PROBLEMS OF TRANSCRIBING *AVINĀBHĀVA* INTO PREDICATE LOGIC

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1. Introduction

Translating ancient logical texts into modern symbolic logic can be a valuable method of getting access to an otherwise incomprehensible train of thought. For this intention, one should not impose boundaries on using *any* available symbolic or graphical technique which supports creative experiments of decoding a difficult text

Translations of this kind, however, may lead the interpretation into directions which are totally unrelated to the given basis-text.[1] Representing a definition or an argument in symbolic form, carries the risk of severely twisting the underlying ideas. Thus the use of modern symbolic logic is often of doubtful value for interpretational purposes.

One main reason for this problem is the prevalent opinion that modern symbolic logic is a universal and neutral instrument, the use of which automatically guarantees an impartial and complete analysis. This, however, is not true.

Predicate logic, besides its intricate syntactical system, possesses it's own standard semantics which, in turn, results from a standard basis-ontology. These presuppositions of predicate logic are bound to interfere with the philosophical background of an ancient logic.

2. From *huparchein* to *vyāpti* and *avinābhāva*

2.1. **Frege on Aristotle's logic.** My first example concerns ancient Greek syllogistic. Much can be learned from this example, because around 1900 early modern logicians made many mistakes in their attempts to "modernize" Aristotle – mistakes which some scholars of Indian logic have been constantly repeating in their proper field of research since about 1930. Frege, the inventor of modern predicate logic, presented his by now classical symbolization of Aristotelian logic already in his fundamental *Begriffsschrift* [Fre67], dating from 1879.

One central concept of Aristotelian syllogistic is the *universal positive proposition* connecting two different terms S and P. It reads as follows:

$$\text{Every } S \text{ is } P$$

or, as Aristotle said,

$$P \text{ belongs to } \textit{(huparchei)}\ S.$$

[1] I do *not* talk about formal mistakes which, by the way, are present in almost any paper on this subject – ranging from simple "syntax errors" to a dadaistic use of symbolic logic.

Frege symbolized this (albeit in his own, different notation) as

$$\forall x(Sx \to Px). \tag{1}$$

which says: "For all individuals x: If x is (or: has the property) S , then x is P, too."

While this sounds plausible, the formula (1) nevertheless creates formal problems which are totally absent from Aristotle's original logic –a fact which caused logicians like Russell and Quine to talk about the faults of Aristotle's system. Today we know that this problem is an artefact of this special translation, and that there are better alternatives.[2]

2.2. **Schayer on *vyāpti*.** The first application of modern predicate logic to the field of Indian logic took place around 1930, when the young Polish indologist Stanisław Schayer met the famous logician Łukasiewicz. Schayer studied the basics of modern predicate logic, and he presented an interpretation of the "Indian syllogism" within a predicate logical setting.[3]

Schayer's papers on *Nyāya* are not very convincing, to say the least.[4] Here I will only mention one of his central formulas. It is his *statement of vyāpti* which established the connection between *hetu* H and *sādhya* S:

$$\forall x(Hx \to Sx). \tag{4}$$

Schayer's *vyāpty* has exactly the same form as Frege's predicate logical translation of Aristotle's formula, (1)! We will address this fact later on.

2.3. **Oetke on *avinābhāva* .** From now on, I will concentrate on Claus Oetke's monograph *Studies on the doctrine of trairūpia*[5] because a major part of his arguments is based on the use of predicate logic in a manner which is typical of the problematic role symbolic formal logic plays in the Humanities. In his *Studies* , Oetke is concerned with the exact relation of the term *avinābhāva* of Vasubandhu's *Vādavidhi* to the Theory of *trairūpya*.

This methods stands and falls with the adequate interpretation and symbolization of the central term *avinābhāva*, because everything which follows depends directly on the symbolic representation of that term.

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[2]see e.g. [Nov80]. One of the basic rules of ancient Greek and medieval logic is the so called "subalternation" which reads

From "All S are P" it follows that "Some S are P"'.

Frege symbolized "Some S are P" by

$$\exists x(Sx \wedge Px), \tag{2}$$

and thus "subalternation" will be, in his system, translated into

$$\forall x(Sx \to Px) \to \exists x(Sx \wedge Px) \tag{3}$$

This, however, is *not* a theorem of predicate logic! – While all this has been known since the great Polish logician Łukasiewicz published his book [Lu57] on Aristotelian logic in 1952, and since Corcoran's papers on Aristotelian logic during the beginning 70's of the last century, modern textbooks on logic still reproduce Frege's formulas.

[3]See his paper [Sch32].

[4]See [Gla04] for a detailled discussion of Schayer's method.

[5][Oet94]

In the chapter titled *The inseparable connection*, the author cites the most important passages from Vasubhandu's *Vādavidhi* together with his own translation and that of Frauwallner. Here we will reproduce one of these passages:

> **Def.I** *tādṛgavinābhāvidharmopadarśanam hetuḥ*
> "The (logical) reason is the pronouncement of a property which does not occur without a such (=which is inseparably connected with a probandum)."

Oetke then starts translating *avinābhāva* into the symbolic "language" of predicate logic[6]. The result of this endeavor which we will comment on later, is the following formula:

$$\forall x(Hx \rightarrow Sx). \tag{5}$$

Strikingly, this is exactly the same formula which occurs in Schayer's translation of *vyāpti* and in Frege's formula for Aristotle's *huparchein*.

Does this fact point to a common basis or a close connection of the corresponding concepts, or is this simply due to the coarseness of the special predicate logic formulation? I would rather say that this is simply lack of accuracy of discrimination. It reminds me of a Chinese cook, who was a master of various foreign cuisines. The only problem was that all his food – even Italian spaghetti and Norwegian salmon – had the typical taste of local Shanghai dishes ... By the way, his Chinese clients did not realize this – however, his Italian and Norwegian guests did!

The main problem with this formula is, however, that its semantical content and its ontological presuppositions do not have any relation to the ancient theories which it is supposed to translate. We will address this point in the next section.

3. Logic and ontology

Each system of symbolic formal logics has an intended, or standard semantics which is closely connected to certain ontological concepts, i.e. to ideas of what kind of things the symbols stand for, and in which way they are related to each other.

Modern predicate logic, due to its historical development, also has its own simple standard semantics: It "talks" about *individuals* a, b, ... possessing *properties* P, Q, ... The basic formula Pa signifies that an individual has the property P.[7]

3.1. Things, and "things"...

Directly after his definition **Def.I**[8], Oetke translates a passage of the *Vādavidhi*:

> *Condition* 1. "A thing [= H; K.G.] which never occurs when such a [thing] [= S; K.G.], i.e. [a thing] of the same kind as the thing which has to be proven .... does not exist without a such."

Let us compare this to Oetke's own restatement (loc.cit. p. 12) which differs considerably from the original wording (for sake of comparison with Condition 1, I changed Oetke's A to H, and B to S):

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[6] pp. 12-16 of his *Studies*

[7] There are, in addition, higher-order predicate symbols and corresponding higher-order relations.

[8] Oetke, loc.cit. p. 11

Condition 2. "**E2** There is no thing in which H occurs and S does not occur."

Obviously, within his Condition 2, Oetke uses the expression *thing* in a totally different way than in his translation of Vasubandhu's text, given in *Condition* 1! While, like in Def.I, the word *thing* denotes entities which Oetke names *properties*, he uses the same expression *thing* in *Condition* 2, as a notation for *individuals*. After this "transformation" it is easy to translate the altered text into predicate logic:

$$\text{NC: } \neg\exists x(Hx \wedge \neg Sx).$$

Within the system of predicate logic, this is equivalent to the desired proposition

$$\text{NC*: } \forall x(Hx \rightarrow Sx).$$

By transforming the underlying text and changing the ontological concepts, Oetke has provided himself with the necessary prerequisites for translating *avinābhāva* into standard predicate logic.

3.2. **More "things".** The next example, also from Oetke's Studies[9], demonstrates how complicated and risky it is to perform intricate symbolic constructions, the consequences of which are not easy to control.

In order to apply *the same formula* (5) also for a more complex ontological situation, Oetke considers a world in which there exist, in addition, other entities called *spatio–temporal locations*. These locations possess properties, too – this is in order to construct a symbolization of the statement "There is fire on that mountain".

It can be shown[10] that Oetke's formal construction imply formulas which, when interpreted, represent statements which seem to be totally uncorrelated to the basic text of the Vādavidhi.

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[9] loc.cit. p. 13.

[10] There a two types or, spoken in technical terms, *sorts* of individuals which Oetke talks about: "Things" which are *objects* and "things" which are *locations*. In the following we will denote variables for *objects* by x, and variables for *locations* by ξ.

There is an elementary relation between objects and locations. This is the two-place relation R defined by

ξRx: "A certain object x is present at a special location ξ"

Now Oetke defines a new concept. If A is a property (of objects), he defines a related property,[11] of *locations* :

$$A\xi := \exists x(\xi Rx \wedge Ax) \tag{6}$$

In plain words:

Definition 3.1. "A location ξ has the property A, if there exists an object x which is located at ξ, and which has the property A."

If, for example, there is a certain smoky piece of wood (an x with property A) at a top of a certain mountain at a certain time (i.e., at a spatio-temporal location ξ), then the definition implies that $A\xi$ holds, i.e. that this location is smoky. Thus, in order for a *location* to have a certain property, there must be an *object* at that location possessing that property.

Given this definition, the fundamental *avinābhāva* relation between *hetu* H and *sādhya* S, according to (5) and (6) is as follows:

$$\forall\xi(H\xi \rightarrow S\xi) = \forall\xi(\exists x(\xi Rx \wedge Hx) \rightarrow \exists x(\xi Rx \wedge Sx)), \tag{7}$$

which, in plain words, signifies:

If these are really unintended side-effects of the formal definition – how will one know whether a certain implication of the formal system is a *fact*, hidden in the text and brought to light by the symbolic system, or whether it is a phantom product of the symbolic system without any reference to the text under discussion?

There are a lot more problematic passages in Oetke's monograph which cannot be mentioned here.[12]

3.3. **Existential import.** There are some other topics which appear recurrently in papers on Indian logic. One of these is the condition of "existential import". In Oetke's paper, he introduces this condition,

$$(\exists x)(Hx)$$

abruptly[13] without relating it to a specific passage of the underlying text. From then on it serves as a central means of classification on an on. I have, however, never seen only the slightest mention of such a "condition of existential import" in any ancient logic text – be it in Greek or Indian logic.

The fatal discussion on "existential import" has left its unpleasant traces in the history of Western logic within the context of how western logicians misinterpreted Aristotle's syllogistic. This, however, is a separate story, and I will only cite Thomas G. Nedzynski [Ned79]:

> "The problem of existential import developed along with the development of modern symbolic logic during the nineteenth century. The problem is peculiar to the standard predicate calculus. There never was a real problem of existential import within the traditional syllogistic logic - it was placed there in retrospect by the modern logicians."

> "For all locations ξ, the following holds true: If there is, at the location ξ, an object with property H then there is a (possibly different!) object at the same location which has the property S."

I am not sure that Oetke really had this interpretation in mind when he constructed his formal setting, leading to his definition (6). Why should he insist on the possibility of the existence of *different* objects realizing the properties H and S, respectively? Did he finds hints to such an idea in the *Vādavidhi*?

[12]Irrespectively of the technical complications of Oetke's construction of different sorts of "things" – I doubt that the classical examples of Indian logic could be subsumed under his *avinābhā* - formula. Let us look at the example "Sound is impermanent, because it originated from effort." We denote the properties *being impermanent* by S, and *being originated by effort* by H. According to Schayer and Oetke, the inseparable connection between H and S would be symbolized by

$$\forall x(Hx \to Sx). \tag{8}$$

Here, the variable x denotes the "things" in a certain universe; according to Oetke these "things" denote *objects* or *locations*. As "sound" certainly is neither an individual object nor a location, it must, in the symbolic system, be a property, let's say, P. However, for Oetke the *pakṣa* is an individual p (see, e.g. *Studies*, p. 24) with properties (*dharma*s). What one could do in order to avoid this dilemma is to enlarge once more the set of sorts – but would that make sense? Is'nt it better to consider *sound* as an abstract general term? Why should the terms "sound" and "produced" be placed at different semantical levels of the formal system?

[13]loc.cit., p.14

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Because of time restrictions, I will not step into the details of other problematical topics. Let me only refer to the notorious problem of material implication which, in my opinion, is not a suitable tool for symbolizing any philosophical founded theory of implication. [14] Nevertheless, material implication is the standard choice for most researchers who tried to symbolize *avinābhāva* or *vyāpti*!

4. On a hermeneutical maxim

In the Introduction to his *Studies* Oetke formulates a "hermeneutical maxim" which gives much weight to the process of symbolic representation of an ancient text. Oetke advocates the

> " ... maxim of exploring in a systematical manner the totality of possible alternatives relative to a set of criteria ...."(p. 3)

Here the author talks of "all possible alternatives" without considering that the choice of a special symbolical system like predicate logic, already restricts the possible interpretations severely . It may set the focus on the old texts in a wrong way, automatically introduce an alien scheme and thus may even *prevent* any acceptable interpretation of the text. We have already pointed to a crass example of this type when we discussed the question of so called "existential import".

The following remark demonstrates Oetke's rather optimistic approach towards his own formal instruments (p. 5):

> "... even if some perspectives have not been adopted by an author or even in a whole tradition, the viewpoint in question might constitute *objectively* possible ways of looking upon some subject matter."

Mentioning objectivity with respect to his method reveals the fact that Oetke is unaware of the presuppositions inherent in predicate logic. This has the consequence that he does *not* generate *all* possibilities of an interpretation, but only those which are possible within a pre-chosen system. This may give the impression of being a complete classification, and, by the way, this statement may even be correct from a formal standpoint. But what is the value of completeness, if the possibilities generated during the classification process have absolutely nothing to do with the subject area? What is, for example, a classification good for which, for biological purposes, classifies all existing animals with respect to the number of their legs, from zero to 1000? This is, of course, a complete system (if no animal has more legs than a millepede)... but why, for example, *should* one collect man and bird into a common category?

5. Final remarks

Scholars who use symbolic logic for the purpose of text-interpretation usually argue as follows:

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[14] The problem is that in propositional logic, the truth of the expression

(9) $$p \rightarrow q$$

depends, in any interpretation, *only* on the truth values of p and q. Up to now, no one has claimed that Indian logicians ever understood implication in such a trivial "extensional" way.

> "In order to derive his statement X, the author *implicitly* takes the Assumption Z for granted (for example: existential import). My formula only makes this explicit."

This, however, is an unfair treatment of the ancient text! The ancient author certainly did not think about predicate logic and did not have to follow the rules and restrictions of that modern theory. The only thing one might assert is the following statement which is quite different in meaning from the above mentioned:

> "If *WE want* to translate statement X into a valid theorem of predicate logic, then *WE* have to make the following Assumption Z."

The ancient author, of course, had to live with rules and restrictions, too – *this*, in fact, should be the topic of research.

Symbolization is a valuable instrument which helps in grasping the formal content of many ancient texts. If, however, formulas play an crucial role in the process of interpretation, the requirements on the "inner connection" between the ancient and the modern system are high. This is the only way to minimizing the danger of the machinery of the symbolic system to run idle, thus producing results with no relevance, or even supporting misinterpretations of an ancient text.

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