

# Roman Suszko and the non-Fregean Logics.

## Selected bibliography

### Index of the Section: "The Rediscovery of Ontology in Contemporary Thought"

- [Table of Formal and Descriptivists Ontologists](#) (PDF - from Bernard Bolzano to present time)
- [Ontologists of the 19th and 20th Centuries](#) (a selection of critical judgments about some of the greatest philosophers of the recent past)
- [Living Ontologists](#) (a list of authors with an interest in ontology, with synthetic Bibliographies)

### Roman Suszko and the Non-Fregean Logics

### SELECTED PUBLICATIONS IN ENGLISH (Works in Polish are not enclosed)

A complete bibliography including publications in Polish can be found in: Mieczyslaw Omyla and Jan Zygmunt, "*Roman Suszko (1919-1979): a bibliography of the published work with an outline of his logical investigations*," *Studia Logica* 43: 421-441 (1984).

1. "Canonic axiomatic systems," *Studia Philosophica* 4: 301-330 (1951).
2. "On the infinite sums of models," *Bulletin de l'Academie Polonaise des Sciences, Classe III* 3: 201-202 (1955).  
Co-author: J. Los
3. "On the extending of models (II). Common extensions," *Fundamenta Mathematicae* 42: 343-347 (1955).  
Co-author: L. Los
4. "On the extending of models (IV). Infinite sums of models," *Fundamenta Mathematicae* 44: 52-60 (1957).  
Co-author J. Los
5. "Remarks on sentential logics," *Indagationes Mathematicae* 20: 177-183 (1958).
6. "Syntactic structure and semantical reference (First Part)," *Studia Logica* 8: 213-244 (1958).  
"The syntactical and semantical investigations in contemporary formal logic refer always to the languages with specified syntactic structure, as with respect to such languages one can formulate exactly and, subsequently examine with mathematical tools 1) the rules of transformation (axioms, rules of inference) and the systems based on these rules (formalized theories), 2) the relations of semantical reference which occur between linguistic expressions and elements of objective sphere. Our considerations belong to that part of logical syntax and semantics which is independent of any assumptions concerning the rules of transformation.  
The syntactic structure of some language  $L$  is determined 1) by the *vocabulary* of  $L$  i.e. by the list of simple (undecomposable) expressions in  $L$ , and 2) by the *rules of construction*  $L$  of which state how the expressions of  $L$ , especially the sentences in  $L$  are built of simple expressions.  
In the first part of this paper we consider the general principles of the syntactic structure of languages. Namely, we shall formulate a scheme of the syntactic structure of language. This scheme will be called the *standard formalization* and the languages which fall under this scheme will be called the *standard formalized languages* (1).  
The scheme of standard formalization is based on a purely syntactical classification of expressions

into so called *semantical categories*.

The standard formalization is an abstract from the concrete material of artificial symbolic languages which are considered in formal logic. It is general in the following sense: every symbolic language known in formal logic - after carrying some modifications in its calligraphy -- falls directly under the scheme of standard formalization.

In the second part of this paper we consider the fundamental properties of semantic reference. First, we introduce a classification of objects into so called *ontological categories*. Further making use of some simple and quite natural connexion of conformity between semantical categories of simple expressions and ontological categories of corresponding objects, we can introduce the general notion of a *model* of any standard formalized language. Namely, for every standard formalized language  $L$  we define the family  $M(L)$  of all models of  $L$ . Every model of  $L$  is a totality to which the expressions of  $L$  can refer semantically and, conversely, every totality to which the expressions of  $L$  can refer semantically, belongs to the family  $M(L)$ . Thus, we obtain a general scheme of the relations of semantical reference which is quite closely connected with the scheme of standard formalization. This shows the ideographic character of standard formalized languages.

It may be a reasonable conjecture the content of this paper to be connected with the structural inquires in linguistics and with some problems of the philosophy of language and of thinking. But, we do not discuss here these connexions." pp. 213-214.

(1) These terms are borrowed from A. Tarski (in collaboration with A. Mostowski and R. M. Robinson) - *Undecidable Theories*, Amsterdam, 1953 p. 5.

7. "On extending of models (V). Embedding theorems for relational models," *Fundamenta Mathematicae* 48: 113-121 (1960).
8. "Syntactic structure and semantical reference (Second Part)," *Studia Logica* 9: 63-93 (1960).  
" 9. *Introductory remarks concerning the relation of semantical reference.*

We begin the considerations about semantics of standard formalized languages with some general remarks belonging to the theory of signs or semiotic in the sense of Ch. Morris [1938].

We consider the languages as systems of signs participating in the process of communication between persons belonging to some human group (speech community). Communicative employment of linguistic signs in some group is intertwined into the whole of activity of members of this group and of their relations to the environment, and the connection between the employment of linguistic signs and the activity of persons of the given speech community grants an intersubjective meaning to the employed signs.

The considerations about signs and languages may be conducted from a historical and descriptive point of view as well from systematical and theoretical one. On the other hand one can distinguish in these considerations three following ranges: syntax, semantics and pragmatics [Morris 1938]. The syntax deals with the relations which do occur between the signs alone. The principles of combination of simple signs into the composite signs are considered by it. Generally speaking with the syntax it is investigated the syntactic structure of languages. Semantics deals with the relations of semantical reference of signs to objects belonging to the objective sphere. These relations bind the signs with that *about what the signs in the process of communication are speaking*. Finally, pragmatics take into account the role of persons employing the signs.

One may say that the division of the science of signs and languages into syntax, semantics and pragmatics is made from the point of view of formal logic. Namely, pragmatics is strictly connected with the psychology, sociology, history of culture and other sciences dealing with members of speech communities. On the contrary the considerations about linguistic expressions conducted in formal logic are included in the syntax and semantics.

If a language  $L$  of some syntactic structure is meaningful in some circumstances (i. e. the expressions of  $L$  are participating in the process of communication in some human group) then the language  $L$  - as a system of expressions - semantically refers to some complex  $R$  of objects which may be called the referent of the whole language  $L$  in the given circumstances of meaningfulness of  $L$ . I think that the existence of this referent  $R$  and the occurrence of the relations of semantical reference between the language  $L$  and the referent  $R$  (and between the expressions of  $L$  and fragments of  $R$ ) is a basis of the intersubjective meaning of expressions of  $L$ . On the other hand the

syntactic structure of the language  $L$  depends 1) on the referent  $R$  and 2) on the members of the given speech community; *the principle of the dual control of linguistic structure*, [1938] p. 12. In the case of formalized languages the situation is much more simple. Firstly, in formal logic we abstract from pragmatical properties and relations of linguistic expressions. In formal logic we consider only the syntactic structure of languages and the relations of semantical reference. Therefore, instead of the referent of a given formalized language  $L$  (in the given circumstances of its meaningfulness) we consider here the family of all possible referents of  $L$  which are called *models* of  $L$  and the principle of dual control mentioned above is reduced to the connection between the syntactic structure and the common structure of all models of  $L$ . This is *the connection of conformity of semantical categories with the ontological categories*. It will be explained later. We do not intend here to prove the connection of conformity of categories. It will be enough to remark that this connection is fulfilled in all semantical interpretations of artificial symbolic languages considered in formal logic. We take in our paper the connection of conformity of categories as a fundamental principle by which are characterized the formal properties of relation of semantical reference and, consequently, it is possible to determine the family of all models of any given standard formalized language." pp. 63-64.

Charles Morris - *Foundations of the theory of signs* - International Encyclopedia of Unified Sciences, vol. I, 2, Chicago, 1938, 5th impr., 1947.

9. "Concerning the method of logical schemas, the notion of logical calculus and the role of consequence relations," *Studia Logica* 11: 185-216 (1961).
10. "A note concerning the binary quantifiers," *Theoria* 28: 269-276 (1962).
11. "A note concerning the rules of inference for quantifiers," *Archiv fr Mathematische Logik und Grundlagenforschung* 7: 124-127 (1965).
12. "Noncreativity and translatability in term of intensions," *Logique et Analyse* 9: 360-363 (1966).
13. An abstract scheme of the development of knowledge. In *Actes du XI Congres International d'histoire des sciences. Varsovie-Cracovie, 24-31 aot 1965*. Wroclaw: Ossolineum 1967. pp. 52-55
14. "A proposal concerning the formulation of the infinitistic axiom in the theory of logical probability," *Colloquium Mathematicum* 17: 347-349 (1967).
15. "An essay in the formal theory of extension and of intension," *Studia Logica* 20: 7-36 (1967).
16. "Concerning the infinitistic axiom in the theory of logical probability," *The Journal of Symbolic Logic* 32: 568 (1967).

Abstract

17. Formal logic and the development of knowledge. In *Problems in the philosophy of science. Proceedings of the international colloquium in the philosophy of science, London, 1963. Vol. I*. Edited by Lakatos Imre and Musgrave Alan. Amsterdam: North-Holland 1968. pp. 210-222  
Suszko's reply to W. V. Quine and J. Giedymin's discussion notes: pp. 227-230.
18. "Non-Fregean logic and theories," *Acta Logica* 11: 105-125 (1968).  
Annals of the University of Bucarest
19. "Ontology in the *Tractatus* of L. Wittgenstein," *Notre Dame Journal of Formal Logic* 9: 7-33 (1968).  
"The *Tractatus Logico-Philosophicus* of Ludwig Wittgenstein is a very unclear and ambiguous metaphysical work. Previously, like many formal logicians, I was not interested in the metaphysics of the *Tractatus*. However, I read in 1966 the text of a monograph by Dr. B. Wolniewicz of the University of Warsaw<sup>2</sup> and I changed my mind. I see now that the conceptual scheme of *Tractatus* and the metaphysical theory contained in it may be reconstructed by formal means. The aim of this paper\* is to sketch a formal system or formalized theory which may be considered as a clear, although not complete, reconstruction of the ontology contained in Wittgenstein's *Tractatus*. It is not easy to say how much I am indebted to Dr. Wolniewicz. I do not know whether he will agree with all theorems and definitions of the formal system presented here. Nevertheless, I must declare that I could not write the present paper without being acquainted with the work of Dr. Wolniewicz. I learned very much from his monograph and from conversations with him. However, when presenting in this paper the formal system of Wittgenstein's ontology I will not refer mostly either to the monograph of Dr. Wolniewicz or to the *Tractatus*. Also, I will not discuss here the

problem of adequacy between my formal construction and Tractatus. I think that the Wittgenstein was somewhat confused and wrong in certain points. For example, he did not see the clear-cut distinction between language (theory) and metalanguage (metatheory): a confusion between use and mention of expressions."

\*Presented in Polish at the Conference on History of Logic, April 28-29, 1967, Cracow, Poland.

20. "A note concerning the theory of descriptions," *Studia Logica* 22: 51-56 (1968).  
Co-author: H. Lewandowski
21. "Consistency of some non-Fregean theories," *Notices of the American Mathematical Society* 16: 506 (1969).  
Abstract
22. "Some theorems on abstract logics," *Algebra i Logika* 9: 165-168 (1970).  
Co-authors: Stephen L. Bloom and Donald J. Brown  
"An abstract logic consists of a pair  $\langle a, cn \rangle$  where  $a$  is an algebra and  $cn$  is a consequence (alias 'closure') operation on the carrier of  $a$ . In this paper several theorems are given characterizing 'structural' and 'invariant' logics by their completeness properties. the method is a generalization of the Lindenbaum-Tarski construction."
23. "A note on abstract logics," *Bulletin de l'Academie Polonaise des Sciences, Classe III* 18: 109-110 (1970).  
Co-authors: Stephen Bloom and D. J. Brown
24. "Sentential variables versus arbitrary sentential constants," *Prace z Logiki* 6: 85-88 (1971).
25. "Quasi-completeness in non-Fregean logic," *Studia Logica* 29: 7-14 (1971).  
"The notion of quasi-completeness (or O-completeness) has been introduced by J. Los [1], [2] into the semantics of theories in open languages with nominal variables. An analogous notion known as Hallden-completeness [3], [4] is applicable to sentential logics. Both notions are of the same formal nature and can be uniformly treated when formulated with respect to W-languages which contain two kinds of variables, sentential and nominal, as well. W-languages considered here are open, that is, not containing bound variables. The aim of this paper is to show that the main theorems of Los concerning the quasi-completeness also hold in non-Fregean logic and semantics.  
The author is indebted to Dr. Stephen L. Bloom from Stevens Institute of Technology for comments on the first draft of this paper."

[1] J. Los, *The algebraic treatment of the methodology of elementary deductive systems*, *Studia Logica* 2, 1955, 151-211.

[2] J. Los, R. Suszko, *On the extending of models II*, *Fundamenta Mathematicae* 42, 1955, 343-347.

[3] S. Hallden, *On the semantic non-completeness of certain Lewis calculi*, *The Journal of Symbolic Logic* 16, 1951, 127-129.

[4] S. A. Kripke, *Semantical analysis of modal logic II*, in: *The Theory of Models*, Amsterdam 1965, pp. 206-220.

26. "Semantics for the sentential calculus with identity," *Studia Logica* 28: 77-82 (1971).  
Co-author: Stephen L. Bloom

The SCI (Sentential Calculus with Identity) is obtained from the classical sentential calculus by the addition of 1 a new binary connective, the identity connective (denoted by  $=$ ) and 2 axioms which 'say' that  $=$  means "p is identical to q" (also: "the situation p is the same as the situation q"). The new axioms are the weakest possible; no presuppositions about the meaning of "is identical to" are included (other than  $p = p$ ). We do not attempt to say what the range of the sentential variables  $p, q, r, \dots$  is. (In the classical propositional calculus, they are intended to range over a two element set.) In this paper, a number of results about the semantics of the SCI are given without proof. The proofs of these and other results are contained in the much longer Investigations into the Sentential Calculus with Identity."

27. "Identity connective and modality," *Studia Logica* 27: 7-41 (1971).
28. "Sentential calculus with identity (SCI) and G-theories," *The Journal of Symbolic Logic* 36:

709-710 (1971).

Abstract

29. "Description in theories of kind W," *Bulletin of the Section of Logic* 1: 8-13 (1972).  
Co-author: Mieczyslaw Omyla
  30. "Definitions in theories of kind W," *Bulletin of the Section of Logic* 1: 14-19 (1972).  
Co-author: Mieczyslaw Omyla
  31. "A note on modal systems and SCI," *Bulletin of the Section of Logic* 1: 38-41 (1972).
  32. "A note on adequate models for non-Fregean sentential calculi," *Bulletin of the Section of Logic* 1: 42-45 (1972).
  33. "Investigations into the sentential calculus with identity," *Notre Dame Journal of Formal Logic* 13 (3): 289-308 (1972).  
Co-author: Stephen L. Bloom  
"The sentential calculus with identity (SCI) is obtained from the classical sentential calculus by the addition of a binary 'identity connective' = and axioms which 'say' that  $p = q$  means  $p$  is identical to  $q$ . the study of the semantics of the resulting consequence operation using Tarski's matrix method yields insights into consequence operations in general and the classical and modal consequence operations in particular. One finitely axiomatizable SCI theory is studied. It is shown that this theory consists of those formulas valid in all topological boolean algebras."
- See also the *Errata* - in: *Notre Dame Journal of Formal Logic*, volume 17, 1976) p. 640.
34. "SCI and modal systems," *The Journal of Symbolic Logic* 37: 436-437 (1972).  
Abstract
  35. Adequate models for the non-Fregean sentential calculus (SCI). In *Logic, language, and probability. A selection of papers contributed to sections IV, VI, and XI of the Fourth International Congress for Logic, Methodology, and Philosophy of Science, Bucharest, September 1971*. Edited by Bogdan Radu and Niiniluoto Ilkka. Dordrecht: Reidel 1973. pp. 49-54
  36. "Abstract logics," *Dissertationes Mathematicae* 102: 9-41 (1973).  
Co-author: D. J. Brown
  37. "Structurality, substitution and completeness," *The Journal of Symbolic Logic* 38: 348 (1973).  
Co-authors: Stephen Bloom and D. J. Brown (Abstract).
  38. "Dual spaces for topological Boolean algebras," *Bulletin of the Section of Logic* 3: 16-19 (1974).  
Co-author: E. Quackenbush
  39. "A note on intuitionistic sentential calculus," *Bulletin of the Section of Logic* 3: 20-21 (1974).
  40. "Equational logic and theories in sentential language," *Bulletin of the Section of Logic* 1: 2-9 (1974).  
A slightly abridged version of the essay published with the same title in *Colloquium Mathematicum*
  41. "Some notions and theorems of McKinsey and Tarski, and SCI," *Bulletin of the Section of Logic* 3: 3-5 (1974).
  42. "Equational logic and theories in sentential languages," *Colloquium Mathematicum* 19: 19-23 (1974).
  43. Abolition of the Fregean Axiom. In *Logic Colloquium. Symposium on logic held at Boston, 1972-73*. Edited by Parikh Rohit. Berlin: Springer-Verlag 1975. pp. 169-239  
This paper was also published as a separate booklet by the Institute of Philosophy and Sociology of the Polish Academy of Sciences, Warsaw 1972, in a series of preprints.
  44. "Ultraproducts of SCI models," *Bulletin of the Section of Logic* 4: 9-14 (1975).  
Co-author: Stephen L. Bloom
  45. "Remarks on Łukasiewicz three-valued logic," *Bulletin of the Section of Logic* 4: 87-90 (1975).
  46. "A note on the least Boolean theory in SCI," *Bulletin of the Section of Logic* 4: 136-137 (1975).
  47. "EN-logic," *Bulletin of the Section of Logic* 3: 13 (1976).  
Co-author: Aileen Michaels  
A loose summary of: *Sentential calculus of identity and negation*
  48. "Sentential calculus of identity and negation," *Reports on Mathematical Logic* 7: 87-106 (1976).  
Co-author: Aileen Michaels
  49. "On distributivity of closure systems," *Bulletin of the Section of Logic* 6: 64-66 (1977).

Co-author: Wojciech Dzik

50. "On filters and closure systems," *Bulletin of the Section of Logic* 6: 151-155 (1977).
51. "The Fregean axiom and Polish mathematical logic in the 1920s," *Studia Logica* 36: 376-380 (1977).  
Summary of the talk given to the 22nd Conference on the History of Logic, Cracow (Poland), July 5-9, 1976.
52. On the antinomy of the Liar and the semantics of natural language. In *Semiotics in Poland 1894-1969*. Edited by Pelc Jerzy. Dordrecht: Reidel 1979. pp. 247-254  
English translation by Oligierd Wojtasiewicz of an article published in Polish in 1957.  
"The antinomy of the liar has been discussed many times in formal logic. It is associated with remarkable advances in logic: the formulation of the semantic theory of truth [4] and the discovery of undecidable statements and the impossibility of proofs of consistency under specified conditions ([2]; see also [3], Vol. II, pp. 256ff).  
All those results make fundamental use of *self-referential expressions*, which were first used, in the history of logic, in the antinomy of the liar. The aim of this paper is to demonstrate, by quite elementary methods; something that has been known since the birth of semantics, namely, that the concept of truth and other semantic concepts are relative in nature [5] and that using relative semantic concepts, including the construction of self-referential expressions, does not result in antinomies in natural language.  
Semantics, and in particular the semantic theory of truth, presupposes syntax. The wealth of semantic analysis thus depends on the wealth of syntactic information about those expressions to which semantic analyses refer. Since in this paper no systematic syntactic studies on the structure of expressions are made, except for the construction of self-referential expressions, the set of concepts used in the semantic theory of truth discussed here is very modest.  
(...)  
The semantic theory of truth does not result in the antinomy of the liar if we use concepts restricted to a set of statements which does not include statements from the theory of truth which we are studying in a given case.  
It can be shown that the same applies to other parts of semantics, namely those in which the other semantic concepts (denoting, satisfying, etc.) are used [4], [5], [6].  
To do this it suffices to analyse other antinomies constructed with the aid of semantic concepts, and to modify them in a manner analogical to that applied above in the case of the antinomy of the liar. The semantic concepts which we can use in semantic research without being involved in antinomies are relative (restricted). They have a certain reference to a type  $L$  of expressions, which includes neither those semantic terms which have a reference to  $L$ , nor statements containing those semantic terms. Within those semantic analyses in which we use semantic concepts restricted to type  $L$  of expressions we can construct, in accordance with general syntactic rules, an expression which can be proved not to be of type  $L$ . The proof consists in a reasoning which changes into an appropriate antinomy if the restrictive reference to  $L$ , applied to the semantic concepts used in that case, is disregarded."

Works cited:

- [1] Carnap, R., 'Die Antinomien und die Unvollständigkeit der Mathematik', *Monatshefte für Mathematik und Physik*, 41, 1934, pp. 263-84.
- [2] Gödel, K., 'Über formale unentscheidbare Sätze der "Principia Mathematica" und verwandter Systeme I', *Monatshefte für Mathematik und Physik* 38, 1931, pp. 173-98.
- [3] Hilbert, D., Bernays, P., *Grundlagen der Mathematik*, Berlin 1934, 1939.
- [4] Tarski, A., 'The Concept of Truth in Formalized Languages', in: Tarski, A., *Logic, Semantics, Metamathematics*, Oxford 1956.
- [5] Tarski, A., 'The Establishment of Scientific Semantics', *ibid.* [6] Tarski, A., 'On the Concept of Logical Consequence', *ibid.*
53. Normal and non-normal classes in current languages. Studies in the concept of class. I. In *Semiotics in Poland 1894-1969*. Edited by Pelc Jerzy. Dordrecht: Reidel 1979. pp. 255-272

Co-author: Zdzislaw Kraszewski.

English translation by Oligierd Wojtasiewicz of an article published in Polish in 1966.

"Russell's antinomy of the class of normal classes, i.e., the class of those classes which are not their own elements, emerged when the current concept of class was being given more precision. It is this current concept of class which is blamed for Russell's antinomy.

The task of the present paper is to offer a fairly precise definition of the current concept of class, which has subsequently come to be split into the collective (concretistic) concept of class and the distributive (mathematical) concept of class or set. S. Lesniewski's mereology, to which T. Kotarbinski's concretism refers, is a theory of classes in the collective sense. The theory of classes in the distributive sense has taken the form of mathematical set theory, which originated with E. Zermelo; other versions of the theory of classes in the distributive sense are provided by B. Russell's type theory and S. Lesniewski's Ontology.

After making the current concept of class more precise, which will consist in a systematization of the assumptions concerning that concept, we shall define normal and non-normal classes as well as the class of normal classes and the class of non-normal classes. Several variations of these definitions are possible, and Russell's antinomy can be reconstructed in each case. We shall see, however, that his antinomy cannot be reconstructed in current language, since the corresponding reasonings do not yield a contradiction. The thesis of this paper is that the current concept of class, as described below, is not self-contradictory."

54. Normal and non-normal classes versus the set-theoretical and the mereological concept of class. Studies in the concept of class. II. In *Semiotics in Poland 1894-1969*. Edited by Pelc Jerzy. Dordrecht: Reidel 1979. pp. 273-283

Co-author: Zdzislaw Kraszewski.

English translation by Oligierd Wojtasiewicz of an article published in Polish in 1968.

"We shall concern ourselves here with the transition from the current concept of class to the distributive (set-theoretical) and the collective (mereological) concept of class. This transition is linked to the concepts of normal and non-normal class. Preliminary remarks on that issue have already been made in Sec. 8.

We assume here a non-existential axiom system for the current concepts of class and element, as described in Secs. 2 and 3. Consequence and equivalence are interpreted, as before, as consequence and equivalence in the light of that axiom system."

55. "Filters and natural extensions of closure systems," *Bulletin of the Section of Logic* 8: 130-132 (1979).

Co-author: T. Weinfeld

56. The reification of situations. In *Philosophical logic in Poland*. Edited by Wolenski Jan. Dordrecht: Kluwer 1994. pp. 247-270

English translation by Theodore Stazeski of an article published in Polish in 1971.

"The great task of the theory of reification is to show in what way the so-called ontological assumptions of the structure of the universe of situations are transferred to events by reifications, and to impose an algebraic structure on them. Such an approach to the theory of reification flows from the earlier expressed opinion that situations are primary and events are derived. One should not confuse this point of view with the false opinion, I believe, that situations are primary in relation to all objects. It is an altogether different and difficult matter, and in this case a certain consultation of Wittgenstein would be very useful. But the fact that situations are primary in relation to their reification is rather natural. The abstract process, of which the formal expression is the reification of a situations, finds - I think - its fragmentary expression in ordinary language; I write 'I think' since I enter into the competence of linguists. These examples given by Slupecki are an illustration. Thus, forest fire = reification of the situation that the forest is burning, and Matt's death = reification of the situation that Matt died. These examples do not give evidence that an explicit symbol of the reification of situations, corresponding to the star of Slupecki of our T, exists in natural language. They are examples giving evidence that the grammatical apparatus of a natural language can often,

though certainly not always, transform sentences  $p$  (describing situations) into names  $x$  (designating particular events) such that  $x = T(p)$ , and sentences containing those names. The opposite transformation is something unnatural, and is hardly taken into consideration by grammarians. This observation obviously does not remove the most serious difficulties which appear in connection with situations. The principal difficulty appears at the moment of incorporation of non-trivial theories written in natural language with help of (bound) sentence variables. Reading formulas appearing in this theory in natural language immediately raises serious doubts for many logicians with regard to sense or correctness. There are no such difficulties, or they are considerably less, in the reading of formulas with name variables (not sentential). It is probably the symptom of some deep, historical attribute of our thought and natural language, whose examination and explication will certainly be prolonged and arduous.

From the rather narrow point of view of formal logic the following considerations are suggested. The difference between a sentence and a name is not exhausted in their syntactical properties. A certain syntactic analogy even exists between the category of sentences and the category of names, which can stretch very far (for example the rules of operations for quantifiers are formally similar in the case of sentential and name variables). The difference between sentences and names appears first of all in that sentences, and not names, are subject to assertion, as well as that sentences are premises and conclusions in reasoning. These distinctions on the language level are transferred in some manner to that to which the sentences and names semantically refer. Semantical relation (reference), however, of sentences and names are also - formally - to a certain degree analogical. Names designate and sentences describe. The difference in terminology (designate, describe) is not essential. The essential point is that we attribute reference to something both to names and to sentences, and that this, in the case of a given name and a given sentences, is exactly one; with the assumption, obviously, of a univocal sense of expression and with exclusion of mythological terms. This analogy, however, is not complete, just like the analogy between sentences and names, with result that a categorial gap exists between that which a sentence describes (a situation) and that which a name designates (an object). The fact that the expressions  $p = x$  and  $p x$ , where on the left we have a sentence and on the right a name, are not well formed formulas, shows this profound gap. The analogies between situation and objects as well as that between sentences and names are not complete. But it does not stop at the level of the formation of sentences and names, not at the level of the formal operation on them in accordance with logic. What, therefore, is the cause that our thought and natural language discriminate sentence variables to a certain degree, and particularly, general and existential sentences about situations?

The above considerations about the reification of situations show that the theory of situations and the theory of events are, in certain manner, equivalent. Why, therefore, prefer the theory of events to the theory of situations?" pp.249-250.

## STUDIES ABOUT THE WORK OF ROMAN SUSZKO

1. Babyonyshev Sergei V., "Fully Fregean logics," *Reports on Mathematical Logic* 37: 59-77 (2003).
2. Beziau Jean-Yves, "A sequent calculus for Łukasiewicz's three-valued logic based on Suszko's bivalent semantics," *Bulletin of the Section of Logic* 28: 89-97 (1999).  
"A sequent calculus S3 for Łukasiewicz's logic L3 is presented. The completeness theorem is proved relatively to a bivalent semantics equivalent to the nontruthfunctional bivalent semantics for L3 proposed by Suszko in 1975. A distinguishing property of the approach proposed here is that we are keeping the format of the classical sequent calculus as much as possible."
3. Bloom Stephen L., "Completeness theorem," *Studia Logica* 27: 43-55 (1971).
4. Bloom Stephen L., "A completeness theorem of 'theories of kind W'," *Studia Logica* 27: 43-56 (1971).
5. Bloom Stephen L., "On 'generalized logics'," *Studia Logica* 33: 65-68 (1974).
6. Caleiro C., Carnielli W., Coniglio M.E., and Marcos J. Suszko thesis and dyadic semantics. 2003.

Research report, CLC, Department of Mathematics, Instituto Superior Técnico, 1049-001 Lisboa,

Portugal, 2003.

Presented at III World Congress on Paraconsistency, Toulouse, France, July 28-31, 2003.

"A well-known result by Wojcicki-Lindenbaum shows that any tarskian logic is many-valued, and another result by Suszko shows how to provide 2-valued semantics to these very same logics. This paper investigates the question of obtaining 2-valued semantics for many-valued logics, including paraconsistent logics, in the lines of the so-called "Suszko's Thesis". We set up the bases for developing a general algorithmic method to transform any truth-functional finite-valued semantics satisfying reasonable conditions into a computable quasi tabular 2-valued semantics, that we call dyadic. We also discuss how "Suszko's Thesis" relates to such a method, in the light of truth-functionality, while at the same time we reject an endorsement of Suszko's philosophical views about the misconception of many-valued logics."

7. Czelakowski Janusz and Pigozzi Don, "Fregean logics," *Annals of Pure and Applied Logic* 127: 17-76 (2004).  
 "The main results of the paper: Fregean deductive systems that either have the deduction theorem, or are protoalgebraic and have conjunction, are completely characterized. They are essentially the intermediate logics, possibly with additional connectives. All the full matrix models of a protoalgebraic Fregean deductive system are Fregean, and, conversely, the deductive system determined by any class of Fregean 2nd-order matrices is Fregean. The latter result is used to construct an example of a protoalgebraic Fregean deductive system that is not strongly algebraizable."
8. Diankov Bogdan. On the main principle underlying Roman Suszko's semantic conception. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984*. Edited by Perzanoski Jerzy. Cracow: Jagiellonian University 1987. pp. 191-196
9. Golinska Joanna and Huuskonen Taneli, "Number of extensions of non-Fregean logics," *Journal of Philosophical Logic* 34: 193-206 (2005).  
 "We show that there are continuum many different extensions of SCI [sentential calculus with identity] (the basic theory of non-Fregean propositional logic) that lie below WF (the Fregean extension) and are closed under substitution. Moreover, continuum many of them are independent from WB (the Boolean extension), continuum many lie above WB and are independent from WH (the Boolean extension with only two values for the equality relation), and only countably many lie between WH and WF."
10. Lukowski Piotr, "Intuitionistic sentential calculus with identity," *Bulletin of the Section of Logic*: 92-99 (1990).  
 "The paper concerns the intuitionistic sentential calculus with identity IISCID, mentioned by professor R Suszko in his several papers. The work presents a semantics for ISCI, which combines the ideas of the matrix semantics for sentential calculi with the well-known Kripke-Grzegorzczuk for the intuitionistic logic. Besides sketching a proof of the strong completeness theorem for ISCI, there are some straightforward connections between the new semantical construction and the modeling of SCI, i.e., the ordinary calculus with identity. The end of the work deals with a simplified version of the frame-matrix semantics for the intuitionistic logic without sentential identity."
11. Lukowski Piotr, "Intuitionistic sentential calculus with classical identity," *Bulletin of the Section of Logic*: 147-151 (1990).  
 "Sentential calculus with identity /SCI/ has been created by Professor R Suszko. The discussion on SCI was a subject of many works. The intuitionistic weakening of this calculus /ISCI/ is presented in Pslukowski's "Intuitionistic sentential calculus with identity", *Bulletin of the Section of Logic*, 19, 3. In fact SCI is a classical propositional calculus with classical identity, while ISCI an intuitionistic propositional calculus with intuitionistic identity. Thus in the present paper two strengthenings of ISCI, i.e., intuitionistic propositional calculus with classical identity /ISCI CI/ and classical propositional calculus with intuitionistic identity /SCI II/ are considered. There are also presented adequate semantics for both calculi."
12. Malinowski Grzegorz and Zygmunt Jan, "Review of: Roman Suszko - Abolition of the Fregean Axiom (1975)," *Erkenntnis* 12: 369-380 (1978).

"According to Professor Suszko's declaration on page 169, the main subject of his paper is the construction of non-Fregean logic (NFL) and its basic properties. To satisfy the reader's curiosity, we may say that NFL is generally speaking a result of the rejection of the Fregean axiom. This amounts to the following:

(FA) *all true (and, similarly, all false) sentences describe the same, that is, have a common referent.*

Before describing the content of the paper in some detail, we would like to draw the reader's attention to the facts that (1) the paper is concerned with the philosophy of logical constructions and the properties of logic but not with the proofs of theorems; (2) the paper is a survey in which the author presents his own results as well as those of his colleagues. The presentation is against the broad background of the historical development of modern logic and recent research in possible world semantics, modal logics, intensionality and entailment, and all this is in order to strongly criticize 'that messy abyss with all its diffuse ghosts of ambiguity, vague flexibility, intensionality and modality' (cf. p. 171).

The paper under review consists of an introduction, 14 main sections, a supplement and a bibliography. The supplement contains 53 notes which provide us with deeper elaboration of some of the networks, comments, complements, sketches of proofs, etc. presented earlier. The bibliography, also containing 53 items, is not arranged alphabetically but in order of their citation in the main text, and includes the titles of almost all the important works by R. Suszko and his colleagues on non-Fregean logic - and in particular, sentential calculus with identity."

13. Malinowski Grzegorz. Non-Fregean logic and other formalizations of propositional identity. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984.* Edited by Perzanoski Jerzy. Cracow: Jagiellonian University 1987. pp. 159-166

The aim of the paper "is to present Sentential Calculus with Identity in comparison with other formalizations of propositional identity."

"Final remarks. It is evident that any comparative question concerning the logic of propositional identity may be posed either in reference to a particular language or to a special feature of a formalisation. Among several current requirements the three following seem to be of it particular importance:

- (1) Extensionality in the sense at Leibniz Law of indiscernibility of identicals.
- (2) Formal character of identity: nothing except general properties such as e.g. reflexivity, symmetry or transitivity has either be assumed or proved
- (3) Purely sentential character of formalisation: the language has to contain only sentential variables.

(...)

If one agreed that all the properties (1)-(3) are basic for the logic of propositional identity, SCI would be considered as the only genuine logic of this kind. [The property that logics of identity corresponding to S4 and S5 proved to be axiomatic strengthenings of SCI, cf. [Bloom & Suszko 1972] and [Suszko 1971] supports the conclusion.]

#### References

S. L. Bloom, R. Suszko, Investigations into the Sentential Calculus with Identity, *Notre Dame Journal of Formal Logic*, 13 (1972), pp. 289-308.

R. Suszko, Identity connective and modality, *Studia Logica*, 27 (1971), pp. 7-39.

14. Malinowski Grzegorz, "Sur les principes sémantiques de Frege et sur une définition non-fregeenne de la notion d'identité propositionnelle," *Mathématiques et Sciences Humaines* 116: 57-62 (1991). "On semantic principles of Frege and non-fregean definition of the concept of propositional identity. A non-fregean realization of the semantic programme of G. Frege elaborated by R. Suszko is one of the most interesting recent logical constructions. The aim of the paper is to present formal and philosophical aspects of the sentential calculus with identity, SCI, constituting the base of that

realization."

15. Metzler Helmut. Some remarks on Roman Suszko's discussion of the Frege-Axiom from the point of view of philosophy and methodology. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984.* Edited by Perzanoski Jerzy. Cracow: Jagiellonian University 1987. pp. 167-174

"Roman Suszko writes: "The semantical assumption that all true (and, similarly, all false) sentences describe the same, i.e. have a common referent (Bedeutung) is called the Fregean Axiom" (Suszko 1977, p. 377). He himself distinguishes in a strict way between logical and algebraic valuations of expressions of languages and speaks of an amalgamation into an inseparable unity of logical valuations (truth and falsity) and algebraic valuations (reference assignments) in Frege's thinking which he rejects (Suszko 1977, p. 378).

From the point of view of the history of logic it is of interest to know something about the reasons why Frege used this amalgamation of two kinds of valuations. The main theses of this talk are the following

- (1) The amalgamation is based on epistemological assumptions.
- (2) Analysing semantical aspects of his general scientific problem of the foundation of mathematics Frege treated a similar subject as the two kinds of valuations, distinguishing referent (truth and falsity) and sense ("Gedanke") of sentences.
- (3) The difference between Frege's approach in solving his problem and other authors' approaches is based on different epistemologies.
- (4) Distinguishing between the two kinds of valuation of sentences is of interest not only with respect to philosophical aspects of logic but also from the point of view of methodology." p. 167

"The distinction between the two different dimensions of valuation of sentences or logical formulae claimed by Suszko seems to me relevant especially from the point of view of methodology but also for the philosophical dispute over logic. For the second aspect the discussion of so called "paradoxes of material implication" provided an example.

I shall exemplify at this special case how the distinction of the two kinds of valuation can help us to come to a deeper understanding of logical expressions. From the philosophical point of view we can't discuss tautologies only as truth-value functions as they work in inferences, or with other words, we can't discuss them only with respect to inference relation. We have also to ask, which kind of reality will be represented by logical tautologies? What is the ontological aspect of logical tautologies? To find some understanding in this topic we will take attention to the so called paradoxes of material implication.

In so far as formulations like "from the False anything follows" or "the True follows from anything" are regarded only with respect to transformation of truth-values, they have the appearance of paradox. But if we assume that there are other reference assignments besides those of truth-values, then the two logical tautologies can stimulate us to seek them. Then we can reflect that tautologies relate not only to inferences but also to conditions of being. With respect to such reference assignments the two tautologies above lose their paradoxical character. Their interpretation as theorems on being of truth says nothing more than "truth exists by itself" ("truth needs no assumptions") and "falsity is no basis of inference". A methodological value of the claimed distinction is given by a twofold sharpening of scientific research; controlling simultaneously methodical aspects of thinking and the association of content of thoughts. By this I mean: Suszko's criticism has it that logicians should think about the objects of scientific research the way other, practically minded scientists do in their research, because scientists in individual or teamwork control their procedures with concern both for the content of their ideas and the logical validity of their inferences. When we focus logical analysis of scientific labour more strongly on the unity and distinction of the two dimensions of valuation, I think we shall obtain new information for the automation of scientific work, and promote the development of applied logic. Comparing the intention behind, and the results of Frege's distinction between sense and referent may, on the one hand, help to describe scientific work; and, on the other hand, Suszko's distinction between the two kinds of valuation may give new insight in modelling scientific research-processes and help us to increase the efficiency of scientific labour."

16. Omyla Mieczyslaw, "Translatability in non-Fregean theories," *Studia Logica* 35: 127-138 (1976).
17. Omyla Mieczyslaw, "Boolean theories with quantifiers," *Bulletin of the Section of Logic* 7: 76-83 (1978).
18. Omyla Mieczyslaw. The logic of situations. In *Language and ontology. Proceedings of the 6th International Wittgenstein Symposium. 23rd to 30th August 1981 Kirchber am Wechsel (Austria)*. Edited by Leinfellner Werner, Kraemer Eric, and Schamk Jeffrey. Wien: Hölder-Pichler-Tempsky 1982. pp. 195-198  
 "Professor Roman Suszko introduced a broad class of languages into the literature of logic. In honour of Wittgenstein Suszko named these languages W-languages. Syntax, semantics and consequence operations in these languages are based on the famous ontological principle: whatever exists is either a situation, or an object, or a function. The distinguishing property of W-languages is that they contain sentential and nominal variables, identity connectives and identity predicates. The intended interpretation of W-languages is such that sentential variables range over the universum of situations, nominal variables range over the universum of objects. All other symbols in these languages except sentential and nominal variables are interpreted as symbols of some functions both defined over the universum of situations and the universum of objects. Identity connectives correspond to identity relations between situations, and identity predicates correspond to identity relations between objects. It is obvious that the ordinary predicate calculus with identity is a part W-language excluding sentential variables, but the most often used sentential languages are the part of W-languages without nominal variables and identity predicates. In this paper, I will discuss only W-languages containing sentential variables, connectives and possibly quantifiers binding sentential variables." p. 195
19. Omyla Mieczyslaw, "Basic intuitions of non-Fregean logic," *Bulletin of the Section of Logic* 11: 40-47 (1982).
20. Omyla Mieczyslaw and Zygmunt Jan, "Roman Suszko (1919-1979): a bibliography of the published work with an outline of his logical investigations," *Studia Logica* 43: 421-441 (1984).  
 Reprinted in Jerzy Perzanowski (ed.) - *Essays on philosophy and logic* - Cracow 1987 pp. 203-217
21. Omyla Mieczyslaw. Roman Suszko's philosophy of logic. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984*. Edited by Perzanowski Jerzy. Cracow: Jagiellonian University 1987. pp. 175-179  
 "In Roman Suszko's logical writings there are to be found many remarks and reflections on the idea of logic which is closely related to his work in formal logic. Though the scope of this paper makes it impossible to deal with them all, I would like nevertheless to draw the reader's attention to some of Suszko's views concerning the philosophy of logic. The aim of this study is to call the reader's attention to the most important of them."
22. Omyla Mieczyslaw, "Non-Fregean logic and ontology of situations," *Ruch Filozoficzny* 47: 27-30 (1989).
23. Omyla Mieczyslaw, "The principles of non-Fregean semantics for sentences," *The Journal of Symbolic Logic* 55: 422-423 (1990).
24. Omyla Mieczyslaw. Non-Fregean semantics for sentences. In *Philosophical logic in Poland*. Edited by Wolenski Jan. Dordrecht: Kluwer Academic Publishers 1994. pp. 153-165  
 "In this paper I intend to present the general and formal principles of non-Fregean semantics for sentences and to derive the simplest consequences of these principles. The semantic principles constitute foundation of non-Fregean sentential calculus and its formal semantics and the philosophical interpretations of it. Non-Fregean sentential calculus is the basic part of non-Fregean logic. Non-Fregean logic is a generalization of classical logic. It was conceived by Roman Suszko under the influence of Wittgensteinian's *Tractatus Logico-Philosophicus*. The term "non-Fregean" indicates that the set of semantic correlate of sentences need not contain of just two elements, as it assumed by Frege in *Über Sinn und Bedeutung* (1892). Frege accepted the following semantic principle:  
 (A.F.) all true sentences have the same common referent, and similarly all false sentences also have the one common referent.  
 J. Łukasiewicz interpreted the common referent of true sentences as "Being" and analogically the

common referent of all false sentences as "Unbeing". Suszko called the principle (A.F) the "semantical version of the Fregean axiom".

In *Abolition of the Fregean Axiom* (1975) Suszko wrote: "If one accepts the Fregean Axiom then one is compelled to be an absolute monist in the sense that there exists only one and necessary fact".

According to Suszko (A. F.) has a counterpart in the language of classical logic which is a formula asserting that the universe of sentential variables is a two-element set. This formula is not expressed that fact in the language of non-Fregean logic.

In *SCI and modal systems* (1972) Suszko presents the properties of his logic as follows: "... non-Fregean logic is the realization of the Fregean program in pure logic, logically bivalent and extensional with two modifications: (1) keep formulas (sentences) and terms (names) as disjoint syntactic categories, having sense and denotations, as well, and (2) drop the desperate assumption that all true or false sentences have the same denotation (not sense that is proposition)." pp. 153-154.

25. Omyla Mieczyslaw. A formal ontology of situations. In *Formal ontology*. Edited by Poli Roberto and Simons Peter. Dordrecht: Kluwer Academic Publishers 1996. pp. 173-187

"The theoretical foundation for this paper is the system of a non-Fregean logic created by Roman Suszko under the influence of Wittgenstein's *Tractatus Logico-Philosophicus*. In fact, we use just a fragment of it called here a non-Fregean sentential logic.

Our basic term is that of a 'situation'. We do not answer the question what situations are. We simply assume that sentences present situations, and we provide a criterion determining when two sentences of some fixed language present the same situation.

The lay-out of this paper is the following. First we set out certain philosophical consequences of the assumption adopted in classical logic that the only connectives of the language in question are the truth-functional ones. Then we sketch out briefly the axiomatics of non-Fregean sentential logic, and of a formal semantics of the algebraic type for it.

Next, for an arbitrary model for a non-Fregean sentential logic, we pick out from the formulae true in that model a theory to be called the 'ontology of situations determined by the model in question' - in contradistinction to all sentences holding contingently in that model, i.e. not determined by its algebra. In the ontology of situations determined by a model we point out those propositions which pertain to possible worlds." p. 173

### Philosophical Interpretations of non-Fregean Sentential Logic

According to the principles of non-Fregean semantics as presented in Omyla 1975, all sentences of an interpreted language have their references. However, not in every such language are we in a position to put forward universal and existential theorems with regard to the structure of the universe of those references. To be in such position the language in question must contain as its sublanguage the language of non-Fregean sentential logic, or at least a significant part of it. As we are not interested here in the universe of any particular language, but only in that of a quite arbitrary one, let us consider now some philosophical aspects of arbitrary models of that kind. Let  $M = (U, F)$  be such a model. The elements of the universe of  $U$  do not generally answer to the intuitions we have about the reference of sentences, and about situations in particular. However, the algebraic structure imposed on  $U$  by the theory  $TR(M)$  is the same as that of a possible universe of situations, with regard to the operations corresponding to logical constants. Moreover, the set  $F$  has the formal properties of a possible (or 'admissible') set of situations obtaining in that universe. This is so because sentential variables are at the same time sentential formulae, and because the logical constants get in the model  $M$  their intended interpretation. Thus for any model  $M = (U, F)$  its algebra  $U$  is a formal representation of some universe of situations, and the set  $F$  is a formal representation of some admissible set of facts obtaining in some universe of situations. Not all the generalized SCI-algebras represent some algebra of situations; for not all of them contain a set  $F$  representing the facts, i.e. such that the couple  $(U, F)$  is a model. This depends on how the operations in the algebra  $U$  are defined. For the sake of simplicity the algebra of any model  $M = (U, F)$  for the language of a non-Fregean sentential logic will be called the *algebra of situations* occurring in the model  $M$ , and the designated set  $F$  will be called the set of *facts* obtaining in  $M$ .

Such a terminology is appropriate here for we are interested only in the formal properties of those universe of situations which in view of our semantic principles find expression in the logical syntax of the language in question, and in consequence operation holding in it. By the completeness theorem for non-Fregean logic it follows that for any consistent theory  $T$  in  $L$  there is a model  $M$  such that  $T \vDash TR(M)$ . Hence any theory in the language of non-Fregean sentential logic will be called a *theory of situations*.

The term 'ontology of situations' we take over from the title of Wolniewicz 1985 [*Ontologia sytuacji: Ontology of situations* in Polish], but we understand it a bit differently. By an *ontology of situations* we mean a theory describing the necessary facts of universe of situations fixed beforehand. I.e. an ontology of situations is a set of formulae holding in some fixed universe of situations, independently of which situations there are facts. To be more accurate, by an ontology of situations we mean a set of formulae with the following three properties:

(1) An ontology of situations is a theory having in its vocabulary just one kind of variable - e. the sentential one. Under the intended interpretation they range over a universe of situations. (Like in modern set theory there are variables of just one kind, i.e. those ranging over sets.)

(2) An ontology of situations is formulated in a language containing logical symbols only, i. e. logical constants and variables. To justify that postulate let us note that such a basic theory should not presuppose any other terminology except the logical one. At most it might adopt some specific ontological terms as primitive, characterizing them axiomatically. However, we shall deal here only with such ontologies of situations which are expressed exclusively in logical terms." pp. 180-181.

26. Omyla Mieczyslaw. Roman Suszko. From Diachronic logic to non-Fregean logic. In *Polish philosophers of science and nature in the 20th century*. Edited by Krajewski Wladyslaw. Amsterdam: Rodopi 2001. pp. 153-161

Poznan Studies in the Philosophy of Sciences and the Humanities - vol. 74

27. Omyla Mieczyslaw, "Possible worlds in the language of non-Fregean logic," *Studies in Logic, Grammar and Rhetoric* 6: 7-15 (2003).

"The term "possible world" is used usually in the metalanguage of modal logic, and it is applied to the interpretation of modal connectives. Surprisingly, as it has been shown in Suszko *Ontology in the Tractatus L. Wittgenstein* (1968) certain versions of that notion can be defined in the language of non-Fregean logic exclusively, by means of sentential variables and logical constants. This is so, because some of the non-Fregean theories contain theories of modality, as shown in Suszko *Identity Connective and Modality* (1971).

Intuitively, possible worlds are maximal (with respect to an order of situations) and consistent situations, while the real world may be understood as a situation, which is a possible world and the fact.

Non-Fregean theories are theories based on the non-Fregean logic. Non-Fregean logic is the logical calculus created by Polish logician Roman Suszko in the sixties. The idea of that calculus was conceived under the influence of Wittgenstein's *Tractatus*. According to Wittgenstein, declarative sentences of any language describe situations."

28. Sayward Charles, "Roman Suszko and situational identity," *Sorites. An International Electronic Magazine of Analytical Philosophy* 15: 42-49 (2004).

"This paper gives a semantical account for the (i) ordinary propositional calculus, enriched with quantifiers binding variables standing for sentences, and with an identity-function with sentences as arguments; (ii) the ordinary theory of quantification applied to the special quantifier; and (iii) ordinary laws of identity applied to the special function. The account includes some thoughts of Roman Suszko as well as some thoughts of Wittgenstein's *Tractatus*."

29. Slavkov-Ristov S. Prof. Dr. Roman Suszko's views on some philosophical and methodological problems of mathematics. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984*. Edited by Perzanoski Jerzy. Cracow: Jagiellonian University 1987. pp. 196-201

30. Tsuji Marcelo and Lippel David, "Many-valued logics and Suszko's thesis revisited," *Studia Logica* 60: 299-309 (1998).

"Suszko's thesis maintains that many-valued logics do not exist at all. In order to support it, R. Suszko offered a method for providing any "structural" abstract logic with a complete set of

bivaluations. G. Malinowski challenged Suszko's thesis by constructing a new class of logics (called "q"-logics by him) for which Suszko's method fails. He argued that the key for logical two-valuedness was the "bivalent" partition of the Lindenbaum bundle associated with all structural abstract logics, while his "q"-logics were generated by "trivalent" matrices. This paper will show that contrary to these intuitions, logical two-valuedness has more to do with the geometrical properties of the deduction relation of a logical structure than with the algebraic properties embedded on it."

31. Wasilewska Anita, "DFC-algorithms for Suszko, logic SCI and one-to-one Gentzen type," *Studia Logica* 43: 395-404 (21984).
32. Wojcicki Ryszard, "R. Suszko's situational semantics," *Studia Logica* 43: 323-340 (1984).
33. Wojcicki Ryszard, "Situation semantics for non-Fregean logic," *Journal of Non-Classical Logic* 3: 33-67 (1986).
34. Wojcicki Ryszard. Situation semantics for non-Fregean logic. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984*. Edited by Perzanoski Jerzy. Cracow: Jagiellonian University 1987. pp. 187-190
35. Wolenski Jan. Suszko's analysis of the development of knowledge. In *Essays on philosophy and logic. Proceedings of the XXXth Conference on the history of logic, dedicated to Roman Suszko. Cracow, October 19-21, 1984*. Edited by Perzanoski Jerzy. Cracow: Jagiellonian University 1987. pp. 181-185
36. Wolenski Jan, "The reception of Frege in Poland," *History and Philosophy of Logic* 25: 37-51 (2003).  
"This paper examines how the work of Frege was known and received in Poland in the period 1910-1935 (with one exception concerning the later work of Suszko). The main thesis is that Frege's reception in Poland was perhaps faster and deeper than in other countries, except England, due to works of Russell and Jourdain. The works of Łukasiewicz, Lesniewski and Czezowski are described."
37. Wolniewicz Boguslaw. Wittgensteinian foundations of non-Fregean logic. In *Contemporary East European philosophy. Vol. 3*. Edited by D'Angelo Edward, DeGrood David, and Riepe Dale. Bridgeport: Spartacus Books 1971. pp. 231-243
38. Zachorowski Stanislaw, "Proof of a conjecture of Roman Suszko," *Studia Logica* 34: 254-256 (1975).  
"It is shown that there is no countable matrix adequate for the consequence operation determined by the theorems of S4 and *modus ponens* for material implication."

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