

Leśniewski's conception of logic

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1. Introduction

The current availability in English of almost all of Leśniewski's works allows even those scholars unfortunate enough not to read Polish to gain a clearer picture of his ideas.¹ Even a brief reading of Leśniewski's works reveals that his main references are: J. Stuart Mill, Austrian philosophy (Brentano, Marty, Husserl), J. Łukasiewicz and L. Petrazycki.

The first three (Mill, Austrian philosophy and Łukasiewicz) are well-known; what is new is the Russian-Polish thinker Leon Petrazycki.² His 1905 book, *Introduction to the study of law and morality: the bases of emotional psychology*, was quoted by Leśniewski in some central passages. Unfortunately the 1955

¹ S. J. Surma, J.T. Szrednicki, D.I. Barnett, V.F. Rickey (eds.), *Stanisław Leśniewski. Collected works*, 2 voll., Dordrecht, Kluwer, 1992. The publication has been an arduous editorial undertaking that has occupied Jan Szrednicki for more than eighteen years. To him we owe our gratitude for the tenacity and the strength of will that enabled him to surmount the many and difficult obstacles that stood in his way. Unfortunately, the English translation is not always crystal clear and certain papers contain some often irritating mistakes. For some general assessments, see the critical notice by M. Libardi, *Axiomathes*, 1993, 105-129, and the review by P. Simons, "Discovering Leśniewski", *History and philosophy of logic*, 1994, 227-235. In our quotes, we will use the following initials: EP: "A contribution to the analysis of existential propositions", 1-19; PC: "An attempt at a proof of the ontological principle of contradiction", 20-46; EM: "The critique of the logical principle of the excluded middle", 47-85; EB: "Is all truth true eternally or is it also true without a beginning?", 86-114; FM: "On the foundations of mathematics", 174-382; FF: "Fundamentals of a new system of the foundations of mathematics", 410-605; FO: "On the foundations of ontology", 606-628; IR: "Introductory remarks to the continuation of my article: 'Grundzüge eines neuen Systems der Grundlagen der Mathematik'", 649-710.

² For some information about Leon Petrazycki and for a wider analysis of Leśniewski in general, cf. R. Poli and M. Libardi, "Logic, theory of science and metaphysics according to Stanisław Leśniewski" (submitted).

translation of Petrazycki's book into English does not include the logical part of his work.³

In the course of this paper, we propose to present a reconstruction of Leśniewski's position, gathering together and analyzing his general theories and – as far as possible – his explicit references to other authors.

Before proceeding with the presentation of our proposal, we should draw attention to the fact that Leśniewski mainly described his general position in his early works. It is well-known that Leśniewski formally 'repudiated' the early stage of his research.⁴ However we should not be misled, as he actually declared that "the change to a symbolic way of writing, which constituted a far-reaching revolution in my scientific life in the field of symbolic technique, was not accompanied by any far-reaching parallel events in the domain of my 'logical' views" [FM, 366]. The change, then, was limited to the decision to move from a presentation of his ideas in natural language to a presentation in symbolic language, without any real change in the underlying ideas.

For a good reconstruction of Leśniewski's logical thought⁵ it is important to understand that he based his proposals on a different logical paradigm, that of tra-

³ L. Petrazycki, *Law and Morality*, Cambridge (Mass.), Harvard University Press, 1955. The Leon Petrazycki Society published a German translation in Paris in 1933.

⁴ "Living intellectually beyond the sphere of the valuable achievements of the exponents of 'Mathematical logic', and yielding to many destructive habits resulting from the one-sided, 'philosophical'-grammatical culture, I struggled in the works mentioned with a number of problems which were beyond my powers at that time, discovering already discovered Americas on the way ... I formally 'repudiate' them ... affirming the bankruptcy of the 'philosophical'-grammatical work of the initial period of my work" [FM, 197-198].

⁵ It is well-known that Leśniewski defined ontology, one of his three foundational systems, as "a certain kind of modernized 'traditional logic'" [FM, 176]. In this respect it is worth remembering that in the 1937-38 academic year Leśniewski taught a course called "Traditional 'formal logic' and traditional 'set theory' on the ground of ontology"; cf. J.T.J. Szrednicki and Z. Stachniak (eds.), *S. Leśniewski lecture notes in logic*, Dordrecht, Kluwer, 1988, 180. Given these premises, we can better understand his interest for the principles of non-contradiction [PC] and excluded middle [EM]. Twardowski, the founder of the school, was also interested in traditional logic. As a lecturer at the University of Lvov, for many years he taught a course on *Attempts to reform traditional logic*, in which he outlined the theories of Bolzano, Brentano,

ditional logic.⁶ With this statement we are saying something significant and difficult. Each paradigm in fact brings with it a whole baggage of thoughts and mental habits. Paradigms work because they save us the effort each time of having to rethink the key concepts which are accepted as a common heritage. Changing a paradigm means rethinking the initial moves, the basic concepts on which it is constructed and which have become common sense, such as, for example, the concepts of formalization, proposition, variable, etc. In effect, much of the ‘difficulty’ and ‘incomprehension’ regarding Leśniewski’s ‘technical’ choices are in fact linked to the desire to understand them by using current logical orthodoxy, without fully exploring the different presuppositions of his logic.

2. *The system of the foundations of mathematics*

In different passages Leśniewski declared that he was working towards a system of the foundations of mathematics, even if it is not wholly clear what he meant by ‘foundations’ and ‘mathematics’. Regarding his idea of ‘mathematics’, the most

Boole and Schröder; cf. I. Dąmbaska, “François Brentano et la pensée philosophique en Pologne: Casimir Twardowski et son école”, *Grazer philosophische Studien*, 1978, 117-129, quotation from p. 123. As confirmation of the fact that “the borderline between modern and traditional logics can hardly be drawn in the case of the Lvov-Warsaw Philosophical School” [V.L.Vasyukov, “A Leśniewskian guide to Husserl’s and Meinong’s jungle”, *Axiomathes*, 1993, 59-74, quotation from p. 59], we may consider the scholars who in the early nineteen thirties formed the so-called ‘Cracow Circle’ to address some of the traditional logical and philosophical problems of Thomism and Scholasticism with the new methods of formal logic. The more important of them are Innocenty M. Bocheński (1902-1994), Jan Salamucha (1903-1944), Jan Drewnowski (1896-1978) and Bolesław Sobociński (the latter was one of the main characters linking the two schools). For the Cracow Circle, cf. the monograph section of *Axiomathes* 1993, 169-226.

⁶ The concept of traditional logic has not yet been defined in conceptually acceptable terms. For a minimalist perspective, consider the *Dictionary of Philosophy* by D. Runes, according to which traditional logic can be defined as those parts and that method of the treatment of logic which have come down to us essentially unchanged, from the classical and mediaeval ages. In this sense, traditional logic highlights the distribution of propositions in subject and predicate and the related classification in the four forms A, E, I, O. For some further observations, cf. R. Poli, “Twardowski’s theory of modification against the background of traditional logic”, *Axiomathes*, 1993, 41-57 and M. Libardi and R. Poli, “La polemica sulle nuove direzioni della

explicit passage is perhaps the following: “mathematical sciences ... serve to capture the various realities of the world in the most exact laws possible” [FM, 176]. In other words, mathematics is a theory of reality. This is an interpretation that the formalistic frenzy of the last sixty years has considered to be of little importance.

If mathematics – as Leśniewski thought and as Brentano and his pupils firmly believed – is the formal theory of reality or of aspects of reality, then it makes no sense to speak of structures based on a so-called meaningless syntax. On this point Leśniewski is penetratingly ironic. In several passages he reiterates that “an unintuitive mathematics contains no effective remedy for any malady of the intuition” [FF, 413] Or: “Having no predilection for various ‘mathematical games’ that consist in writing out according to one or another conventional rule various more or less picturesque formulae which need not be meaningful, or even – as some of the ‘mathematical gamers’ might prefer – which should necessarily be meaningless, I would not have taken the trouble to systematize and to often check quite scrupulously the directives of my system, had I not imputed to its 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” [FF, 487].

Leśniewski saw the problem of the antinomies as lying at the root of the divide between formal theories built on an underlying intuition and formal theories as pure syntactic games. “[The antinomies] encouraged the disappearance of the feeling for the distinction between the mathematical sciences, conceived as deductive theories, which serve to capture various realities of the world in the most exact laws

logica” (unpublished), R. Poli and M. Libardi, “Il concetto di logica tradizionale. Elementi per

possible, and such non-contradictory deductive systems, which indeed ensure the possibility of obtaining, on their basis, an abundance of ever new theorems, but which simultaneously distinguish themselves by the lack of any connection with reality of any intuitive, scientific value” [FM, 177-178].

To sum up, Leśniewski proposed a system of the foundations of a theory of reality possessing, as a system, a considerable intuitive force. This system is made up of the three theories that Leśniewski developed during his research work – protothetic, ontology and mereology – as the author himself reminds us in several passages.⁷

3. *Modernized traditional logic*

It is well-known that Leśniewski defined his proposal as a system of modernized traditional logic [IR, 650]. But for what reasons did Leśniewski feel that he had to turn to traditional forms of logic? Put another way, why did he never seriously consider some modern form of logic, even though he had studied it in depth? We are faced with the case of a scholar who had a good knowledge of the modern mathematical form of logic and who nonetheless decided to use the old form of two names plus copula. Obviously there must have been aspects of the modern form of logic which were radically unacceptable to him. The problem then is to discover what were these problematic aspects of the modern method of studying logic. Unfortunately, in this respect, Leśniewski is not very explicit. Nevertheless, some indications can be found, at least indirectly.

una riattualizzazione” (submitted).

⁷ [FM, 176] In some other passages the system seems to be limited to only the first two of the above theories. Cf. for example [FO, 608]. The logical basis of the system consists of protothetics (roughly a second order propositional calculus) and ontology (a calculus of predicates founded on the traditional structure of two names plus copula). Mereology, or the

We know for example that Leśniewski devoted several years to a meticulous study of *Principia Mathematica* ([FM, 175 & foll., 195]).⁸ We also know that he was extremely critical of both the *Principia*'s approach and the decidedly more rigorous approach of Hilbert and his School. Let us briefly consider Leśniewski's main criticisms of them.

First of all, Leśniewski found "shocking defects" in the formal instrumentation of the *Principia* and stated that the fundamental questions were "presented disastrously" [FM, 179], so much so that he was "unable to understand the terminology of Whitehead and Russell" [FM, 224]. Now, it is widely acknowledged that the presentation of the expressive and deductive apparatus of the *Principia* is considerably lacking in precision. This issue is well-known and not worth dwelling on here. Indeed the limitations of the *Principia Mathematica* were highlighted by many scholars and within a decade it had become a widely shared view. What is special about Leśniewski's criticism is perhaps its extreme, even excessive, radical nature [FM, 181].

Leśniewski's second criticism was levelled at the formalistic approach which was emerging at the time. In other words he was attacking the distinction between the syntactic aspect, reduced to the calculistic and manipulatory dimension, and the moment of the interpretation. To quote Lejewski, "Leśniewski meant his logic to be a true, though very general, description of reality, a kind of *prote filosofia* ... Contrary to the fashion prevailing among mathematicians, Leśniewski insisted that only *true* propositions should be allowed as axioms of a deductive theory and that only those rules of transformation should be admitted which embodied intuitively

calculus of parts, is an extension of ontology based on the introduction of the 'part-of' functor or of similar functors.

valid rules of inference. He did not reject formalization as a method of presenting deductive theories. Far from it. But he maintained that a theory which was intuitively sound did not lose its meaning through being subject to a process of formalization. He consequently described himself as a confirmed intuitionist who at the same time was a radical formalist, and a better characterization of his standpoint could hardly be given.”⁹ For Leśniewski, then, formalization was an instrument for making precise and clear assertions which were already true and significant. We will come back to this point later on.

From this perspective the distinction between formalization and interpretation obviously makes no sense and there is therefore no point in considering the formal systems as a manipulation of arbitrary formulae. Here one of the fundamental characteristics of contemporary logic falls down – the distinction between syntax and semantics, and therefore the distinction between the level of correctness and the level of validity.

To sum up, logic is not an empty game of symbols to which an interpretation is added a posteriori, but an outlining of the rules for the use of terms which have been meaningful from the very start. This does not clash with exact formalization: “I see no contradiction ... in saying that I advocate a rather radical ‘formalism’ in the construction of my system even though I am an obdurate ‘intuitionist’” [FF, 487].

But how do things stand with the problem of the antinomies? Before essaying a possible answer, it is worth noting that, among the different replies to the problem

⁸ Cf. also C. Lejewski, “Ricordando Stanisław Leśniewski”, *Quaderni del Centro Studi per la Filosofia Mitteleuropea*, 1989.

⁹ C. Lejewski, “On Leśniewski’s Ontology”, in J.T.J. Szrednicki, V.F. Rickey and J. Czelakowski (eds.), *Leśniewski’s systems. Ontology and Mereology*, Dordrecht, Kluwer, 1984, 123-148, quotation from pp. 123-24.

of the antinomies that were developed at the first developments of modern mathematical logic, those who chose to *accentuate* the distance from the level of intuition, from, let's say, the level of common sense, were the ones to prevail. In other words, the winning tendency was the exact opposite of the one chosen by Leśniewski. From this point of view the “obdurate ‘intuitionist’” found no fellow-travellers.

But to come back to the main point. A possible reply to the question of why the beginnings of modern logic fell such easy prey to the antinomies may lie in its initial move of starting with terms (individual variables and constants) which had a denoting role only, without any connotative value and, from there, to constructing terms (predicative variables and constants) which were to play a vicarious connotative role. Leśniewski did not accept such a position, for various reasons. Some of his reasons take us back to the fact that a theory of this kind must adopt two different types of terms (one for individuals and one for properties) and that such a theory ends up by treating propositional and predicative calculuses at distinct layers (thus distinguishing a further type of variable, the propositional one) and it is therefore difficult, if not impossible, to develop a *general* theory of linguistic signs.

From these preliminary notes, it is becoming clearer that Leśniewski's diversity was not so much or not only of the technical kind, but rather of a paradigmatic nature. Before considering more closely what this means, we must eliminate a false problem.

It is usually thought that the difference between traditional logic (in its various forms) and modern formal logic depends on the fact that the latter – unlike the former – is a *mathematical* logic. In fact, it is perfectly possible to give a

mathematical structure to (at least some of the versions of) traditional logic, as has already been done in several significant cases. Our vision of a mathematical logic results from certain choices which in general – and quite irrespective of our current reference to Leśniewski – deserve to be explored more thoroughly. Consider, for example, the concept of function, whose application to linguistic objects represents Frege's great intuition. We all know that a function is a many-one or one-one connection, where the fundamental point is the unicity of the value. In effect, however, it would be perfectly acceptable to weaken the requisite of the unicity of the value without leaving the sphere of mathematical rigour. Instead of functions, we could for instance use mappings, that is a many-many or one-many kind of connection. Who is to say that in this case we are no longer in the sphere of influence of logic? And we can consider other possibilities – which moreover in certain cases have already been tested – such as that of admitting operations which are not defined for all the objects of the domain. The point, therefore, once again, is not one of mathematical shaping.

The problem can be seen more clearly if we carry out a check on the mathematization of traditional logic effected from the point of view of modern formal logic. It is not hard to see that in many cases there is something that is not properly working. The issue has been raised many times but, it would seem, without coming up with a conclusive answer. We believe that the difficulties depend on the fact that different forms of logic may use different semiotical frameworks.

Two of the fundamental components of every semiosis are the choice of the type of admissible variables and the expression of the distinction between reference (denotation) and meaning (connotation). Let us look at the latter.

If we go back to Mill's classic doctrine – the starting point for Leśniewski's reflections – there are four possible cases: terms which have denotation but no connotation; terms which have connotation but no denotation; terms which have connotation and denotation; terms which have neither connotation nor denotation. Let us stop for a moment to consider this situation. If we look at the 'standard' extensional viewpoint, we see at once the drastic nature of its starting point; in fact it admits only denoting expressions which have no connotation (names of individuals) and, from there, a different class of terms (the predicates) which should show a connotation (intended rather daringly as the class of bearers of the property) is constructed.

However, the situation is very different if we start with natural language. For this reason Leśniewski moved on to the development of a more general framework, which we will now look at.

4. Forms of expressions

The starting point is the development of a general theory of expressions. From Mill and traditional logic Leśniewski took the idea by which all expressions can be divided into connoting and non-connoting expressions and into denoting and non-denoting expressions. According to Leśniewski, the expression 'connoting expression' denotes expressions that can be defined, whereas the expression 'non-connoting expression' denotes expressions that cannot be defined. The examples that follow come from Mill's *Logic* and are pretty clear: the expressions 'man', 'green', 'square circle' and 'centaur' are examples of connoting expressions; the expressions 'to a man', 'well', 'at', 'abracadabra', 'object', 'every man is mortal', etc. are examples of non-connoting expressions [PC, 31]. In other words, all nominal expressions which have a superordinated genus are definable. The other

kinds of expressions are not definable: non-nominal expressions (every man is mortal), nominal expressions without a superordinated genus (object), adverbs and prepositions (well, at), exclamations and interjections (abracadabra) and incomplete expressions (to a man).

Moving on to the other classification, we can say that “an expression which denotes something can be exemplified by the following: ‘man’, ‘green’, ‘object’, ‘the possessing by every man of the property of mortality’, ‘every man is mortal’, etc. The expressions which do not denote anything can be exemplified by the following ones: ‘abracadabra’, ‘square circle’, ‘centaur’, ‘the possessing by every man of the property of immortality’, ‘every man is immortal’, etc.” [PC, 31].

To understand how this second classification works, it is essential to look at the world itself. Thus we can check whether there are things which are men, things which are green, things which are objects and whether the things which are men are also mortal things. Continuing in the same vein, we can check whether it is impossible to find things which are abracadabras or things which are square circles or things which are centaurs, just as we can check whether the things which are men are not immortal things.

At this point there are two fundamental observations to be made. The least we can say is that the distinction between nominal expressions and propositional expressions is not given *ab origine* but is constructed within the system.

It should also be acknowledged that checking how things stand in the world is not the task of logic but of science. We will come back to this aspect further on, when we address the problem of Leśniewski’s theory of science and the relationship between scientific propositions and logical propositions. For now we will leave this aspect of the theory to one side. The last observation is that the two

distinctions of ‘denoting / non-denoting terms’ and ‘connoting / non-connoting terms’ are orthogonal.

It follows “that there exist expressions which connote something ... but denote ... nothing; such expressions are, e.g. ‘square circle’, ‘centaur’. On the other hand, there exist expressions which connote nothing and yet denote something, e.g. ‘object’, ‘every man is mortal’. Besides, there also exist expressions which neither denote nor connote anything; example: ‘abracadabra’” [PC, 32].

The expressions which denote everything and which connote nothing cannot, because of their very nature, be defined [EP, 4-5; PC, 27].

To sum up, we can state that for Leśniewski some terms are denoting and connoting (man), some are denoting and non-connoting (object), some are non-denoting and connoting (centaur) and some are neither denoting nor connoting (abracadabra).

The distinction between expressions which denote and expressions which do not denote is the same distinction that we have when we distinguish those expressions which are symbols from those which are not. In other words Leśniewski thought that the distinction between expressions which denote something and expressions which denote nothing can also be formulated by resorting to the distinction between symbolizing something and symbolizing nothing, or expressions which are symbols and those which are not. To say that an expression denotes something or that an expression symbolizes something or that an expression is a symbol are different ways of formulating the same content.

For this reason we can say that “the expression ‘square circle’ does not possess a symbolic function because no object is a square circle; in other words there is no such object as could be symbolized by the expression ‘square circle’; thus the

expression ‘square circle’ symbolizes no object, in other words symbolizes nothing” [PC, 31-32].

If logic, at least for some of its components, is the discipline of rendering more exact natural language which operates from our linguistic instinct, it is necessary to introduce at least one further distinction between symbolic *disposition* and symbolic *function*. If we fail to be clear on this point, we run the risk of “treating expressions which are not symbols as expressions possessing a symbolic function” [PC, 33].

According to Leśniewski, an expression’s property of being used *as if* it were a symbol, or *as if* it had a symbolic function, is called ‘symbolic disposition’. Thus “not all of the expressions possessing a symbolic disposition possess also a symbolic function”. The difference between a symbolic disposition and a symbolic function does not alter the opposition between connotation and non-connotation: just as the expressions possessing a symbolic function are or are not connoting, so the “expressions that possess a symbolic disposition can be connoting or non-connoting”.

At this point it is possible to use the distinctions that have just been introduced to define new classes of expressions. Consider for example the class of expressions which are propositions. By ‘proposition’ Leśniewski intended those expressions “possessing the *disposition* to symbolize relations of inherence” [PC, 34, my italics], whereas the relation of inherence is “the relation between an object and a property which consists in this object possessing that property” [EB, 89].¹⁰

Once the initial framework has been outlined, the next step is to check whether a certain content is or is not adequately represented in a proposition. To be able to

see this, we have to establish the criteria of adequacy (or of inadequacy). These criteria belong to the general theory of propositions [EP, 16]. They concern “certain general conventional-normative schemas to embody the dependence of symbolic functions of propositions on the symbolic functions of their elements, and on the mutual relationship between these elements” [EP, 17]. One of the first of Leśniewski’s formulations was: “To express this dependence I have adopted the following normative schema: every proposition is to represent the possessing, by the object represented by the subject, of the properties connoted by the predicate” [EP, 17].

In the light of what we have just seen, many things change. Among the aspects that deserve at least a brief discussion there is the theory of proper names, the problem of synonymy and the difference between analytical propositions and synthetic propositions, which we will now look at.

5. Proper names, synonymous expressions and the analytic/synthetic distinction

Let us start with J. Stuart Mill, quoting Leśniewski’s words: Mill “says that not all names have connotations; to those which have no connotations belong, according to Mill, proper names such as, e.g. Paul, Caesar ... Yet even the names which I have mentioned, and which according to Mill have no connotation, in my opinion have connotation; proper names connote the property of possessing a name which sounds like the given proper name ... In fact the word ‘Socrates’, while denoting different objects, connotes always one property, that is the property of bearing the name ‘Socrates’ [EP, 5-6]. Unlike Mill, therefore, Leśniewski asserts that proper names have a connotation: to be precise they connote the denoted

¹⁰ For further details, cf. R. Poli and M. Libardi, “Logic, theory of science and metaphysics

object's property of having the name that they have. This position is extremely interesting, even if it seems to have gone completely unnoticed for at least eighty years. Placed alongside an opportune definition of synonymy, it enables us to eliminate a number of problems. To fully understand this, let us move on to look at how Leśniewski defined synonymy.

A preliminary condition of the possibility of checking whether two expressions are synonymous is that they be reduced to a canonical form which, according to Leśniewski, is that of "categorical propositions with positive copulas and predicates in the nominative". Once this reduction has been made it is possible to proceed. Leśniewski says: "I employ the expression 'synonymous propositions' to denote such propositions as ... possess adequate subjects and synonymous predicates. I employ the expressions 'adequate subjects' to denote such subjects as do not denote different (if only numerically) objects and do not connote different properties ... I employ the expressions 'synonymous predicates' to denote such predicates as connote identical properties" [EP, 21]. Let us look at an effective application of these instructions. In this respect Leśniewski states the following: "Łukasiewicz claims that the propositions 'Aristotle was the founder of logic' and 'The Stagirite was the founder of logic' are synonymous; I think this claim is false. These two propositions are not synonymous because they do not have adequate subjects; their subjects – 'Aristotle' and 'the Stagirite' – are not adequate because they connote different properties: the word 'Aristotle', e.g. connotes the property of possessing the name 'Aristotle' while the word 'Stagirite' does not connote that property". It is quite obvious that by adopting a similar perspective, some if not

according to Stanisław Leśniewski" (see note 2).

most of the difficulties related to certain aspects of the problem of opaque contexts are disposed of.

Moving on to the distinction between the analytic and the synthetic, we will begin with some much-needed definitions. A proposition in canonical form is analytic if it contains no predicates which connote properties that are not connoted by the subject. A proposition in canonical form is synthetic if it contains predicates which also connote properties that are not connoted by the subject [EP, 3]. Examples of analytic propositions are the following: ‘Paul bears the name ‘Paul’’; ‘Napoleon bears the name ‘Napoleon’’ [EP, 7-8]. On the other hand, a proposition such as ‘The victor from Jena bears the name ‘Napoleon’’ is synthetic.

It is usually thought that analytic propositions are true a priori. In reality, given the definition adopted by Leśniewski, the distinction between analytic and synthetic interferes in a new original way with the distinction between a priori and a posteriori.

Leśniewski stated that “only the following two types of propositions can be true a priori: (1) propositions whose subject is the word ‘object’, and (2) propositions which ... are based on propositions whose subject is the word ‘object’” [PC, 42].

Moreover, “true propositions whose subject is the word ‘object’ are always synthetic since their subject does not connote anything” and therefore the predicate always connotes properties which are not connoted by the subject. In brief, “only (the) following two types of propositions can be true a priori: (1) synthetic propositions and (2) propositions which are based only on synthetic propositions. Hence it follows that all analytic propositions true a priori are based on the validity of synthetic propositions” [PC, 42].

Even if “in modern logic there is a widespread conviction that all analytic propositions are true ... the discussion [above] indicates that some analytic propositions might be true, while others might be false” [EM, 61]. Put another way, Leśniewski’s proposal radically upsets a picture which seemed to have reached a certain stability at the cost of much effort and obliges us to rethink once again the whole issue.

6. The concept of logic

We have wished to reconstruct Leśniewski’s position in some detail in order to present some of his general theories with greater effect. In the light of the analyses that we have summarized, it is clear that at their basis lies a particular idea of what should be understood by logic. Leśniewski’s answer was as follows: “I use the word ‘logic’ to denote the discipline which investigates the question which propositions are true and which are false” [EM, 53]. It follows that “a logical proposition is not every proposition but only such a proposition about a proposition or propositions which asserts that the latter proposition (or propositions) is true or false. To every true proposition of the type ‘A is b’ corresponds a true logical proposition of the type ‘the proposition ‘A is b’ is true’” [EM, 54]. Thus a logical proposition is a proposition such as: ‘the thesis that- p is true’. Let us say that it is logical because it concerns the proposition p .

In other words, propositions of the kind ‘A is b’ are not always logical propositions. From Leśniewski’s point of view, a proposition such as ‘all bodies are heavy’ is a proposition of physics, not one of logic; while the proposition ‘the thesis that all bodies are heavy is true’ is a logical proposition.

Secondly, Leśniewski explicitly stated: “I call all propositions which possess a symbolic function, true propositions; I call all propositions which do not possess a symbolic function, false propositions” [PC, 35]. It follows that the correspondence between a ‘true proposition’ and a ‘proposition possessing a symbolic function’ is the point of contact between the theory of logic and the theory of signs.

We can summarize Leśniewski’s position in the following thesis: “(1) a true proposition always possesses a subject which denotes something; (2) a true proposition always possesses a predicate that connotes something” [EM, 57]. In other words: (1) every proposition whose subject denotes nothing is a false proposition; (2) every proposition whose predicate connotes nothing is a true proposition.

From what has been said about the idea of logic as developed by Leśniewski, we can make several observations. Firstly we get an original interpretation of semantics, according to which the semantic relationship is not seen as a relationship between a term and its denotation in some universe of discourse. We should rather say that the relationship is between the terms which occur in logical propositions and the terms which occur in the corresponding propositions with which the logical propositions are concerned.

A reflection of this position is shown in the theory of definition. Leśniewski notes that mistakes are commonly made based on ‘typical’ symbolic inadequacies [EP, 18]. The most common mistakes are those which in mediaeval terminology lead back to an erroneous use of the *suppositio materialis*. These are mistakes in which “instead of formulating a proposition about the expression we are going to define, we formulate a proposition about the object of which the expression in question can only be a symbol” [EP, 18]. The definitions must proceed in such a

way that their “subjects are symbols of the symbols of objects, that is symbols of words and not symbols of the objects themselves or their so-called concepts” [EP, 19].

7. The theory of science and metaphysics

According to Leśniewski, a science is “a systematized aggregate of propositions which possess a symbolic function” [PC, 35]. We know that possessing a symbolic function means that the corresponding propositions are true. A science then is a systematized aggregate of true propositions. “The aim of any scientific criticism of a proposition or of a system of propositions consists in answering the question whether these propositions possess a symbolic function, i.e. whether they are true. The purpose of a consistent scientific criticism is the exclusion of all propositions which do not possess a symbolic function” [PC, 35].

From what has been said up until now, there is nothing surprising in the theory that, to understand the concept of metaphysics adopted by Leśniewski and to distinguish it from the concept of logic, the first step is to understand which propositions are metaphysical propositions and which are logical propositions. An early declaration goes as follows: “I employed the word ‘metaphysics’ to represent the system of true propositions concerning all objects in general” [EM, 48]. To which we can add: “propositions ... which refer to all objects in general are metaphysical propositions (I also call them ‘ontological’). The propositions [which refer only to a certain group of objects] are logical propositions” [EM, 48]. Given that “propositions concerning all objects in general cannot be formulated as conditions” [PC, 30], it follows that “if we apply the word ‘metaphysics’ to denote the system of true propositions concerning all objects in general, we shall thus

obtain the following thesis: metaphysics can be constructed only as a system of categorical propositions” [PC, 30].¹¹

8. *Conclusion: An interpretation of Leśniewski’s proposal*

With these observations, we can end our description of the general traits of Leśniewski’s proposal. If we look at what Leśniewski accomplished in the course of his career as a scholar, it seems that the fundamental reason for his entire research was to progress towards a formalization and a ‘modernization’ of Aristotle’s *Metaphysics*. Indeed, his early works are perfectly in keeping with the Aristotelian renaissance of the period. One only needs to think of the papers on the ontological principle of contradiction [PC] and on the principle of the excluded middle [EM], as well as those on the existential propositions [EP] and on truth [EB]. But the most telling fact comes from a possible and, in the end quite reasonable, interpretation of the structure of his system of the foundations of mathematics.

In this sense, it is not so difficult to see mereology as a system which proposes a formalization of the theory of substance (matter). If we continue in this fashion, we realize that the so-called implausibility of mereology immediately disappears. The results of mereology as a theory of substance correspond perfectly to the expectations of our intuition. The move towards ontology is even less problematic. For example, Leśniewski states: “I used the name ‘ontology’ to characterize the theory I was developing, without offence to my ‘linguistic instincts’ because I was formulating in that theory a certain kind of ‘general principles of existence’” [FM, 374], from which one naturally draws the conclusion that ontology is a

¹¹ The thesis according to which metaphysics refers to all objects in general is to be understood in a very precise sense: “the propositions about ‘general’ objects which are allegedly opposed

formalization of the theory of being. Finally, with protothetics, we have – and this is something we have already seen – a formalization of the theory of *verum*.

To these internal observations we can add some notes concerning its intellectual context. In those years, first at Lvov and later at Warsaw, Aristotle was studied in depth. In addition to the universally known works by Łukasiewicz, we should also mention Twardowski, the founder of the Lvov-Warsaw school and one of the most important pupils of Brentano. Then Kotarbiński is certainly no less important and we should at least mention his analysis of Aristotle's categories which he developed in *Elementy teorii poznania, logiki formalnej i metodologii nauk*, an analysis carried out along lines very similar to Leśniewski's approach.¹²

In brief, we would like to conclude by noting that, however surprising it may seem, the hypothesis that Leśniewski's fundamental intention was perhaps to seek to formalize the *Metaphysics* is perhaps the deepest and clearest explanation of his unshakeable faith in the superiority of the traditional theory of logic.

to 'individual' objects cannot be metaphysical propositions because they do not refer to 'individual objects' and, thus, are not propositions concerning all objects" [EM, 50].

¹² With reference to expressions of the 'A is b' kind, Kotarbiński's analysis of Aristotle's theory of categories distinguishes purely nominal categories of the 'b' kind (the first six) from categories of the 'is-b' kind (the last four). Cf. T. Kotarbiński, *Gnosiology. The scientific approach to the theory of knowledge*. Oxford, Pergamon Press, 1966, 49-50. The original edition was published in 1929.