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PROBLEM OF EXPLANATORY CIRCULARITY IN LEŚNIEWSKI'S SYSTEMS

Leśniewski describes one of the essential features of his philosophical stance as follows: *I see no contradiction* [...] *in saying that I advocate rather radical 'formalism' in the construction of my system even though I am an obdurate 'intuitionist'*[1]. He meant that he endeavoured to express his thoughts on various particular topics by representing them in deductive systems. At the same time, in order to agree with his readers on logical intuitions he had decided to refer to, he formalized to the utmost those deductive theories. He declared that the best method of acquainting readers with his logical intuitions is the method of formalizing any deductive theory to be set forth[2]. Leśniewski however did not explain why formalization is a best way to communicate to readers his logical intuitions. Since he published little and his manuscripts were burnt during the war, we have sometimes insufficient evidence for interpreting his logical and philosophical ideas. Nevertheless, let us extract several fundamental ideas of Leśniewski's, namely those concerning the danger of a certain circularity error in the foundations of his logical systems.

As we could see in the above declaration, Leśniewski tried to communicate his intuitions on logic precisely with the aid of logic. As that means that what is to be explicated is at the same time what serves as the tool of explication, the question arises whether Leśniewski commits an error of circularity in his explanations or not. To avoid such circularity, i.e. self–referencing, logicians usually distinguish between levels of speaking. However, this approach is not effective in the case of explication of general criteria of being a logical constant, because what is to be explicated – the sense of logical constants – is the same at any linguistic level and is independent of the level of abstraction. Let us try to extract those ideas of Leśniewski which may explain whether and – possibly – in what way Leśniewski solved the problem of circularity in his attempt to clarify the foundations of logic.

Leśniewski considered science in general as a system of propositions which possess a symbolic function, i.e. that are true[3]. Thus science for him is

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[1] S. Leśniewski, *Fundamentals of a New System of the Foundations of Mathematics*, p. 487.

[2] See S. Leśniewski, *Fundamentals of a New System of the Foundations of Mathematics*, p. 487.

[3] See S. Leśniewski, *An Attempt at a Proof of Ontological Principle of Contradiction*, p. 35.

above all a system of symbolic symbols. It is obvious then that the first step of any formalization is description. To construct and to understand linguistic symbols, it is necessary to have certain rules of constructing them and certain keys to decipher them. These rules and keys are, *on one hand, precise definitions of various expressions and, on the other, different kinds of conventions concerning linguistic symbols*[1].

Conventions, as Leśniewski understood them, differed meaningfully from conventions in the sense of 'conventionalists', such as that of Poincaré's. Usual *conventions* do not pertain to the objects whose properties depend on the will of those who make up these conventions but refer to such objects which cannot be changed by any of the *conventions* accepted with respect to those objects. Such convention does not influence in any way the logical content of the theory. Leśniewski's conventions instead constitute *necessary conditions for the possibility of understanding linguistic symbols since they establish the rules on which the system of linguistic symbols that I use is constructed*[2]. Thus, they are an indispensable key to deciphering the expressions he used. He wrote: *The conventions which I accepted refer to the objects whose certain properties are dependent on my will. It is I who decide what rules to choose for constructing the system of linguistic symbols to be used*[3]. Of course, such linguistic conventions which he accepts modify in one way or another the objects to which they refer (e.g. symbolic functions of certain linguistic expressions change according to what functions he assigns to these expressions in the conventions he accepts). As he states:

> *Propositions in which the content of the accepted conventions can be stated are true because they symbolize the state of affairs which, by means of accepting the conventions, I create myself. Thus the truth of such propositions depends on the fact that I accept these and no other particular conventions, and the objects to which these propositions refer, i.e. certain functions of various linguistic expressions, constitute the material for 'conventions' necessary in this field of knowledge*[4].

The acceptance of linguistic conventions solves then a number of problems concerning the functions of various linguistic expressions. Therefore, according to Leśniewski, it has scientific value[5].

The important consequence of such conventionality is that

> *to ascertain whether the given content has been represented adequately or inadequately in a proposition, one has to analyze individually how the*

[1] S. Leśniewski, *An Attempt at a Proof of Ontological Principle of Contradiction*, p. 35.

[2] S. Leśniewski, *An Attempt at a Proof of Ontological Principle of Contradiction*, p. 38.

[3] S. Leśniewski, *An Attempt at a Proof of Ontological Principle of Contradiction*, p. 38.

[4] S. Leśniewski, *An Attempt at a Proof of Ontological Principle of Contradiction*, p. 38.

[5] See S. Leśniewski, *An Attempt at a Proof of Ontological Principle of Contradiction*, p. 38.

> *speaker's representational intentions relate to the above–mentioned* [conventional–normative] *schemas.* [...] *The semiotic analysis of the adequacy or inadequacy of certain propositions in relation to the contents which they represent is then ultimately based on a phenomenological analysis of the speaker's representational intentions*[1].

The last quotation is taken from one of Leśniewski's early works *A contribution to the analysis of existential propositions* published in 1911. It is well known that Leśniewski later vehemently *repudiated* all of his works published between 1911–1916, i.e. in the earliest period of his activity[2]. The question then arises whether Leśniewski repudiated also his view on the role of symbolic conventions and of phenomenological analysis of the author's intentions. If we look at the whole of Leśniewski's work in mature period of his creativity (1927–1938), we can state that the change did concern the ontological aspect of his philosophical stance and the way of presentation both of his logical and philosophical intuitions but did not concern his views on logic. Let us substantiate this thesis making the most of Leśniewski's publications.

Already in his text from 1927, in which he emphatically states *the bankruptcy of 'philosophical'–grammatical work of the initial period* of his work[3], he at the same time explains also what was – first of all – the point of the change. And namely,

> *it is a long time since I believed in the existence of objects which are features, or existence of objects which are relations and now nothing induces me to believe in the existence of such objects* [...] *and in situations of more 'delicate' character I do not use the expressions 'feature' and 'relation' without the application of various extensive precautions and circumlocutions*[4].

This explanation demonstrates that what changed after 1916 in Leśniewski's work, were – first of all – his basic ontological presumptions, namely, those concerning the ontological status of general objects.

Another novelty in the ripe period of Leśniewski's creativity was a higher level of formalization of his theories than before. Formalization meant for Leśniewski (a) the use of axiomatic method, and (b) the explicit formulation of inference and definition directives.

As far as (a) – axiomatization – is concerned, although *later* Leśniewski started to build both his new versions of old theories (e.g. set theory) and new ones – systems of Protothetic, Ontology and Mereology – *on explicit axio-*

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[1] S. Leśniewski, *A Contribution to the Analysis of Existential Propositions*, p. 17.

[2] See S. Leśniewski, *On the Foundations of Mathematics*, p. 198.

[3] See S. Leśniewski, *On the Foundations of Mathematics*, p. 198.

[4] S. Leśniewski, *On the Foundations of Mathematics*, p. 198.

matic foundations[1], this did not modify his general approach to the relation between intuition and formalism. And notably he still maintained that

> *I tried to write my work so that it would not concern exclusively some kind of 'free creations' of various more or less Dedekindian creative souls; it follows hence, that I cared more about the fact that my theorems, while possessing as exact form as possible, should harmonize with the 'common sense' of the representatives of 'spirit laique' who are engaged in investigating a reality not 'created by them'*[2].

Even more emphatically sound words were published in 1938: *Having no predilections for various 'mathematical games'* [...] *I* [...] *imputed to its* [system's – J. P.] *theses a certain specific and completely determined sense in virtue of which its axioms, definitions, and final directives* [...] *have for me an irresistible intuitive validity*[3].

As far as (b) – directive system – is concerned, he wrote: *for many months I spent a great deal of time working systematically towards the 'formalization' of these systems of Protothetic by means of clear formulation of their directives using the various auxiliary terms whose meaning I have fixed in terminological explanations*[4]. Since directives do not themselves belong to the system of Protothetic which they affect, he usually formulated them in ordinary colloquial language. He commented on particular terms of ordinary language appearing in the directives in a series of terminological explanations, which were also formulated in ordinary language[5]. And – which is essential in the context of our analysis – he usually gave *to the terminological explanations* [...] *the form of propositions of the type 'I say of an object* A *that it is a* b *if and only if* p[6]. Even if Leśniewski's careful choice and discussion of examples for his terminological explanations was to make this author–reader communication easier, Leśniewski still relied essentially on the reader's ability to interpret his intentions on the ground of what he called *propositions about myself*[7]. It means that both in earlier and in later period of Leśniewski's activity, readers should be ultimately able to grasp Leśniewski's intentions by means of a *phenomenological analysis of speaker's intentions*[8].

Exactly here –it seems – we face the problem of circularity in explanation in the body of Leśniewski's systems as whole. Namely, in order to communicate his logical intuitions Leśniewski formalizes deductive systems. In turn,

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[1] S. Leśniewski, *On the Foundations of Mathematics*, p. 201.

[2] S. Leśniewski, *On the Foundations of Mathematics*, p. 228.

[3] S. Leśniewski, *Fundamentals of a New System of the Foundations of Mathematics*, p. 487.

[4] S. Leśniewski, *Fundamentals of a New System of the Foundations of Mathematics*, p. 487.

[5] See S. Leśniewski, *Fundamentals of a New System of the Foundations of Mathematics*, p. 468.

[6] S. Leśniewski, *Fundamentals of a New System of the Foundations of Mathematics*, p. 471.

[7] S. Leśniewski, *On the Foundations of Mathematics*, p. 230.

[8] S. Leśniewski, *A Contribution to the Analysis of Existential Propositions*, p. 17.

in order to agree on the deductive systems he uses symbolic conventions, which must open to readers' phenomenological analysis. In addition, since these conventions are taken individually by Leśniewski, the problem arises how he can secure objectivity in the intersubjectivity of theories created in such a way.

Taking into account the whole of Leśniewski's work, we come to the conclusion that he tries to overcome the danger of circularity in explanation and the danger of voluntarism in his understanding of science by taking certain assumptions underlying the whole of his philosophical and scientific project. What are these assumptions?

To answer that we must first explain what Leśniewski means by his *phenomenological analysis of intentions*. In any occurrence of a phenomenological way of thinking a person does not distinguish what is given to him from what is *behind* – there is no any *behindness*, no *essence*, no *noumen*, no *outside* of a given phenomenon. It means that by using the expression *phenomenological analysis* Leśniewski wanted to emphasize that those intentions are given to the interpreter directly, pre–logically, pre–argumentatively.

Leśniewski wanted to enable the reader to interpret his intentions in a phenomenological way by showing with utmost clarity the reasons for the introduction of his conventions. Obviously that is why his texts are so rich in the word *I*: *this is the way, in which* I *solve the problem*, my *solution*, my *convention* etc. This is also why he describes so often the evolution of his systems and explains his motives in taking his project decisions.

Let us ask next: what is the set of fundamental logical intuitions which Leśniewski tried to communicate in such direct – phenomenological – way? Grzegorczyk proved that all of Leśniewski's systems are, from a mathematical point of view, formally equivalent – isomorphic – a Boolean Algebra[1]). He says: *In spite of great variety of types an adequate model for the system of prothotetics is the two–elemental Boolean algebra with all functions definable on it*[2]. And later: *Ontology is a full algebra of sets, i.e. from a formal point of view it is a theory of atomic and complete Boolean algebra*[3]. In turn Grzegorczyk further demonstrated that *mereology is in a certain sense equivalent to Boolean algebra without the assumption of atomicity*[4]. As he finally writes about the fourth element of Leśniewski's logical construction – the theory of definitions – he calls it *achievement of historical value*, but consider it just as system of rules for *defining arbitrary functions of Boolean algebra*[5].

The results of analysis carried out by Grzegorczyk leads us to conclude that exactly the system of forms called *Boolean Algebra* is the set of a direct, pre–logical intuitions underlying the philosophical work of Leśniewski, which

[1] See A. Grzegorczyk, *The systems of Leśniewski in relation to contemporary logical research.*

[2] A. Grzegorczyk, *The systems of Leśniewski* ... , p. 81.

[3] A. Grzegorczyk, *The systems of Leśniewski* ... , p. 89.

[4] A. Grzegorczyk, *The systems of Leśniewski* ... , p. 91.

[5] A. Grzegorczyk, *The systems of Leśniewski* ... , p. 90.

also constitute a precondition of intelligibility and communicability of his work. He suggested this set for acceptance by the reader and at the same time he presumed its exisstence in the reader's mind, when he described his personal motives in taking design decisions and when he formulated his own conventions.

Since Leśniewski carried out the construction of his logical systems with utmost care and fundamentality, that perhaps suggests he was convinced that Booolean structure constitutes certain inborn disposition of every conscious subject. So far as the fact that those intuitions summarized as Boolean Algebra are inborn to the reader and constitute the reader's inborn dispositional knowledge, the danger of circularity in explanation of the essence of logic could be overcome.

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