā mahānasah*" is the *udāharaṇa* under consideration, then the *upanaya* will be: "*Tathā chayam parvataḥ*" - (So like the kitchen hearth) there is smoke on this mountain.

And as regards the fifth *avayava, nigamana,* Gautama says: *Hetu apadeśāt pratijñāyāḥ punarvachanam nigamanam.*" (1/1/39). "*Nigamana* is the re-statement of the *pratijñā* as a result of adducing ***hetu*** as the cause." "*Tasmāt vahnimān asau parvataḥ*" - "Therefore, in this way, there is fire on the mountain" states the conclusion in our example.

Putting now together the fragments in order, let us see how a concrete example of an argument gets structured, *as conceived by Gautama,* (c.200 years B.C.).

"*Parvato vahnimān*" (Pratijñā)
"*Dhoomāt*" (Hetu)
"*Yathā mahānasaḥ*" (Udāharaṇa)
"*Tathā chāyam parvataḥ*" (Upanaya)
"*Tasmāt vahnimān asau parvatah*" (Nigamana)

This is the starting point of all anumana in the Nyaya system. Of course Gautama needs to be appreciated for having made a distinction between an instance of knowledge which is direct (i.e., without an element of any inference) viz. *Pratyakṣa* Jñān and an instance of knowledge which is not sākṣāt pratitiḥ viz. *anumiti*. However, surely this cannot be regarded as a fully developed anumāna. It is a kalikā, a bud, a growing *anumāna*.

V

How much progress (in our present area of interest) have the Naiyāyikas made while going through the Conflict Period and the Post-Dignāga period? Let us judge *that*. So far as the structure of *anumāna* is concerned, Annambhaṭṭa's 'Tarkadīpikā' represents the spirit of the syncretic school.

"*Pratijñā hetu udāharaṇa upanaya nigamanāni panchāvayavaḥ.*
Parvato vahnimān iti pratijñā
Dhoomavattvāt iti hetu
Yo yo dhoomavān sa sa agnimān, yathā mahānasaḥ iti udāharaṇam
Tathā chāyam iti upanaya
Tasmāt tathā iti nigamanam."

This is how the 46th sūtra of 'Tarkasaṅgraha' reads after in a distinction between *Svarthānumāna* and *Parārthanumāna* having made in the previous *sūtra*. While commenting on it, the 'Dīpikā' defines *'pratijñā'* as *"Sādhyavattāyā pakṣavachanam"* - "Speaking of *pakṣa* as possessing *sādhya* is *pratijñā*." Its job is to make the listener mentally set for *nigmana*. The 'Dīpikā' continues: ". . . *lingapratipādakam vachanam hetuḥ*" - "*Hetu* is the statement which declares the *liṅga* (the charecteristic mark of *sādhya*)." Then comes the definition of *'udāharaṇa'*: *"Vyāpti pratipādakam udāharaṇam."* - "*Udāharaṇa (avayava)* is that which declares the *vyāpti*". Another definition in one of the later editions of the 'Dīpikā' with the commentary of Nīlakantha, printed at Benares in 1875 (which possibly is a later interpolation) includes even *dṛṣṭānta*. It reads thus: *"Vyāptipratipādakam dṛṣṭānta vachanam udāharaṇam"* - *"Udāharaṇa avayava* is that which declares the *vyāpti* and *dṛṣṭānta."* And the same later edition puts forth a very accurate definition of '*upanaya*': *"Vyāpti viśiṣṭa liṅga pratipādakam vachanam upanaya."* - *"Upanaya (avayava)* is the statement which declares the *liṅga* as qualified by *vyāpti*." Accordingly, *"Tathā chāyam"* gets a detailed analysis so as to read as: *"Vahni vyāpya dhoomavānāyam parvataḥ"* - *"Dhoom* which is the *vyāpya* of vahni is on the mountain." Finally, the 'Dīpikā' defines 'the purpose of *nigamana* as follows : *Abādhitatvādikam nigamana prayojanam"* The purpose of nigamana is *to exclude the possibility of any contradiction* as to the existence of *sādhya*." This last statement is very significant in our context. It represents the Naiyāyikas' claim to the certainty of the conclusion!

In the light of what has been discussed so far, part I through Part V, I believe I have cleared the ground for the reader to judge whether one can liberally attach labels like "deductive" and "inductive" to a Nyaya argument.

VI

The label "deductive", as defined above, cannot be tagged to a Nyāya argument. Syntactic validity and semantic validity are *system-relative* and *apply only to formal arguments*. The Nyāya system lacks a formal language. Naiyāyikas did not develop any formal system. Perhaps they did not feel the necessity of developing one. The whole platform on which the Naiyāyikas stand, the whole context in which their *Anumānakhaṇḍa* was developed, is altogether different from the one in which the Western logic has got developed. Is it then a wise move to attach Western labels of formal logic to an epistemological theory of an Indian system ?

Further, if the Naiyāyikas claim the certainty of the conclusion of their inference, as noted above, then while judging their arguments by the inductive standard it would turn out that for each and every argument of theirs, the probability of the premises being true and the conclusion false would be zero. Their system will not be able to permit a range of degrees of probability. We will not be able to say (in their system) that here is an argument with low degree of probability or moderately high degree of probability or very high degree of probability. Therefore how can one apply even the label "induction" to Nyaya argument ?

Sometimes it is suggested that induction gets involved (in the Nyāya system) in the process of the formation of a *vyāpti*. No doubt, in the six-fold procedure, they begin with specific experiences. The first four steps - *Anvaya, Vyatireka, Vyabhichārajñānavirah* and *Upādhinirasaḥ* - are discussed by the Naiyāyikas as sets of specific experiences to be gone through by an individual before making a universal statement (*vyāpti*). This makes us think that they are now about to take an inductive leap. But they disappoint us by bringing *Sāmānyalakṣaṇapratyakṣa* as the sixth step. (Of course, the fifth step viz., *Tarka*, is a kind of hypothetical argument which they have introduced in the procedure but, mind well, it, by itself, falls under *Apramā*. (See Table III above.)

VII

But is there nothing in Western logic with which the Nyaya anumana can have some affinity?

Formal arguments do not cover the whole of the domain. There are informal arguments too. And while judging this latter kind of arguments, ordinarilly, we "somehow" separate "good" from "bad", "correct" from "incorrect" ones. When pressed upon for the details of this "somehow", we realize that we, in judging an argument as "good" / "sound", intuit that its conclusion follows from its premises, that its premises couldn't be true and conclusion false. If this be the case, if this is what is judged in an informal argument, then is not the concept of validity again brought into the picture? When we judge an informal argument to be "valid", it is NOT the same as the notion of "System-relative validity" as discussed above. Syntactic relations are not judged. The concept of validity here, in the domain of informal arguments, is labelled by some logicians as *extra systematic validity*". When we merely judge relations among the symbols of a formal language, we are said to have judged the syntax. When we relate the sets of symbols to the things/objects which are symbolized (Note: Truth and Falsity are abstract objects, as discussed above), then we are said to have brought in semantics into the system. But when, in a universe of discourse which is not a formal system, the symbols get related to the person who uses them, we are said to have brought in the notion of "semiotic". Perhaps the Naiyāyikas' *Anumānakhaṇḍa* comes nearer to this last-mentioned area of logic I, as *pramātṛ*, take recourse to an instance of *svārthānumāna* to yeild true knowledge. Again, I, as a *vādin*, take recourse to an instance of *parāthānūmāna* to convince my opponent about an instance of *pramā*.

However, the fact that an epistemological system like that of Nyāya-Vaiśeṣka is charecterised by this concept of extra-systematic validity is, by itself, not a very great achievement in the *area of logic*. This is because the connections between the concepts of system-relative validity (syntactic and semantic) and the concept of extra-systematic validity cannot be brushed aside. The two should *not* stand completely unrelated. Let me elucidate this point. Surely a reflective thinker often begins with ordinary experiences, informal conception of arguments, extra - systematic validity, in formal notion of tautologyhood and the like. But he, as a logician, does not stop here, He refines these informal conceptions. He tries to formalise informal arguments and aims at representing them in very rigorous terms.. He develops a formal system through the development of a formal language and a deductive apparatus (see table 1 in part I). Once a logical system carries the label of being "formal" then it ought to satisfy the formal properties of Soundness, Consistency and Completeness. Thus given an informal argument which is valid in extra-systematic sense will, when formalised, be valid in the system. Inversely, an informal argument which is valid in the extra-systematic sense, when formalised, will be invalid in the system. Of course there are challenges to certain parts of this explanation coming from the thinkers who advocate Relevance Logic but any detailed discussion on that, I believe, would be beyond the scope of this paper and hence I would be content to leave the matter here while resounding my initial opinion that where there is no good ground for comparison, comparison is odious.

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