Leśniewski's Early Liar, Tarski and Natural Language[*]

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Abstract

This paper is a contribution to the reconstruction of Tarski's semantic background and to the history of metalanguage and truth. Although in his 1933 monograph Tarski credits his master, Stanisław Leśniewski, with crucial negative results on the semantics of natural language, the conceptual relationship between the two logicians has never been investigated in a thorough manner. This paper shows that it was not Tarski, but Leśniewski who first avowed the impossibility of giving a satisfactory theory of truth for ordinary language, and the necessity of sanitation of the latter for scientific purposes. In an early article (1913) Leśniewski gave an interesting solution to the Liar Paradox, which, although different from Tarski's in detail, is nevertheless important to Tarski's semantic background. To illustrate this I give an analysis of Leśniewski's solution and of some related aspects of Leśniewski's later thought.

Keywords: Tarski, Leśniewski, Truth, Metalanguage, Liar Paradox

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I. A Well-entrenched Conviction

There is a well-entrenched conviction about Alfred Tarski which is shared by a large number of philosophers: it was Tarski who first showed, in his epoch-making monograph on truth, that semantical paradoxes demonstrate that natural language is hopelessly infected with contradiction, and must be sanitized before any serious talk on truth can begin.[1] The well-entrenched conviction is, however, demonstrably wrong. The idea comes from Stanisław Leśniewski, and not from Tarski, his sole doctoral student.

Although Tarski was responsible for wrong-doings towards Leśniewski, he cannot be blamed for having contributed to this particular historical distortion. When going through the negative results on natural language in the first chapter of his famous work on truth, Tarski himself explicitly credits his master with them.

> The considerations which I shall put forward in this connexion <i. e. the discussion of the various difficulties which meet the attempts to solve the problem of the definition of truth in application to the ordinary language, *A.B.*> are, for the most part, not the result of my own studies. Views are expressed in them which have been developed by S. Leśniewski in his lectures at the University of Warsaw (from the academic year 1919/20 onwards), in scientific discussions and in private conversations; this applies, in particular, to almost everything which I shall say about expressions in quotation marks and the semantical antinomies […].[2]

It is not Tarski's fault, thus, if the demonstration of the impossibility of a formally correct and materially adequate truth-definition for natural language, as well as the considerations concerning its semantic closure, and about the difficulties linked with quotation marks, are almost without exception attributed to him and not to Leśniewski.[3]

This well-entrenched conviction is prevalent in that part of the scholarly world which is not familiar with Polish analytic philosophy, or at least not with Leśniewski. Among those philosophers who are, instead, sufficiently conversant with this philosophical territory, Tarski's words are taken at face value. But even if for some Leśniewski's role in the first chapter of Tarski's book is not news, no one has so far provided us with much more than the disconsolate remark that we find no treatment of semantic paradoxes in Leśniewski's writings.[4]

Here is the novelty: there is written evidence that Leśniewski had first the idea of sanitation, and so we need not make do with oral or third-party testimony. We *do* have a treatment of paradoxes by Leśniewski, only it does not belong among Leśniewski's mature works. Leśniewski published a solution to the Liar Paradox in 1913, in a neglected paper in Polish called "Critique of the Logical Principle of the Excluded Middle",[5] where he rejected natural language as an adequate means for scientific analysis.

To the best of my knowledge, hardly anyone has so far noticed Leśniewski's Liar, let alone understood its importance in spelling out Tarski's semantic background.[6] As a matter of fact, generally speaking Leśniewski's influence upon Tarski is recognized,[7] but the conceptual links between them have not yet been thoroughly investigated. My main aim will be to show that such an investigation must start with Leśniewski's so-called 'prelogistic phase'. This is, however, only part of the story, and it is not meant

to dispute the fact that the most relevant influence on Tarski was exerted by Leśniewski's more mature thought.

A thorough account of the latter fact is, nevertheless, rather difficult to give, owing to the intricacies in the development of Leśniewski's ideas and the lack of textual sources. In the final sections of the present paper I attempt, however, a preliminary analysis of two aspects connected with the mature Leśniewski. My account is not exhaustive, and an open-ended epilogue is to be expected: a comprehensive reconstruction of the Leśniewskian background of Tarski's semantics would need a broader historical context in which to embed Leśniewski's and Tarski's contrasting attitudes towards logic, and it would go far beyond the scope of the present contribution.

I would like to stress, though, that however indispensable Leśniewski's contribution to Tarski's *negative* results regarding natural language was, I attempt in no way to diminish Tarski's *positive* results. In particular, as will be clearer in the following, Tarski's own solution to the Liar is quite different from Leśniewski's early one, nor does the cure he proposes for the illnesses of natural language coincide with his master's mature remedy.

II. Leśniewski's Early Semantics

Leśniewski's Liar is to be found in an early paper which Leśniewski later disowned, together with other three, as immature and very deficient.[8] If we want to avoid misunderstandings as to what the trademark 'Leśniewski' should or should not be attached to, this fact is vital to bear in mind. Although in the early writings we find

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typical traits that Leśniewski maintained also later, some ideas are characteristic of this period only, and cannot be carried over to his mature thought.

The chronology of Leśniewski's writings is usually seen as falling into two main periods, with a transitional one in the middle: the early period (1911-1914), comprising five papers, the so-called 'prelogistic' writings; the 'bridging work' of 1916 on Mereology; finally, the mature, 'logistic' writings (1927-1938), in which Leśniewski sets out part of the architecture of the logical systems and mature formal results. Although this partition of Leśniewski's *œuvre* is questionable, it is certainly adequate for my purposes here.[9]

Leśniewski's early works are devoted to a critical assessment of fundamental logico-semantic and ontological principles of traditional logic. In this he was inspired by Łukasiewicz, who, in the same period, was engaged in a similar, although radically opposed, project.[10] Leśniewski's solution to the Liar in the "Critique of the Logical Principle of the Excluded Middle" ('*Critique*' henceforth) is conceived within the framework of this general reconsideration of the classical logical heritage.

The semantic notions and the logical principles on which Leśniewski's solution is based are exposed in the following. Note that his perspective here is rather traditional in the sense of a traditional logic of *terms*.

1. The main aim of the *Critique*, to which Leśniewski's solution to the Liar is strictly connected, is to show that the logical principle of excluded middle is false. Despite this latter apparent oddity, Leśniewski is very faithful to classical and old-fashioned logical views, something which was to become also typical of his logical systems.

The oddity is easily explained. By 'Logical Principle of the Excluded Middle' (*L*ogical *T*ertium *N*on *D*atur) Leśniewski understands

LTND At least one of two mutually contradictory (*sprzeczne*) sentences [of the form '*a* is *b*' and '*a* is not *b*'] must be true.[11]

According to Leśniewski, LTND is false, because there are pairs of contradictory sentences for which it does not hold, i. e. there are cases in which '*a* is *b*' and '*a* is not *b*' are both false. One may wonder how this is at all possible if we are to understand correctly the notion of contradiction considered in LTND. The truth of the matter is that here Leśniewski's 'contradiction' is in fact a weaker notion, resulting in some cases in a mere *contrariety* of the sentences under consideration (for which, as is well-known in traditional logic, the excluded middle fails). This, in turn, derives from the notion of negation which Leśniewski considers, namely *(predicate) term negation*. In the sentence 'contradicting' '*a* is *b*', i. e. its *denial* '*a* is not *b*', negation is understood as in '*a* is non-*b*'.[12]

Leśniewski shows that LTND is false in virtue of his conditions of truth for well-formed sentences, i. e. for sentences reduced to the canonical form '*a* is *b*':

L1 '*a*' is a denotative name;

L2 '*b*' is a connotative name;

L3 the object(s) denoted by '*a*' possess(es) the property/ies connoted by '*b*'.[13]

Here 'denotation' and 'connotation' are taken more or less in John Stuart Mill's sense.[14] Denotative names refer to one or more objects; non-denotative names, like 'Pegasus', 'round square' and so on, do not refer to anything. Connotative names are those which refer to some properties; more technically, they are those names that can be defined *per genus proximum et differentiam specificam*. 'Being connotative' for Leśniewski is synonymous with 'being meaningful', therefore an expression is connotative iff it is meaningful iff it can be defined *per genus proximum et differentiam specificam*. From L1 and L2 follows that if *a* is non-denotative (or *empty*, if you like) or *b* is non-connotative,

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both '*a* is *b*' and '*a* is non-*b*' are false, and therefore LTND does not hold. Consequently, Leśniewski accepts a weaker principle, the 'Principle of Contradictory Sentences or Restricted Excluded Middle ' (RLTND):

RLTND   If one among two sentences of the form '*a* is *b*' and '*a* is non-*b*' is false, the other is true iff its subject is denotative and its predicate is connotative.

Among other principles which Leśniewski defends are the Ontological Principle of Contradiction (OPC), the Logical Principle of Contradiction (LPC), and the Ontological Principle of the Excluded Middle (OTND):

OPC   No object may at the same time possess and not possess the same property;

LPC   If one of two mutually contradictory sentences (of the form '*a* is *b*' and '*a* is not *b*') is true, the other is false.

OTND Every object *a* has either the property *b* or else non-*b*

Note that a special case of OTND is the Principle of Bivalence, truth and falsity being properties of sentences as special objects ('non-true' equals 'false').[15]

2. The issue of the *Critique* directly relevant for us is the testing of Leśniewski's semantical apparatus *vis-à-vis* a series of famous paradoxes. Some paradoxes disappear by merely showing that the pairs of 'contradictory' sentences of which the paradox consists have an empty subject. In order to solve the Liar, however, Leśniewski is forced to introduce the following *convention*, as he terms such logico-semantic rules, the sole brand-new one of the *Critique*. It can be re-written as follows:[16]

K   For every token-expression *W* connoting the properties $b_1 \ldots b_n$ and for every object *o*, *W* denotes *o* iff *o* possesses the properties $b_1 \ldots b_n$, with the exception of the case in which *o* is *W* itself and of the case in which *o* is an object having any constitutive part in common with *W*.[17]

Leśniewski speaks of the parts of the very token expression W, i.e. a concrete *meaningful* (because connotative) occurrence made up of sounds or signs, as if he spoke of a concrete part of a chair or of a stone – in this (but only in this) K is similar to his later metalinguistic mereological terminology.[18] Let me give an example to explain what K says. Suppose you have the token 'English expression' written on a certain blackboard in a certain place M_1. Other English expressions are written on the same blackboard in other places M_2, M_3 ... M_6: 'Prague' in M_2, 'Castle' in M_3, 'English' in M_4, 'Expression' in M_5, 'English expression' in M_6. K says that 'English expression' M_1 denotes 'Prague' M_2, 'Castle' M_3, 'English' M_4, 'Expression' M_5, 'English expression' M_6, but it does not denote 'English expression' M_1 (itself), 'English' or 'expression' as constitutive parts of 'English expression' M_1.[19]

3. The following is also laid down,

TL For every a and b, 'a is b' is true iff a is b.[20]

Note that TL is in no sense or circumstance taken as a *definition* of the predicate 'true'.

4. Leśniewski observes the use/mention distinction with scrupulous care, to a degree far beyond what was common among his contemporaries.[21] The reason for such unusual attention has been linked to the fact that Leśniewski had already by that time recognized and applied the language/metalanguage distinction. Indeed, some passages from Leśniewski's early writings suggest this line of thought, and some scholars, notably Surma and Lejewski, ascribed Leśniewski's 'discovery' of the latter, fundamental distinction to the very beginning of his activity. The whole issue depends, among other things, on whether we are ready to identify the use/mention with the language/metalanguage distinction. This matter is by no means settled, and I shall return to it later.[22]

Here follows Leśniewski's solution, of which I shall give only the bare bones.[23] The reason why Leśniewski offers a solution to the Liar Paradox is expressly that he wants to show that LPC and RLTND, two fundamental principles of his semantics, are not contested by the Liar and that, therefore, the semantics he has laid down is consistent. First of all Leśniewski analyses the Paradox in a way that can be reconstructed as follows. Epimenides states at time t_1 the sentence 'the sentence stated by Epimenides at t_1 is false'. Let us suppose that the sentence he states is true. 'Ep' abbreviates here below 'the sentence stated by Epimenides at t_1'.[24]

i.	Ep is true	*hyp. 1*
ii.	'Ep is true' is true	From i., TL
iii.	'Ep is false' is false	From ii., LPC (since 'Ep is true' and 'Ep is false' are mutually 'contradictory')
iv.	Ep = 'Ep is false'	(since the sentence stated by Epimenides at t_1 is 'the sentence stated by Epimenides at t_1 is false')
v.	Ep is false	From iii., iv., Leibniz's Law

Leibniz's law is applied to iii. and iv. to get v., although Leśniewski does not say explicitly that here there is an instance of the law.[25] So from the hypothesis that Ep is true it follows that Ep is false, and so *hyp. 1* is false, because it leads to a contradiction. Let us suppose now that the sentence stated by Epimenides is false.

i.	Ep is false	hyp. 2
ii.	'Ep is false' is true	From i., TL
iii.	Ep = 'Ep is false'	(since the sentence stated by Epimenides at t_1 is 'the sentence stated by Epimenides at t_1 is false')
iv.	Ep is true	From ii., iii., Leibniz's Law

So from the hypothesis that Ep is true it follows that Ep is false. Therefore, *hyp. 2* is also false because it leads to a contradiction. If both hypotheses are false, it raises a problem for RLTND, because if the subject of the hypotheses is denotative, RLTND is false. Moreover, since we have

(1) 'Ep is true' is false

(2) 'Ep is false' is false

we have also

(3) 'Ep is true' is true   from (2), RLTND

(4) 'Ep is false' is true   from (1), RLTND

and from (3) (4) follows that LPC is false, too.[26] So if the paradox of Epimenides remains unsolved, Leśniewski's semantics collapses.

But here comes Leśniewski's solution. First note that Leśniewski takes 'the sentence stated by Epimenides at t_1 is false' as a token,[27] so, more precisely, one should write it with an index, like

(*) The sentence stated by Epimenides at t_1 is false $_{\text{Epimenides, } t_1}$.

And now Leśniewski claims that RLTND and LPC are not challenged by the Epimenides paradox, because for K the subject of (*) is non-denotative. As a matter of fact, for K the expression that is the subject of the token (*), 'the sentence stated by Epimenides at t_1', as a part of (*), denotes any object that has the properties connoted

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by it except itself and objects that have constitutive parts in common with it. But since the unique object that the subject of (*) could denote is (*) itself, and these two expressions have constitutive parts in common, the subject of (*) is non-denotative. The conclusion is, therefore, that the sentence stated by Epimenides at t_1 is false. And the subject of the sentence 'The sentence stated by Epimenides at t_1 is false' when it is stated—for instance—by me in 2002, i.e. the token

(**) 'The sentence stated by Epimenides at t_1 is false'$_{ab,\ 2003}$

does, instead, denote (*)*,* and *does not* possess a constitutive part common with the expression stated by Epimenides, but only with the expression stated by me in 2003, namely (**)*.* Therefore (**) is a true sentence, and, for TL '(**) is a true sentence' is a true sentence, etc. The same conclusions hold in application to any other token of 'the sentence stated by Epimenides at t_1 is false' stated by any other person at any other time, with the proviso that it is not Epimenides at t_1*.* From the truth of (**), or of any other (from (*)) token of 'the sentence stated by Epimenides at t$_1$ is false', follows not the truth of (*), as the Paradox claims, but the truth of sentences which are composed of the same expressions of (*), which is false.

IV. *"The Natural Rapids on the Dnepr"*

Much could be said concerning Leśniewski's solution, its medieval ancestors and its contemporary descendants.[28] But these angles appear to be of minor relevance to our present purpose. It is what Leśniewski says regarding K that deserves all our attention:

> It is absolutely correct that I solved the paradox of Epimenides only because I accepted <K, *A.B.*>—had I not accepted it, the paradox would not have been solved. It is also correct to say that the above-mentioned convention is 'arbitrary' in the sense that it

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conflicts with 'natural' 'tendencies of development' of language. These latter are undoubtedly contravened in my 'laws' by the fact that certain connoting expressions are not supposed to represent all objects which have the properties connoted by the given expressions. Such remarks, I say, would be totally justified—they could not, however, depreciate my arguments in any way. Since, keeping to 'natural tendencies of development' of language we get involved in irresolvable paradoxes, these 'tendencies' seem to imply contradiction in themselves. [...] 'scientific' language can eliminate various contradictions only departing from some schemas of 'natural language'; its value will depend on how much it succeeds in eliminating contradictions. 'Scientific' language 'artificially' framed by exactly defined conventions is a far better instrument of reason than language dissolving in the opaque contours of 'natural' habits which often imply incurable contradictions—much as the 'artificially' regulated Panama Canal is a better waterway than the 'natural' rapids on the Dnepr.[29]

There are at least three important issues to be noticed in connection with the introduction of K and with the passage just quoted.

The first regards the distinction philosophers usually describe as the *token/type* distinction. Without using this terminology, which he never employed, Leśniewski makes explicit the ontological status of the entities which play the role of truth-bearers, namely token-sentences. It should be noted that in Leśniewski's later formal systems the terminological explanations for the effective construction of the systems speak of token-expressions. His nominalism finds its roots here. Note also that this is an element which distinguishes Leśniewski's analysis from Tarski's *Concept of Truth*, where the notion of *equiformity*, a fundamental notion in the architecture of Leśniewski's later systems, is not taken into account formally. Roughly put, equiformity is the property shared by two token-expressions of the same type. Tarski stipulates that in his monograph expressions like 'expression', 'sentence' and so on are

not *common* names of the inscription enclosed in the quotation marks and of any other inscription equiform to it, but *singular names of classes of equiform expressions,* respectively *of sentences* and so on.[30] In his systems Leśniewski considered only concrete inscriptions which have been actually written down, token-sentences (equipped with meaning), and not type-sentences. The language of Leśniewski's systems is a language which grows, and the directives for the effective construction of a system of protothetic, ontology or mereology are always relative to a particular stage of development of that system.[31]

The second important element concerns the fact that *natural language has a superabundance of expressive means,* to the extent that only by limiting this superabundance can we solve the contradictions which we get involved in while operating with natural language, as the Epimenides paradox shows. Here, in particular, the limitation at issue regards self-reference in the sense of K.

The third important fact is connected with the second, and regards the (non-) 'naturality' of the language for which Leśniewski's solution is designed. The point is very interesting, and rather complicated, as it is also linked with Leśniewski's distinction between metalanguage and object-language, which, as previously mentioned, has not yet been discussed in the right perspective. We may first ask: does the distinction come from Leśniewski? and do we find it in his early papers? The answer to the first question is in the affirmative, as it will be clearer in the following section. Tarski's failure to ascribe the distinction properly to Leśniewski is indeed one for which he deserves to be blamed, and one of the greatest historical distortions to Leśniewski's detriment to which Tarski contributed. As a result, Tarski's, and not Leśniewski's, name is now most intimately associated with it.

Another question is, however, whether we find the distinction in Leśniewski's early papers. As mentioned above, Lejewski and Surma believe so. According to Czesław Lejewski, referring to Leśniewski's first paper:

> Leśniewski strictly [...] complied with the principle of observing the difference between object language and metalanguage or between use and mention to put it in alternative terms.[32]

Surma's claim is weaker and more acceptable: the early papers contain "the first outline of the distinction between language and metalanguage".[33] It is correct to say that in his early papers Leśniewski observes scrupulously the distinction between use and mention of words (no matter whether this is the right way of putting it), but it is not for this reason that we find there the first outline of the momentous distinction between language and metalanguage.[34]

To understand correctly what is at issue here, and in what way the early papers contain a move towards the distinction, one has to take into account an aspect of Leśniewski's early language about which Leśniewski himself is quite explicit, but on which misconceptions have often arisen. Leśniewski did not operate here within a fully formalized language. Nevertheless, Leśniewski's solution to the Liar is not meant for *natural language*. Leśniewski is well aware that in his papers he is discussing the grammar of *regimented language*, and it is because of this awareness that we can say that we find here the first outline of the distinction between language and metalanguage. *In* the language in which conventions, theses and semantic analyses are formulated, Leśniewski talks *about* language which he calls 'scientific language'. The scientific language is (conceived as) regimented natural language, as only language like this can be an adequate means of investigation in scientific practice.

The artificiality of this 'scientific language' is not a negative value: only thanks to the artificial elimination of its pernicious ambiguities—dangerous like the deadly rapids on the Dnepr, in the quotation—does natural language become an adequate means for scientific argumentation. Leśniewski's solution is meant for this language made 'scientific', not for natural language. Leśniewski's language of 1911-13 is, even if not symbolic, a partially artificial language, which already comprises fragments of formalized language, and which aims to be formalized in full. In speaking of *conventions, definitions, theorems, proofs, rules*, and trying to free his formulations from the typical ambiguities of ordinary language, Leśniewski created at this stage something located—very much in the spirit of the medieval tradition—in the middle between ordinary and formalized language, no longer the former, not yet the latter.

Whoever wants to do justice to Leśniewski should consider first of all these two latter connected aspects as making his approach original. Only in this way can Leśniewski's influence upon the development of semantics be seen more clearly. The modern approach is characterized by the idea that paradoxes show something deep and important about language. It has been argued that the modern treatments of the Liar differ from the traditional because of the modern attitude towards paradoxes as 'crash tests', under which semantic machineries can fall into a thousand pieces.[35] In this sense the approach of the *Critique* seems to be the first modern approach to paradoxes. The thought that paradoxes teach us that there is 'something to give up in ordinary language' belongs today to logical folkore. Leśniewski was the first, in 1913, twenty years before Tarski, to point out that this something is its semantic richness. This was also one of the most important reasons Tarski had to cite his teacher in the *Concept of Truth*.

V. The Early Leśniewski, Tarski and the Hierarchy of Languages

Without a doubt Leśniewski's 1913 *solution* has only very weak links with Tarski's own *solution*. It is a contextual solution, it makes use of a ban on self-reference and is based on tokens, and its direct links to the Tarskian hierarchy of languages as a way out are to be put seriously in question. The point is related to the language-*versus*-metalanguage distinction and to Leśniewski's non-natural regimented language as discussed above, although it remains a different point anyway. The issue is worth considering, as misunderstandings could easily arise from Leśniewski's application of TL to get a language stratification which seems to create a metalinguistic ascent.[36]

As Albert Visser pointed out,[37] Tarski's definition of 'metalanguage' as "the language in which we 'talk about' [the object-language] and in terms of which we wish in particular to construct the definition of truth for the first language" has to do with the *definition* of truth, not with Tarski's solution. That Leśniewski was at least implicitly at ease with the distinction does not imply that he himself employed a hierarchy of languages with distinct truth predicates. Quite the contrary. A major difference between the early and the mature Leśniewski is that in the former the language is semantically closed, while this is not the case with the object-language of the later systems, in which no semantic notions appear (and with this I do not intend to suggest in any way that a Tarskian hierarchy of languages is to be found in Leśniewski's mature thought). The need for a ban on self-reference like K is symptomatic of the universality of Leśniewski's early language. Consequently, since the language is universal, it contains its own, unique, truth-predicate.

As TL says, 'true' can be applied to quote-names of sentences like '*a* is *b*', where '*a*' can well be '*a* is *b*' and *b* the predicate 'true' and, in turn, '*a*' can be '*a* is *b*' and *b* 'true' etc. This, however, does not amount to a conception of distinct logical languages hierarchically ordered in Tarski's sense, and plays no role in solving the *Critique*'s Liar. The idea of a stratification of language is certainly present, but not that of a ***hierarchy*** of different distinct languages. It is rather a ***classification of parts of speech;*** that is to say, the first seed of the later theory of semantic categories.

Leśniewski's conception in these early writings may be sketched like this: there are particular sciences as physics, geometry and so on, which treat different kinds of objects. The sentences of which (the language of) these sciences are composed contain names to denote their objects. There is a 'super-science' which is about all the objects in general, sentences included, ***metaphysics*** or ***ontology,*** and metaphysical sentences contain names for all the objects in general (recall that Leśniewski does not eschew multiple denotation). Logic is a science which is about only ***some*** objects, namely sentences, and the sentences of logic contain names for (in principle) all sentences of geometry, physics and so on, as well as for the sentences of metaphysics.

To a certain extent Leśniewski will retain also later this idea of the single sciences,[38] with one important exception: Ontology does not anymore play the role of the 'super-science'. The 'super-science' that does not presuppose any other science is Protothetic, the 'science of first propositions'. Incidentally, Leśniewski's early choice of metaphysics as 'super-science' comes from the fact that in this period Leśniewski, like his Polish colleagues, is not yet familiar with the sentential calculus (the 'Theory of Deduction', as they used to say).[39] If the stratification given by TL resulted in different languages hierarchically ordered, then in the *Critique* the language of logic would be the metalanguage of metaphysics, and this is evidently not the case.

VI. From Leśniewski's Early Liar to the Logical Systems: Tarski's Background

The difficulties of natural language, Leśniewski observed, are like the rapids on the Dnepr: we must remove them through artificial regimentation. Rapids on the Dnepr aside, however, how useful is the *Critique* for tracing specific elements of Tarski's background? As previously remarked, Leśniewski's thinking, accessible in painfully few, convoluted publications, underwent considerable change. Some of them can be reconstructed by painstakingly comparing his early papers with his mature production, but some cannot, and many aspects of the development of his thought are not yet known to us. Some probably never will be. If accessible, these elements would cast valuable light on several philosophical aspects of Leśniewski's systems. And on this would depend, if possible at all, a thorough reconstruction of Tarski's background.

Leśniewski did not publish anything between 1916 and 1927.[40] This is particularly regrettable, since these silent years were the ones in which Leśniewski developed his systems and in which he was strongly influential upon Tarski, who, on his behalf, gave fundamental contributions to his master's enterprise.[41] True, we have Leśniewski's 1927-31 'autobiographico-synoptical' reconstruction of his former ideas. But no one would seriously think that by relying on that we can achieve an adequate understanding of Leśniewski's previous work.[42]

Although Leśniewski's early papers from 1911-14 are precious for historical reasons and for providing important insights into the philosophical foundations of Leśniewski's systems, the difference between them and his mature publications in logical technique and sophistication is apparent. The Leśniewski of the early papers is not the one whom Tarski met, and although some of the notions and principles which

are described above in sections 2.1. and 2.2. come – *mutatis mutandis* – quite close to Leśniewski's logical system of Ontology, taking these papers as Tarski's sole sources would be groundless. No one would consider as a serious hypothesis the claim that the *Critique* had an exclusive influence on Tarski, as if nothing happened afterwards in lectures, "scientific discussions and private conversations".

Tarski was definitely not taught by Leśniewski in 1919/20 that the Liar could be blocked by assuming K. But what was he taught? Is there something we can say, despite the hiatus in Leśniewski's published output?

We can safely assume that among the things which Tarski was taught by Leśniewski were at least the following: how to analyse *quotation marks*, the *language/metalanguage distinction*, the idea that *truth is language-relative*, the notion of a *closed language*, and that natural language is such a language, namely that natural language is *universal*.[43] These issues deserve much more than the few rough brush-strokes I am going to offer. The delicacy of the matter, however, chiefly due to the lack of textual first-hand sources, should not prevent that something be said at any rate: here below I limit myself to the first two points.

1. The analysis of quotation marks is among the elements which mark a definite distance between Leśniewski's early papers and Leśniewski's mature works. As we saw in the *Critique*, Leśniewski considered quotation marks as acceptable names of sentences and of other expressions, so that they are allowed in the 'definitions', the 'directives' and the 'conventions' he gives, like TL. In his later writings Leśniewski kept using quotation marks only informally and in ordinary language examples, without ascribing them any role in his logic.[44] Leśniewski's analysis of quotation marks is mainly known through Tarski, but it is in Kotarbiński that we find the first mention of it.

Others <Leśniewski, *A.B.*> question the correctness of the following formulations: 'The sentence «*p*» is true, hence *p*', 'The sentence «*p*» is false, hence not-*p*', '*p*, hence the sentence «*p*» is true', 'not-*p*, hence the sentence «p is false» is true'. And they refer to the fact that the variable '*p*' appears only apparently twice in these formulas […]: once it occurs without quotation marks, once in quotation marks; but this is something different and here there is no closer connection than is between the word *man* which is the name of Jan, Piotr and others, and the inscription '*man*', which is the name of each of the words consisting of those three letters in this order: m, a, n.[45]

Therefore, '«*p*»' must be considered as a syntactically simple inscription: in the name of sentences '«*p*»' there is no variable '*p*', even though quite the contrary seems to be the case. As Kotarbiński says in the note to this passage, the issue is also connected with Leśniewski's method of eliminating intensional functions which was mentioned in general terms by Tarski in 1923.[46] For something which Kotarbiński's passage points out very clearly is that TL was exposed to the same criticism by Leśniewski as the famous

(5) 'Snow is white' is true if and only if snow is white

and, more generally, the formulation

(6) '*p*' is true if and only if *p*

underwent in Tarski's *Concept of Truth*: that it is not a correct definition.[47] On the other hand, Leśniewski maintained that if a quote-expression is instead considered as a syntactically complex expression, then it must be the value of a name-forming function of one sentential variable argument, and the Liar, like other paradoxes, is easily obtained, even without making use of expressions like "true sentence".[48]

The problem is not that quotation marks are 'intensional functors', however, but rather that "the entire expression '«*p*»' is an informal symbol for some name whose formal definition may not be quite the same from one context to another".[49]

2. It has been remarked that although scholars have attributed the language/metalanguage distinction to Leśniewski, no one has quoted any source, textual or otherwise.[50] As a matter of fact we would seek in vain a clear statement in Leśniewski's works stating literally that he introduced the distinction in the Polish philosophical milieu (let alone the *term* 'metalanguage').[51] As previously remarked, in the *Concept of Truth* Tarski does not credit Leśniewski with the distinction.

He does so, however, in "The Establishment of Scientific Semantics". Although the passage is rather generic, it is significant: in Tarski's writings this is (seemingly) the only place where Leśniewski is said to be the first to give attention to the necessity of keeping language and metalanguage distinct and of relativizing semantic notions to language, as well as to the inadequacy of the 'monolinguistic' paradigm.

> S. Leśniewski did this first over a dozen years [*kilkanaście*] ago with full exactness and strength.[52]

As '*kilkanaście*' means 'from thirteen to nineteen', the attribution is in agreement with the hypothesis that the metalanguage/language distinction was in the 1919/20 package.[53] This is confirmed by the German version of the paper,[54] and by Tarski's 1930 letter to Neurath.[55]

We saw already in what sense we should look at Leśniewski's early writings for an outline of this distinction and how the point is connected with a strict formalization of the object-language. It suffices to consider, for instance, Leśniewski's 1929 paper on Protothetic to see the distinction perfected and in full action, a fact which Carnap acknowledged in the *Logische Syntax der Sprache*.[56]

A Leśniewskian formalized deductive system is a material collection of theses actually produced by someone and growing in space and time which begins with axioms, presupposing a theory of semantic categories (roughly a simple theory of linguistic types). The 'official' systems use a special symbolism of Leśniewski's own invention, which is generally considered the most precise ever formulated. The construction of such a system is carefully regulated by *directives* that must be *formally stated*. These regard the inscription of axioms, of definitions and of new theses in the system.[57] Directives do not belong to the object-language, but to the metalanguage:

> Since directives do not themselves belong to the system of Protothetic which they affect, I usually formulated them in ordinary colloquial language. I comment on particular terms of ordinary language appearing in the directives in a series of *terminological explanations*, which are also formulated in ordinary language.[58]

In order to save space, however, in this paper Leśniewski used a mereological metalanguage in Russell and Whitehead's symbolism for the directives and the terminological explanations. The language of the systems fulfills the expectation that Leśniewski had of the 'scientific language' of the early writings. Note that Leśniewskian systems are *interpreted* formal systems, in the sense that their language is a language *in use*, and their expressions are expressions *with meaning*. Despite the appearances, the path from the early writings to the mature logical systems is not one of rupture as one of progressive systematization, towards a complete separation of language and metalanguage.

The road from universality to its opposite required a formal sophistication which Leśniewski did not possess when he was struggling only with the weapons put at his disposal by Mill, Husserl and the other Brentanians.[59] This path, which passed through the removal from the object-language of names of the expressions actually occurring

in the object-language itself, is more visible if seen in the light of the 'bridging work' of 1916. Here Leśniewski still uses quotation marks and semantic expressions like 'denote' and 'true' in the language of his first mereological system, which is already a far more regimented 'scientific language' than that of Leśniewski's previous works. Quotation marks as adequate names of expressions and semantic notions still appear in the context of the object-language. For instance, we read

> *Definition I.* I use the expression 'ingredient of the object P' to denote the object P itself as well as each part of this object.[60]

And

> *Statement XXVII.* The statement 'If P is an element of the set of the objects m, then P is m' is false.
>
> *Proof.* Let us suppose that the statement XXVII is false. We infer from this that
>
> (1) The statement 'if P is an element of a set of objects m, then P is m' is true. From statement (1) follows that
>
> (2) if P is an element of a set of objects m, then P is m. […][61]

Definition I would not be a proper definition according to Leśniewski's later requirements.[62] It is very similar to the definition of ingredient we find in Leśniewski's reconstruction of the system from 1927,[63] but it shares with the later metalinguistic terminological explanations the character of a prescription formulated in the first person.[64] Leśniewski wrote about the definitions of 1916 that

> The propositions which I called 'definitions' in the original were propositions about myself.[65]

In *Statement XXVII* we can see, instead, that Leśniewski still considers TL perfectly appropriate. TL is, moreover, just presupposed and used in proofs without having been explicitly stated as a convention. Although Leśniewski himself never considered TL as a definition of truth, at this stage neither did he criticize such a view. A very probable hypothesis is that Leśniewski's reflections on the predicate 'true' were connected with his attack on Russell and Whitehead's *Principia Mathematica*, which involved, among other, the discussion of the meaning of the theses of the system of *Principia* and the role of the turnstile, accompanied by the crucial discovery of Frege's *Grundgesetze*.[66]

VII. Fragments of An Epilogue: Tarski's Dam and Frege's Ghost

At the time when Leśniewski wrote the *Critique*, the rapids on the Dnepr - the Polish-Ukrainian *porohy* - were still there, on the last stretch of the river, for 65 kilometers, from Dnepropetrovsk to Zaporožje ('beyond the *porohy*'). The Ukraine was sharply divided in two by the deadly difficult and well-nigh uncrossable *porohy*.[67] More or less in the same years in which Tarski was working on his Polish monograph, whose aim was "to build—for some given language—a *materially adequate* and *formally correct* definition of the term 'true sentence'"[68], a gigantic artificial, hydroelectric dam project was started, initially known as the Dneprostoj dam, now as the DneproGES, which, when it was finished in 1932, covered the dangerous *porohy* and finally made the Dnepr entirely navigable.

If, as we saw, Leśniewski and Tarski both agreed on the disease, what about the cure? Did Leśniewski agree on Tarski's gigantic *architektonisch raffiniertes* DneproGES project? Did Leśniewski approve of one of the seven wonders of modern philosophy?

Underground oral sources have it that the answer must be No. Tarski's should have appeared to Leśniewski an insufficiently intuitive solution to the malady of semantic antinomies.[69]

What stand did the mature Leśniewski take on truth, then? The only place where Tarski might help us with this is a short report in Polish from 1930/31:

> We can try to speak like this: a sentence of a certain system is true if and only if it is a thesis of that system.[70]

Although this was for Tarski, in turn, no sufficiently intuitive answer to the problem, we can be reasonably certain that at the time it was more in accordance with Leśniewski's (Fregean?) view on the relationship between logic and truth. If so, it is no wonder that

> Leśniewski did not anticipate the possibility of a rigorous development of the theory of truth, and still less of a definition of this notion; hence, while indicating equivalences of the form (T) as premises in the antinomy of the liar, he did not conceive them as any sufficient conditions for an adequate usage (or definition) of the notion of truth.[71]

In order to understand why for Leśniewski anticipating the definition of truth in Tarski's sense was no option, it is necessary that the gap which separates Tarski from Leśniewski in the entire conception of logic and semantics be properly understood.

The whole matter is, however, not an easy one, chiefly and again due to the scarcity of textual support. What we do know is that, from a certain period onwards, these two towering figures grew more and more apart, both personally and professionally. It seems that the reason for this is to be found in the context of the metalogical turn which took place in the Thirties. As Göran Sundholm has suggested, the contrast embodied by Leśniewski and Tarski has many similarities with Jean van

Heijenoort's opposition between *logic as language* and *logic as calculus*.[72] The construction of Tarski's dam on the Dnepr, and the circumstances under which the triumphant paradigm of logic as calculus made Leśniewskian logic appear to far too many an all too unmanageable, surpassed and superfluous tool, are a major issue in the history of logic. Thus, before a proper epilogue to the story of Tarski's dam and its Leśniewskian origins can be written, it will be necessary not only that its elements be disinterred in full detail, but also that a broader historical and cultural understanding of the matter be safely established.

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[1] Cf. Burge (1979), p. 169: "At the core of Tarski's theory of truth and validity was a diagnosis of the Liar Paradox according to which natural language was hopelessly infected with contradiction. Tarski construed himself as treating the disease by replacing ordinary discourse with a sanitized, artificial construction".

[2] Cf. Tarski (1933), p. 4 n. 3 (= (1995), p. 17 n. 3); (1935), p. 267; quoted from (1956a), p. 155 n. 1. Translations from Polish are mine unless otherwise indicated.

[3] As do, among others, Davidson (1967), pp. 27 and *ff*, (1973), pp. 71-72, (1979), p. 80, pp. 81-2; Haack (1978) – where Tarski's (1933) and (1935) are unwittingly and plurally referred to as "Tarski 1931" - pp. 102, 104-5, 120. Field (1972), p. 353 n. 9 attributes to Tarski even Leśniewski's notion of semantic category.

[4] Cf. Woleński (1994), p. 122 n. 4.

[5] Cf. Leśniewski (1913a).

[6] The exception is Rojszczak (1996), p. 159.

[7] Cf. for instance Woleński & Simons (1989), pp. 422, 425-6.

[8] Cf. Leśniewski (1927), pp. 182-3. Eng. tran. pp. 197-8. The rejected papers are Leśniewski (1911), (1912), (1913a) and (1913b).

[9] For some objections to the standard chronology, cf. my (1998).

[10] Cf. Betti to appear.

[11] Cf. Leśniewski (1913b), §7, p. 343; Eng. tran. p. 76.

[12] For a closer analysis of a perfect counterpart of this point in Łukasiewicz, cf. Betti (2002). Cf. also n. 39 *infra*.

[13] Cf. Leśniewski (1913a), §3, pp. 324-5; Eng. tran. p. 57; Leśniewski (1912), §§5-6 p. 212; Eng. tran. p. 31.

[14] "A connotative term is one which denotes a subject, and implies an attribute [...] the word white, denotes all white things [...] and implies, or in the language of the schoolmen, *connotes* the attribute *whiteness*";, Mill (1843), p. 31. Strictly speaking, as for Leśniewski there are connotative but non-denotative names, like 'round square', Mill's definition does not really fit his position.

[15] The elements *ad* 1. are already presented in the two articles that precede the *Critique*, cf. Leśniewski (1911) and (1912).

[16] See for instance Leśniewski (1912), §2, Remark III, p. 205; Eng. tran. p. 23. The terminology immediately brings to mind Tarski's *Convention T* – although in the original Tarski has the Slavonic '*umowa*' and Leśniewski here the Latin '*konwencja*'.

[17] Cf. Leśniewski (1913b), Remark to §4, p. 331; Eng. tran. p. 64.

[18] See the Terminological Explanations in Leśniewski (1929), pp. 63-8; Eng. tran. pp. 472-485.

[19] Cf. Leśniewski (1913b), Remark IV to §1, p. 332; Eng. tran. pp. 64-5 is really bad: the translator for instance renders "the English expression '*Polish* [instead of 'English'] expression'", which does not make sense.

[20] Cf. Leśniewski (1913b), Remark III to §1 p. 322. Eng. tran. pp. 53-4. It could seem that in this passage Leśniewski accepts rather the following: the sentence "*a* is *b*' is true' is true iff 'a is *b*' is true. The latter is enough to assume for Leśniewski's analysis of the Liar.

[21] Bar perhaps Frege, who, however, was older than - and at that time unknown to - Leśniewski. For a particularly clear example cf. Leśniewski (1911), Remark to §1, p. 329; Eng. tran. p. 1.

[22] Cf. *infra* section 6.2.

[23] Cf. Leśniewski (1913b), pp. 343-49; Eng. tran. pp. 77-82.

[24] The abbreviation is not used in Leśniewski's argumentation.

[25] Cf. also Tarski (1944), p. 672.

[26] Cf. Leśniewski (1913b), Remark I to §7, p. 345; Eng. tran. p. 78.

[27] See Leśniewski's treatment of tokens in the contemporaneous Leśniewski (1913a), pp. 508 and *ff*; Eng. tran. pp. 98 and *ff.*

[28] The nearest resolutions seem to be the Ockham-Pseudo-Sherwood-Burley one analyzed by Simmons in his stimulating (1993), pp. 83-98, that of Buridan's *Sophismata,* ch. 8 (better, the Hughes-Buridan's solution in Hughes (1982), pp. 23-29) and in very many respects Simmons' own resolution, *op. cit.*, pp. 98 ff.

[29] Cf. Leśniewski (1913b), Remark II to §7, p. 349; Eng. tran. p. 82 (reproduced here with changes, and the addition of the passage from "'scientific' language" to "contradictions"), my emphasis. Cf. also Rojszczak (1996), p. 160.

[30] Tarski (1933), p. 5 n. 5 (= (1995), p. 19 n. 5); (1935), p. 269, n. 5; (1956a), p. 156 n.1. Cf. also (1930), p. 315 n. 2; Eng. tran. p. 31 n. 3. The so-called 'name theory' of quotation marks was popular in Poland: cf. Ajdukiewicz (1928), p. 5: "The

inscription composed of quotes and of another inscription placed inside it is the name of this latter inscription, as well as of the inscriptions equiform with it". See also the passage from Kotarbiński quoted in section 6 below.

[31] Cf. Luschei (1962), p. 118, 6.1.5.

[32] Lejewski (1995), p. 34.

[33] Surma (1992), p. viii.

[34] I wrongly held the opposite view in my (1999), p. 102. Leśniewski's criticism of the reading of '~*p*' in *Principia Mathematica* also concerns just the use/mention confusion, cf. Leśniewski (1927), p. 176; Eng. tran. p. 190.

[35] Cf. Spade (1982), p. 253.

[36] There have been misunderstandings at this point, also on my part, cf. Betti (1998), p. 104 and Rojszczak (1996), p. 158-9.

[37] Cf. Visser (1989), p. 635.

[38] Cf. Leśniewski (1927), p. 179; Eng. tran. p. 193.

[39] This second fact should make us aware of the dangers of lifting formal results directly from Leśniewski's early papers. For example, it is evident that Leśniewski's early negation is not equivalent to his ontological negation: '*A* is non-*b*' cannot be rewritten as '*A* ε ¬<*b*>', because the latter is defined as '*A* ε *A* ∧ ¬(*A* ε *b*)', and LTND would be true even if no *A* exists.

[40] To my knowledge the sole work published by Leśniewski between his (1916a) and Leśniewski (1927) is a three-page review of the first volume of Sierpiński's *Analiza matematyczna*, published in the periodical of the Polish expatriates in Moscow, *Echo Polskie*. Cf. Leśniewski (1916b).

[41] One of the most important is Tarski's definition of the conjunction by means of equivalence and the universal quantifier, cf. Tarski (1923a) and Leśniewski (1929), p. 12 *ff*; Eng. tran. p. 419.

[42] We can have an idea of how much we have lost by simply imagining not having his early papers, and comparing what Leśniewski himself says of them in 1927.

[43] Cf. *supra* n.2.

[44] Cf. LeBlanc (1991), p. 3.

[45] Kotarbiński (1929), p. 147, referring to an oral communication by Leśniewski. See also (1966), p. 121. In (1954), pp. 468-9 (Eng. tran. (1966), pp. 399-400) Kotarbiński refers instead only to Tarski (1933).

[46] Cf. Tarski (1923a), p. 75; (1923b), pp. 23-4. Eng. tran. 1956, p. 8; Eng. tran. 1998 p. 50. Few know that the method was also mentioned by Leśniewski himself: "The speaker does not know [...] of any effective method for a reasonable interpretation and logical 'mastery' of the 'intensional functions' [...], except the method of their 'de-intensionalization'". Leśniewski mentions Carnap's (1934) stand as similar to his, but only in its fundamental conception, as for the rest Carnap's is "in certain essential details completely incorrect and leads to untenable theoretical consequences", cf. Łukasiewicz, Smolka, Leśniewski *et al.* (1938), p. 236.

[47] Cf. Tarski (1930/31), p. 3; (1933), p. 9 (= (1995), p. 23 and *ff*); (1935), pp. 268-9; (1956a), p. 159.

[48] Cf. Tarski (1933), p. 11 (= (1995), p. 26); (1935), p. 275. Cf. also (1956a), p. 161-2. It is difficult to tell whether in these latter passages Tarski reported Leśniewski's reconstruction of the Liar not involving the predicate 'true' exactly as it was. The particular formulation of the Liar-sentence in it comes from Łukasiewicz (1915), p.

29 (cf. also Woleński (1994), p. 121) and Tarski denies that Leśniewski detected the empirical premise occurring in the reconstruction, cf. Tarski (1944), p. 695 n. 7. Incidentally, the editors cause a mistake in the reprint of this latter (cf. Tarski (1986), p. 671) by just reprinting the original text without changing the Liar sentence accordingly.

[49] LeBlanc (1991), p. 10. Cf. also Lejewski (1981), p. 222 *ff.*

[50] Cf. Milne (1997), p. 190.

[51] Tarski has 'metalanguage' only from 1933 onwards (cf. Tarski (1933), p. 18 (=(1995), p. 34)).

[52] "pierwszy uczynił to przed kilkunastu laty z całą wyrazistością i siłą S. Leśniewski", cf. Tarski (1936a), pp. 174-5.

[53] Cf. also Luschei (1962), pp. 34-5.

[54] Cf. Tarski (1936b), p. 256. Göran Sundholm attracted my attention to the German passage. The original passage at fn 52 above was changed both in the German and the English translation. It is a pity that the reprint in the precious Tarski (1995), containing a comparison with the English translation, fails to signalize this. The less laudatory German and English versions sound respectively: "(so viel ich weiß, hat das zum ersten Mal vor 15 Jahren mit vollem Bewußtsein Leśniewski getan)", p. 256 and "(Leśniewski was the first to become fully aware of them)", p. 402.

[55] Cf. Tarski (1992), p. 15, 25. Cf. also Milne (1994), p. 190-1 n. 7.

[56] Cf. Carnap (1934), p. 113.

[57] Cf. LeBlanc (1991), p. 3-5; 13. This work is an excellent presentation of Leśniewski's systems.

[58] Cf. Leśniewski (1929), p. 59; Eng. tran. p. 468.

[59] Cf. Leśniewski (1927), p. 169; Eng. trans. p. 181.

[60] Cf. Leśniewski (1916a), p. 9; Eng. tran. p. 132.

[61] Cf. Leśniewski (1916a), p. 24; Eng. tran. p. 151 quoted with changes. 'Statement' translates here '*twierdzenie*: 'theorem', but also 'assertion'.

[62] And it would not be part of any system of logic, as Leśniewski observed about the reading of the assertion sign in *Principia* as "we assert that". Cf. Leśniewski (1927), p. 174. Eng. tran. p. 187. Incidentally, from this we can have an idea of the development which definitions underwent in Leśniewski's philosophy.

[63] Cf. Leśniewski (1927), p. 264: "*P* is an ingredient of the object *Q* if and only if *P* is the same object as *Q* or is a part of the object *Q*"; in formal terms: $\forall AB\,(A\,\varepsilon\,\mathbf{ingr}\,(B) \leftrightarrow A\,\varepsilon\,\mathbf{pt}\,(B) \vee (A\,\varepsilon\,B \wedge B\,\varepsilon\,A))$. Eng. tran. p. 230.

[64] Cf. Leśniewski (1929), p. 63: "To the 'terminological explanations' […] I give usually the form of propositions of the kind 'Of an object *A* I say that it is a *b* if and only if *p*'". Eng. tran. p. 471.

[65] Leśniewski (1927), p. 264 n. 1; Eng. tran. 230 n. 10, here reproduced with slight changes.

[66] See Leśniewski (1927), ch. I.

[67] And as such they were described by the Polish writer Henryk Sienkiewicz in *With Fire and Sword* (1884). Cf. Henryk Sienkiewicz, *Ogniem i mieczem,* Państwowy Instytut Wydawniczy, Warsaw, 1962; Eng. tran. New York, Collier Books, Macmillan Publishing, 1993.

[68] Cf. Tarski (1933), p. 1 (= (1995), p. 14); (1935), p. 264; (1956a), p. 152.

[69] "The only method for a real 'solution' of the 'antinomies' is through an intuitive undermining of the inferences or assumptions which contribute to the contradiction.

39

An unintuitive mathematics contains no effective remedy for any malady of the intuition". Cf. Leśniewski (1929), p. 6; Eng. tran. p. 413.

[70] Tarski (1930/31), p. 4.

[71] Tarski (1944), p. 695, n. 7.

[72] Cf. Sundholm (200X).