

Theory and History of Ontology (www.ontology.co) by Raul Corazzon | e-mail: rc@ontology.co

Stanisław Leśniewski: bibliography in English (Lep - Sim)

Contents of this Section

This part of the section **Ontologists of 19th and 20th centuries** includes the following pages:

[Stanisław Leśniewski's Logical Systems: Protothetic, Ontology, Mereology](#)

[Bibliography of the studies in English on Stanisław Leśniewski:](#)

[A - Ind](#)

[Ino - Lej](#)

[Lep - Sim \(Current page\)](#)

[Sin - Z](#)

[Bibliographie des études en Français sur Stanisław Leśniewski](#)

Polish ontologists:

[Kazimierz Twardowski on the Content and Object of Presentations](#)

[Tadeusz Kotarbinski from Ontological Reism to Semantical Concretism](#)

[Roman Ingarden and the Realism/Idealism Debate](#)

[Roman Suszko and the Non-Fregean Logics](#)

[Bogusław Wolniewicz on the Formal Ontology of Situations](#)

[Jerzy Perzanowski: Modal Logics, Ontology and Ontologies](#)

Studies on Leśniewski in English

1. Lepage, François. 2000. "Partial monotonic Protothetics." *Studia Logica* no. 66:147-163.
Abstract: "This paper has four parts. In the first part, I present Leśniewski's protothetics and the complete system provided for that logic by Henkin. The second part presents a generalized notion of partial functions in propositional type theory. In the third part, these partial functions are used to define partial interpretations for protothetics. Finally, I present in the fourth part a complete system for partial protothetics. Completeness is proved by Henkin's method using saturated sets instead of maximally saturated sets. This technique provides a canonical representation of a partial semantic space and it is suggested that this space can be interpreted as an epistemic state of a non-omniscient agent."
2. ———. 2009. "Definitions and Contradictions. Russell, Poincaré, and Leśniewski." *Baltic International Yearbook of Cognition, Logic and Communication*: no. 4:1-28.
"Introduction
This paper is composed of two independent parts. The first is concerned with Russell's early philosophy of mathematics and his quarrel with Poincaré about the nature of their opposition. I argue that the main divergence between the two philosophers was about the nature of definitions.
In the second part, I briefly present Leśniewski's Ontology and suggest that Leśniewski's original treatment of definitions in the foundations of mathematics is the natural solution to the problem that divided Russell and Poincaré." (p. 1)
3. López-Escobar, E. G. K. , and Miraglia, Francesco. 2002. *Definitions: the primitive concept of logics or The Leśniewski-Tarski legacy*. Warsaw: Polska Akademia Nauk, Instytut Matematyczny.
"In the 75 years since the publication of Tarski's result [the reduction of all the classical logical atoms to the *equivalence propositional connective* (and the *universal quantifier*)]. there has been an increasing trend for Mathematics to be more constructive. Thus we decided that an appropriate way to acknowledge the work of Lessniewski and Tarski was to develop, *ab ovo*, a Constructive Protothetic, which we call the New Protothetic; furthermore not only the formalization should reflect constructive intuition, but the metatheory should also be constructively acceptable.
In Part Two of the monograph we set up the New Protothetic, simultaneously explaining why we chose that particular formalization. Then we prove some general results about it, results which further legitimize the system; for example, the completeness with respect to Beth models and proven in an intuitionistic metatheory (which is the version of constructive Mathematics that we are adopting) and the *normalization property*(12).
To complete Part Two we show that Tarski's reduction, that conjunction is definable in terms of equivalence and the universal quantifier, is also applicable in the New Protothetic. Thus Part Two may be considered as an extension of the Leśniewski/Tarski project to constructive logics." (p. 11)
(12) Actually the proof of normalization is in Appendix A.
References
[Tarski, 1923a] A. Tarski, *O wyrazie pierwotnym logistyki*, *Przegląd Filozoficzny* 26 (1923), 68–89.
[Tarski, 1923b] A. Tarski, *Sur le terme primitive de la logistique*, *Fund. Math.* 4 (1923), 196–200.
[Tarski, 1956] A. Tarski, *On the primitive term of logistic*, in: A. Tarski, *Logic, Semantics, Metamathematics. Papers from 1923 to 1938*, transl. by J. H. Woodger, Clarendon Press, Oxford, 1956.
4. Luschei, Eugene. 1962. *The Logical Ssystems of Leśniewski*. Amsterdam: North-Holland.
"Prescribing rules of definition as comprehensive and rigorous as his other directives, Leśniewski formalized his system completely, combinatorially on a finite

basis, and in extensional terms. It is further distinguished by its “constructively nominalist” and “contextualist” character; its basic grammar of semantic categories; its rigor, generality, and power of expression; its demonstrable relative consistency; its universal validity; and its logical purity, economy, and elegance. It consists of three axiomatic deductive systems in hierarchic order: *protothetic*, *ontology*, and *mereology* etymologically, proto-theses, theory of being, and theory of parts, respectively. Protothetic and ontology together form a unified system of logic comparable in scope and power to *Principia Mathematica* as a foundation for classical mathematics and for any further axiomatic theory, such as mereology, in a deductive hierarchy.

I rely on context to distinguish Lesniewski’s ontology from the homonymous branch of metaphysics. The names stem from the same root, the genitive case of the participle of the Greek copula, whose initial letter provides the epsilon of singular predication in Lesniewski’s ontology." (p.28)

5. Lyczak, Marcin, and Andrzej, Pietruszczak. 2018. "On the definability of Leśniewski's copula 'is' in some ontology-like theories." *Bulletin of the Section of Logic* no. 47:233-263.
 Abstract: "We formulate a certain subtheory of Ishimoto’s [1] quantifier-free fragment of Lesniewski’s ontology, and show that Ishimoto’s theory can be reconstructed in it. Using an epimorphism theorem we prove that our theory is complete with respect to a suitable set-theoretic interpretation. Furthermore, we introduce the name constant 1 (which corresponds to the universal name ‘object’) and we prove its adequacy with respect to the set-theoretic interpretation (again using an epimorphism theorem). Ishimoto’s theory enriched by the constant 1 is also reconstructed in our formalism with into which 1 has been introduced. Finally we examine for both our theories their quantifier extensions and their connections with Lesniewski’s classical quantified ontology."
 Refences
 [1] A. Ishimoto, A propositional fragment of Lesniewski’s ontology, *Studia Logica* 36 (1977), pp. 285–299
6. Łyczak, Marcin, Porwolik, Marek, and Świętorzecka, Kordula. 2016. "The Universe in Lesniewski’s Mereology: Some Comments on Sobocinski’s Reflections." *Axioms* no. 5:1-13.
 Abstract: "Stanisław Lesniewski’s mereology was originally conceived as a theory of foundations of mathematics and it is also for this reason that it has philosophical connotations. The ‘philosophical significance’ of mereology was upheld by Bolesław Sobocinski who expressed the view in his correspondence with J.M. Bochenski. As he wrote to Bochenski in 1948: “[...] it is interesting that, being such a simple deductive theory, mereology may prove a number of very general theses reminiscent of metaphysical ontology”. The theses which Sobocinski had in mind were related to the mereological notion of “the Universe”. Sobocinski listed them in the letter adding his philosophical commentary but he did not give proofs for them and did not specify precisely the theory lying behind them. This is what we want to supply in the first part of our paper. We indicate some connections between the notion of the universe and other specific mereological notions. Motivated by Sobocinski’s informal suggestions showing his preference for mereology over the axiomatic set theory in application to philosophy we propose to consider Sobocinski’s formalism in a new frame which is the ZFM theory—an extension of Zermelo-Fraenkel set theory by mereological axioms, developed by A. Pietruszczak. In this systematic part we investigate reasons of ‘philosophical hopes’ mentioned by Sobocinski, pinned on the mereological concept of “the Universe”."
 Refences
 Sobocinski, B. Letter to J. M. Bochenski from Brussels, dated 12.11. 1948, photocopy of the manuscript.
 Pietruszczak, A. *Metamereologia*; Uniw. Mikołaja Kopernika: Torún, Poland, 2000.

7. M., Machover. 1966. "Contextual Determinacy in Leśniewski's Grammar." *Studia Logica* no. 19:47-57.
 "There are several reasons why much of Leśniewski's work has fallen into oblivion. For one thing, a considerable part of it was destroyed during World War II, which started shortly after Leśniewski's death. And what he did publish¹ is written in a highly condensed and difficult style. Moreover, as Grzegorzczuk [2] has pointed out, the general trend of logical research had meanwhile drifted away from "system building" to metalogical investigations, for which Leśniewski's system (although very admirable as such) is not too convenient. More important still, Leśniewski wished to base mathematics not upon set-theoretical ideas and relations but rather upon a certain kind of Boolean algebra⁽²⁾. This approach - which is quite out of line with the thinking habits of most mathematicians - is not only built into his formal system, but also determines his mode of expression when speaking about it, in his syntactical explanations, etc. This makes Leśniewski's system uninviting, and his explanations of it intelligible only with great difficulty, to people who do not share his philosophical beliefs and habits of thought. (To this should be added his insistence that the conditions in each metalogical definition be mutually independent - an insistence which is perhaps very laudable in theory, but certainly most cumbersome in practice). All that is quite unfortunate, for many features incorporated in Leśniewski's system of logic have a definite merit by themselves, quite apart from the philosophical doctrine with which they are associated. These features are certainly worth investigating even by mathematical "technicians" and may eventually be employed for various theoretical and practical purposes." (p. 47)
 (1) For a bibliography of works by Leśniewski and his disciples see Luschei [3]. This book is an orthodox account of Leśniewski's ideas, together with an ardent (to say the least) defence thereof.
 (2) At least, this is one way of looking at what he did - a way to which he himself would presumably not have agreed.
8. Miéville, Denis. 2009. "Leśniewski, Negation, and the Art of Logical Subtlety." In *The Golden Age of Polish Philosophy: Kazimierz Twardowski's Philosophical Legacy*, 113-120. Dordrecht: Springer.
 "Leśniewski essentially developed three theories: Protothetic, Ontology, and Mereology. Since his death in 1939, none of the efforts to reawaken interest in Leśniewski have had much success. In spite of his successive burials, I am among those who persevere in thinking that Lesniewski's systems present more than a merely historical interest. The richness of Lesniewski's alternative lies in his approach to truth and falsity, the idea of predicative levels and his conception of logic as something which, so to say, freely "expands". Lesniewski's systems can be called to task when it comes to the study of formal languages, the development of higher order logics, definitiona procedures, the search for extreme metalinguistic rigor and the quest for an ontologically neutral language. In this paper, I focus on the following three issues. First, I consider the question of the number of operators a formal system must or can possess. Secondly, I argue that those unsatisfied by the conceptual paucity of classical logics – that is to say, systems that were initially developed specificall as tools for the foundations of arithmetic – should envision a new way of developing formal systems, and that Lesniewski's work has, in this respect, valuable heuristic potential. Finally, after presenting the main lines of Lesniewski's project, I will illustrate the value of his approach. Although Leśniewski was a marginal figure as far as both his work and his character are concerned, he occupies a central position in the history of Polish philosophical thought. The fact that he studied and collaborated, namely with Twardowski, Adjukiewicz, Łukasiewicz, and Tarski is not insignificant in this respect (see for instance the papers by Łukasiewicz, Patterson, Wolenski, this volume)." (pp. 113-114)
 References
 Łukasiewicz, Dariusz, *Polish Metaphysics and the Brentanian Tradition*, 1-31.
 Patterson, Douglas, *Tarski on Definition Meaning and Truth*, 155-170.

- Wolenski, Jan, *The Rise and Development of Logical Semantics in Poland*, 43-59.
9. Morawski, Roman. 2018. "Ontology of Logic and Mathematics in Lvov-Warsaw School." In *The Lvov-Warsaw School. Past and Present*, edited by Garrido, Ángel and Wybraniec-Skardowska, Urszula, 645-661. Cham (Switzerland): Birkhäuser. Abstract: "The aim of the paper is to consider ontological views connected with mathematics and logic of main representatives of Lvov-Warsaw School of Philosophy.
In particular views of the following scholars will be presented and discussed: Jan Łukasiewicz, Stanisław Leśniewski, Alfred Tarski, Tadeusz Kotarbiński and Kazimierz Ajdukiewicz. We shall consider also views of Andrzej Mostowski who belonged to the second generation of the school as well as of Leon Chwistek who was not directly the member of this group but whose conceptions are of interest."
 10. Murawski, Roman. 2014. *The Philosophy of Mathematics and Logic in the 1920s and 1930s in Poland*. Basel: Birkhäuser.
Translated from Polish by Maria Kantor.
Chapter 3: *Lvov-Warsaw School of Philosophy*, 3.4 *Stanisław Leśniewski*, pp. 84-91.
 11. Obojska, Lidia. 2015. "Some Remarks of Jan Slezynski regarding Foundations of mathematics of Stanisław Leśniewski." *Technical Transactions / Czasopismo Techniczne* no. 2:235-245.
Abstract: "Jan Śleszyński [1854-1931], a great mathematician, is considered a pioneer of Polish logic; however, he was not connected with the famous Warsaw School of Logic (WSL). He believed that his mission was a critical evaluation of work of other logicians in the field of foundations of mathematics and proof theory. Among his writings we find several notes regarding the work of Stanisław Leśniewski (the co-founder of the WSL) and his collective set theory. These remarks are the subject of investigation of the presented paper."
"Conclusion
Summarizing, in general, the criticism of Śleszyński can be considered very positive. It emphasizes Leśniewski's accuracy and precision, and the work itself contains neither logical nor formal errors. As for the lack of understanding of certain terms, one can always have doubts, but it is not a formal shortcoming of this work. It is a pity that Śleszyński's notes were not published during his life. Perhaps the reception of Leśniewski's ideas could have been easier. Leśniewski's systems are not currently used as foundations of mathematics; maybe the reason lies in the language applied by the author. However, his work can be considered a masterpiece of mathematical precision and accuracy." (p. 244)
 12. Ozawa, Masanao, and Waragai, Toshiharu. 1985. "Set theory and Leśniewski's Ontology." *Annals of the Japan Association for Philosophy of Science* no. 6:261-272.
The aim of this paper is to investigate a general logical relation holding between Leśniewski's Ontology and axiomatic set theory. Though a natural and intuitive comparison of these two systems well suggests a close logical relation between them, no direct comparison between them seems to have not undertaken yet, probably because of Leśniewski's extreme nominalistic standpoint.
We begin this paper with some remarks which are of historical interest. Fraenkel-Bar-Hillel-Levy [1973] makes mention of the relation between Ontology and axiomatic set theories, stating: "Since Leśniewski's 'E' is not meant to be a symbol for class-membership, it is preferable to regard his ontology not as a variant of set theory but rather as a rival of set theory for the foundation of mathematics. How important a rival of set theory ontology is, or could be made to be, is a question which it is still very difficult to decide" [p. 203]. We see two points in this passage, namely 1) the foundational status of Ontology is acknowledged in connection to set theory, while 2) the logical relation which should hold between them is referred to as one left unestablished. Thus the foundational character of Ontology has been realized, whereas it has been left as an open problem.

To this problem, the following remark seems also worth mentioning : "This view does not exclude that counterparts of many set-theoretical axioms turn out under a certain notational transformation - to be ontological theorems or that the ontological axiom should be transformed into a type-theoretical axioms. The latter possibility is easily materialized by interpreting ' $x \in w$ ' as ' x is a unit-class of individuals, w is a class of individuals and $x \subset w$ ' [loc. cit. p. 203]. Thus the crux of the problem is to define set-theoretical concepts inside of Ontology and to determine the deductive power of the set theory within Ontology.

We aim to give an answer to this open problem. The main result of this paper is the following : By adding to Ontology one function symbol for class formation, we can define the set, the class and the membership relation within Ontology. The deductive power of the resulting class theory can be also well characterized by an extensionality axiom and an impredicative comprehension axiom. Eventually, this class theory is ultimately innocent of existence of sets. Thus we can conclude that any axiomatic set theory can be developed equivalently in Ontology by adding to it one function symbol for class formation and appropriate axioms for existence of sets." (pp. 261-262)

References

Fraenkel-Bar-Hillel-Levy [1973] : *Foundations of Set Theory*, North Holland

13. Pańniczek, Jacek. 2023. "Leśniewskian Ontology with Many-argument Predication." *History and Philosophy of Logic* no. 44:327-336.
Abstract: "Leśniewskian Ontology (LO) is a system in which the basic subjectpredicate formula takes the form of $a\epsilon b$ and express one-argument predication, e.g. John is a student. In LO's language, there is no many-argument form of predication given that would allow for the structural expression of, for example, the sentence John is Anne's son. In this article, a simple and natural extension of LO is suggested to encompass many-argument predication. The system thus obtained corresponds to polyadic second-order logic."
14. Piętka, Dariusz. 2006. "The philosophy of Stanisław Leśniewski." *Organon* no. 35:175-190.
"The article presents the views of Leśniewski both from the first and the second period of his work. Although his articles from the period of 1911–1915 do not usually get much attention, they should not be completely forgotten as the opinions expressed therein are reflected in his later output. Above all, the method of practicing philosophy changed radically. The purpose of deliberations presented below is a synthetic discussion of the views of Leśniewski, but also presentation of certain connections between his opinions from the grammatical and formal periods." (p. 175)
15. Pietruszczak, Andrzej. 2018. *Metamereology*. Toruń: The Nicolaus Copernicus University Scientific Publishing House.
Original Polish edition 2000.
Revised and expanded edition translated from the Polish by Matthew Carmody.
16. ———. 2024. "From the History of Lesniewski's Mereology." *Studia Humana* no. 13:5-16.
Abstract: "In this paper, we want to present the genesis of Stanisław Lesniewski's mereology. Although 'mereology' comes from the word 'part', mereology arose as a theory of collective classes. That is why we present the differences between the concepts of being a distributive class and being a collective class. Next, we present Lesniewski's original mereology from 1927, but with a modern approach. Leśniewski was inspired to create his concept of classes and their elements by Russell's antinomy. To face it, Leśniewski had to define the concept of being an element of based on the concept of being part of. Leśniewski showed that in his theory, there is no equivalent to Russell's antinomy. We will show that his solution has nothing to do with the original approach because, in both cases, we are talking about objects of a different kind. Russell's original antinomy concerned distributive classes, and Lesniewski's considerations concerned collective classes."

17. Poli, Roberto, and Libardi, Massimo. 1998. "Leśniewski's conception of logic." In *The Lvov-Warsaw School and Contemporary Philosophy*, edited by Kijania-Placek, Katarzyna and Wolenski, Jan, 139-152. Dordrecht: Kluwer.
- "The current availability in English of almost all of Leśniewski's works allows even those scholars unfortunate enough not to read Polish to gain a clearer picture of his ideas. 1 Even a brief reading of Leśniewski's works reveals that his main references are J.S. Mill, Austrian philosophy (Brentano, Marty, Husserl), J. Łukasiewicz and L. Petrażycki.
- The first three (Mill, Austrian philosophy and Łukasiewicz) are well-known; what is new is the Russian-Polish thinker Leon Petrażycki.² His 1905 book, *Introduction to the study of law and morality: the bases of emotional psychology*, was quoted by Leśniewski in some central passages. Unfortunately the 1955 translation of Petrażycki's book into English does not include the logical part of his work.⁽³⁾
- In the course of this paper, we propose to present a reconstruction of Leśniewski's position, gathering together and analyzing his general theories and as far as possible - his explicit references to other authors." (p. 139)
- (1) S.I. Surma, I.T. Szrednicki, D.I. Barnett, Y.F. Rickey (eds.): *Stanisław Leśniewski. Collected works*, 2 vol., Dordrecht, Kluwer Academic Publishers, 1992. The publication has been an arduous editorial undertaking that has occupied Jan Szrednicki for more than eighteen years.
- To him we owe our gratitude for the tenacity and the strength of will that enabled him to surmount the many and difficult obstacles that stood in his way.
- Unfortunately, the English translation is not always crystal clear and certain papers contain some irritating mistakes. For some general assessments, see the critical notice by M. Libardi, *Axiomathes*, 1993, pp. 105-129, and the review by P. Simons, 'Discovering Leśniewski', *History and Philosophy of Logic*, 1994, pp. 227-235.(,,)
- (2) For some information about Leon Petrażycki and for a wider analysis of Leśniewski in general, cf. R. Poli and M. Libardi, 'Logic, theory of science and metaphysics according to Stanisław Leśniewski' (submitted).
- (3) L. Petrażycki, *Law and Morality*, Cambridge (Mass.), Harvard University Press, 1955. The Leon Petrażycki Society published a German translation in Paris in 1933.
18. ———. 1999. "Logic, Theory of Science, and Metaphysics According to Stanisław Leśniewski." *Grazer Philosophische Studien* no. 57:183-219.
- "We can therefore now attempt to draw some conclusions.
- First, the influential role of Łukasiewicz's monograph on the Aristotelian principle of non-contradiction emerges with unexpected salience, but also and especially that of Petrażycki's monograph on the psychological foundation of law.
- Łukasiewicz's monograph had important repercussions on Leśniewski's concepts of ontology and of synonymy. From Petrażycki he derived his theories of science, logic and (again) metaphysics/ontology.
- An extreme hypothesis, one which is not supported by Leśniewski's writings but which emerges with a certain force from examination of his intellectual career, is the following: it seems that the fundamental purpose of his entire inquiry was to progress towards a formalization and a 'modernization' of Aristotle's *Metaphysics*. Indeed, Leśniewski's early works are perfectly in keeping with the Aristotelian revival of the period. One need only consider his papers on the ontological principle of contradiction [PC] and on the principle of the excluded middle [EM], as well as those on the existential propositions [EP] and on truth [EB]. But the most telling evidence is provided by a possible and, in the end quite reasonable, interpretation of the structure of his system of the foundations of mathematics." (p. 216)
- The following abbreviations are used in the notes: EP: "A contribution to the analysis of existential propositions", [*Collected Works*] 1-19; PC: "An attempt at a proof of the ontological principle of contradiction", 20-46; EM: "The critique of the logical principle of the excluded middle", 47-85; EB: "Is all truth true eternally or is it also true without a beginning?", 86-114; FM: "On the foundations of mathematics", 174-382; FF: "Fundamentals of a new system of the foundations of mathematics", 410-605; FO: "On the foundations of ontology", 606-

628; IR: "Introductory remarks to the continuation of my article: 'Grundziige eines neuen Systems der Grundlagen der Mathematik'", 649-710.

19. Prakel, Judith. 1983. "A Lesniewskian re-examination of Goodman's nominalistic rejection of classes." *Topoi* no. 2:87-98.
 "In 'A World of Individuals (1)~ Goodman clarifies his earlier rejection of classes. To him, "as a nominalist", he says, "the world is a world of individuals". What is involved in being an individual is made clear by the calculi of individuals. To be an entity is to be an individual: no other sorts of entities are admissible. What makes them inadmissible is their behaving in an unintelligible way, contrary to the principles set forth in the calculi of individuals, because, in effect, the calculi of individuals lay down general principles of intelligibility for being an entity at all.(2) What is unacceptable about class theories, then, is that classes are purported to have properties that individuals cannot have. The problem is not that classes are 'abstract' or 'non-concrete' or 'universal', but that they are not individuals. A nominalist, to use class terminology in an intelligible way at all, must be able to reconstrue all claims about classes as claims about individuals." (p. 87)
 (...)
 "As long then as 'class construction' is to be limited to those 'classes' produced by generating relations, it is going to be very difficult to produce some distinct 'classes' that will go proxy for those distinguished by set theoreticians.
 For the same reason that K and L are difficult to distinguish, so are: \emptyset , the empty set, and $\{\emptyset\}$ (not to mention the problem of understanding how \emptyset can be 'generated' in the first place!); a and $\{a\}$ (where 'a' is taken to name some individual); (a,b) and (b,a). (the usual ordered pairs of the individuals a and b).
 But without these distinctions much of set theory is lost and along with it, many would argue, the possibility of providing logical foundations for much of classical mathematics(3).
 What I want to suggest is that there is a way to provide a logical reconstrual of these distinctions which makes them intelligible (and acceptable) while at the same time we are not required to abandon the Principle of Nominalism that there can be no distinction of entities without a distinction of content, nor are we required to accept any non-individuals as entities. The logical reconstrual will be within Lesiewski's systems. I also want to claim that the reconstrual can help us to evaluate, rather more clearly than has previously been possible, the philosophical position of present-day nominalists on the matter of the existence of mathematical entities." (p. 87)
 (1) Goodman (1956).
 (2) Incidentally, these clarifications of Goodman's ought to suggest that, contra Martin (Martin, 1963), the Principle of Nominalism is to be regarded as a principle of logic, even if as a principle of transcendental logic.
 (3) For Martin (Martin, 1963, p. 34) is surely correct that it is not enough to be able to construe the syntax of mathematics nominalistically.
 We also need a suitable *interpretation*.
 References
 Goodman, Nelson: 1956, 'A World of Individuals', in *The Problem of Universals*, Notre Dame University Press, Notre Dame, 1956.
 Martin, R.M.: 1963, 'The Principle of Nominalism', *Philosophical Studies* XIV (1963), 33-37.
20. Prior, Arthur Norman. 1955-1956. "Definitions, Rules and Axioms." *Proceedings of the Aristotelian Society* no. 56:199-216.
 Reprinted in A. N. Prior, *Papers in Logic and Ethics*. Geach, P. T. and Kenny, A. J. P. (eds.), London: Duckworth 1976, pp. 39-55.
21. ———. 1965. "Existence in Leśniewski and in Russell." In *Formal Systems and Recursive Functions*, edited by Crossley, John N. and Dummett, Michael, 149-155. Amsterdam: North Holland.
 Proceedings of the Eighth Logic Colloquium. Oxford, July 1963.

22. Richard, Sebastien. 2018. "Leśniewski on metalogic and definitions." *Synthese* no. 195:2649–2676.
 Abstract: "Lesniewski's metalogic is often considered to be difficult to understand because it differs greatly from its standard formulation. In this paper I try to explain the reasons of these idiosyncrasies. I claim that they have mainly two sources. First of all there is Lesniewski's conviction that a formal system should be conceived as a set of concrete marks that can always physically and syntactically be expanded by the addition of new theses. Secondly there is Lesniewski's conviction that definitions should neither be formulas belonging to the metalanguage, nor deduction rules, but formulas belonging to the object-language and expressed with the help of the biconditional functor. The realisation of the first point is linked to the second one in so far as the metalinguistic rule for the writing out of definitions has to be formulated in a way that makes it possible to build the formal system in agreement with Lesniewski's conception. While explaining these points I give an overview of the main peculiarities of Lesniewski's metalogic."
23. ———. 2020. "Leśniewski's Intuitive Formalism." In *Formal and Informal Methods in Philosophy*, edited by Będkowski, Marcin, Brożek, Anna, Chybińska, Alicja, Ivanyk, Stepan and Traczykowski, Dominik, 206-228. Leiden: Brill Rodopi.
 Abstract: "When Stanisław Leśniewski read in 1911 Jan Łukasiewicz's book *The Principle of Contradiction in Aristotle* he discovered modern symbolic logic and the Russellian antinomy of the classes, that do not contain themselves. He started then to look for a solution to this antinomy and elaborated his formal theory of wholes and parts. However, if he adopted the new formal tools of logistics, he refused to proceed in his building of formal systems as a "pure formalist". In particular, for Leśniewski, a formal system must not be interpreted after having been built. An intuitive interpretation must be given from the beginning, the formal system being only a means to communicate the "logical intuitions" of the author. That is the reason why Leśniewski's unconventional position has been called an "intuitive formalism" by Kearns or an "intuitionistic formalism" by Tarski. In this paper, I try to make these expressions more precise and explain how exactly the relation between intuition and formal systems must be understood according to Leśniewski."
24. Rickey, Frederick V. 1973. "Axiomatic inscriptional syntax. Part I: General syntax." *Notre Dame Journal of Formal Logic* no. 13:1-33.
 "Inscriptional syntax is that study of syntax wherein the linguistic entities are studied as inscriptions, i.e., as physical objects and not as abstract entities. In this paper we shall axiomatize the syntax which is common to all languages, i.e., General Syntax. In *Chapter I* of this paper we elucidate the notion of an inscription, expose some pre-logical assumptions, describe the three primitive terms of inscriptional syntax, and discuss our logical basis (viz., Leśniewski's Ontology). In *Chapter II* we present the axioms for the syntactical system M, define the usual notions of general syntax, and prove some typical theorems of general syntax. Our aim is not to obtain new syntactical results, but rather to put the theory of syntax on a secure foundation. Accordingly, we shall only develop system M to the point where most syntactical investigations begin. In particular, concatenation is defined in our system, whereas it is usually taken as primitive.
 The initial task of syntax is to formulate precise statements of the formative and deductive rules of a particular formal language. After these rules have been stated it is of interest to develop their consequences by proving derived rules and to investigate the interconnections between primitive and derived rules. All of these tasks can be accomplished using system M. To support this claim we shall formulate the rule of Protothetic in the second part of this paper." (p. 1, a note omitted)
25. ———. 1973. "Axiomatic inscriptional syntax. Part II: The syntax of protothetic." *Notre Dame Journal of Formal Logic* no. 14:1-52.
 Reprinted in Jan Srzednicki, Zbigniew Stachniak (eds.), *S. Leśniewski's Systems: Protothetic*, Dordrecht: Kluwer 1998, pp. 217-288.

"Part 1** of this paper presented an axiomatized theory of general syntax, defined the usual notions of general syntax, and proved some typical theorems of general syntax. We claimed that this system is strong enough to precisely state the formative and deductive rules of formal languages. In Part II we support this claim by formulating, in a very precise way, the rule of procedure of Leśniewski's Protothetic. Section 1 is an informal introduction to Protothetic and its rule of procedure. Our metalogical system is extended there to a theory MP which is concerned explicitly with the syntax of Protothetic. This section is intended to motivate the Terminological Explanations of Section 2 which culminate in the statement of the rule of Protothetic. In Section 3 we sketch a proof that our formulation of the rule is equivalent to that given by Leśniewski (1929). This proof shows that our system is strong enough to conduct certain metalogical investigations." (p 217 of the reprint)

** Part I of this paper appeared in the *Notre Dame Journal of Formal Logic* XIII (1972), pp. 1-33. The author would like to thank Professor Boleslaw Sobocmski for considerable advice.

References

Leśniewski, Stanisław (1929). 'Grundziige eines neuen Systems der Grundlagen der Mathematik', *Fundamenta Mathematicae* XIV, 1-81.

26. ———. 1975. "Creative definitions in propositional calculi." *Notre Dame Journal of Formal Logic* no. 16:273-294.

"Leśniewski felt that definitions were most naturally stated as equivalences in the object language and as such a rule of procedure governing their introduction is necessary. This view will be accepted here in our investigation of the role played by definitions in propositional calculi. In this paper we construct propositional calculi wherein some of the definitions play a creative role; i.e., they do not function as mere abbreviations and are not, even theoretically, superfluous.

A definition will be said to be creative for a thesis T in a given presentation of a deductive theory iff T does not contain the defined term (nor any defined via it) and is provable using the definition, but not without it.

The usual approach to definitions is to attempt to prescribe conditions which prevent the creativity of definitions. In trying to understand the role that definitions play in deductive theories we approach the subject from the opposite direction and attempt to construct systems which contain creative definitions. In 3 we give axiomatizations of propositional calculi which contain a single creative definition, a finite number of creative definitions, and also examples which contain an unlimited number of creative definitions.

In 1 the history of the problem is presented as best it is known, including a review of the literature. The rules of procedure for propositional calculi and especially the rule of definition are presented informally

in 2 and precisely in the appendix. Several metalogical remarks are presented in 4 including our proof of a hitherto unpublished theorem of A. Lindenbaum which shows that if Cpp is a thesis of a propositional calculus, then that calculus contains no creative definitions." (p. 273)

27. ———. 1977. "A survey of Leśniewski's logic." *Studia Logica* no. 36:407-426. Reprinted in Jan Szrednicki, Zbigniew Stachniak (eds.), *S. Leśniewski's Systems: Protothetic*, Dordrecht: Kluwer 1998, pp. 23-41.

"In the period between the two world wars the eminent Polish logician Stanisław Leśniewski (1886--1939) created a hierarchy of logical systems which are unparalleled for their generality, precision, and intuitive foundations. By way of a careful and insightful analysis of the Russell Antinomy he came to distinguish between two notions of class, the distributive class and the collective class.

Investigation of these concepts led to the creation of his systems of Ontology and Mereology, respectively. Then, in order to secure the foundations of these systems, he created the most fundamental system, Protothetic.

We intend to survey the most important technical contributions to these three disciplines. The restriction to technical results is necessary to restrict this paper to manageable proportions. Moreover, the non-technical aspects of Leśniewski's

systems are more accessible. There is no doubt that the philosophical aspect of Leśniewski's work is extremely important and interesting.

This, together with historical matters, is enthusiastically discussed in Luschei's book (1962) on *The Logical Systems of Leśniewski*. Applications to philosophy and linguistics are also omitted. Hopefully, all of these matters will receive full consideration at this conference. (*)" (p. 23 of the reprint)

(*) Ed. Note: The author refers to *XXInd Conference on the History of Logic*, July 5-9, 1976, Kraków, Poland.]

28. ———. 1985. "Interpretations of Leśniewski's Ontology." *Dialectica* no. 39:181-192.
Summary: "This article proposes to clarify the problem of interpreting Leśniewski's ontology. A distinction is made between two kinds of interpretation: substitutional and "natural". Substitutional interpretation is shown to involve difficulties and limitations. A "natural" ontology, the major principles of which are presented here, is shown to be of considerable interest."
29. Rybaříková, Zuzana. 2016. "Prior's Definition of Creative Definitions (Sobociński-Prior-Lejewski's Discussion on the Leśniewskian Definitions)." *Organon F* no. 23:405-416.
Abstract: "The article introduces Prior's paper *Definitions, Rules and Axioms* which deals with Leśniewski's creative definitions. It presents the origins of Prior's paper and the discussion which is linked with its final form. Prior's aim in this paper was to present the Leśniewskian definitions in comparison with Russell's concept of definitions, demonstrating their advantages and disadvantages. The main source of Prior's knowledge about the Leśniewskian definitions were Sobociński's papers and letters, which are stored in the Bodleian library. Although the paper *Definitions, Rules and Axioms* is a unique attempt at approximating creative definitions, it contains several mistakes. Lejewski identified them in his letter to Prior and also described how they arose. Lejewski's critique was not severe, however, and Prior coped with it in the introductory page of his paper."
References
Prior, A. N. (1955-1956): *Definitions, Rules and Axioms*. *Proceedings of the Aristotelian Society* 56, 199-216 reprinted in A. N. Prior, *Papers in Logic and Ethics*. Geach, P. T. and Kenny, A. J. P. (eds.), London: Duckworth 1976, 39-55.
30. ———. 2016. "The Reception of Stanisław Leśniewski's Ontology in Arthur Prior's Logic." *Organon F* no. 2:243-262.
Abstract: "Arthur Prior's logic was influenced, among others, by logicians from the Lvov-Warsaw school. This paper introduces the impact Leśniewski's Ontology had on Prior's logical system. The paper describes the main characteristics of Leśniewski's Ontology, Prior's logical system and the manner in which Prior became acquainted with Leśniewski's logical system. Since Leśniewski was no longer alive when Prior began to develop his logical system and Leśniewski's papers were not easily available to Prior, this paper also includes Prior's interpretation of Leśniewski's logical system which did not always correspond to Leśniewski's original ideas."
31. ———. 2022. "The Value of Reality to Logic and the Value of Logic to Reality: A Comparison of Łukasiewicz's and Leśniewski's Views." *Filozofia Nauki (The Philosophy of Science)* no. 117:83-94.
Abstract: "Since Kazimierz Twardowski introduced the notions of "symbolomania" and "pragmatophobia," the relationship between logic and reality was the focus of the philosophers from the Lvov-Warsaw School — inter alia two prominent logicians of the group, Stanisław Leśniewski and Jan Łukasiewicz. Bolesław Sobociński has pointed out, however, that there was a contrast between their approach to logic and reality. Despite being members of the same philosophical group and even colleagues from the same department, their philosophical views on the position of logic in reality differed considerably. Yet they both agreed that reality has a certain importance for logic and that logic could be valuable for reality. The

aim of this paper is to introduce their divergent positions and describe in more detail how Leśniewski and Łukasiewicz understood the relationship between logic and the real world."

32. ———. 2023. "Arthur N. Prior and Leśniewski's Concept of Names: Why Prior Adopted It and Why He Left It in His Temporal Ontology." *Logic and Philosophy of Time* no. 5:1-20.

Abstract: "For a certain period, the concept of names that Stanisław Leśniewski and his followers developed had a certain impact on the concept that appeared in Arthur Prior's temporal ontology. However, this impact seemed to vanish in time. The aim of this paper is to present why Prior was interested in Leśniewski's concept of names and quantification and to discuss why in Prior's later works Leśniewski's influence is not as apparent as it was in the first works on temporal logic. Namely, the paper suggests three possible solutions; the differences that were between Prior and Leśniewski's views on time and determinism, new concepts of names that occurred at that time, and Leśniewski's extensionalism that opposed Prior's preference for intensional logic."

33. Sagal, Paul T. 1973. "On how best to make sense of Leśniewski's ontology." *Notre Dame Journal of Formal Logic* no. 14:259-262.

"Familiarity breeds contempt; on the other hand it can be very comforting. Philosophers find familiar logical systems very comforting.

On the whole they prefer the logic they learned on their mother's knee or in graduate school. When confronted with an unfamiliar system they either resist it or twist and turn to put the unfamiliar in a familiar frame.

A. N. Prior, in his essay *Existence in Leśniewski and in Russell*(1) does a lot of twisting and turning. Prior centers his discussion upon Theorem 24.52 of Russell and Whiteheads's *Principia Mathematica*. This theorem asserts that there exists at least one individual. But where does a logical system come off telling us that something exists? Leśniewski's ontology contains no such thesis. Prior's essay investigates how *ontology* could get away with this when Russell considered 24.52 a necessary evil. This investigation leads Prior to make some general claims about Leśniewski's *ontology*, and to present its basic ideas in what Prior considers a less puzzling way than is customary. Prior's thesis is "that ontology is just a broadly Russellian theory of classes deprived of any variables of Russell's lowest logical type." (150) If we consider lowest type variables to range over individuals then we are left with a no *individual* theory. The only logical truths which remain would be those not involving individuals. According to Prior, the above characterization captures the essence of *ontology*. To give the reader who is completely unfamiliar with *ontology* enough information to appreciate the following discussion, I will make a few observations about *ontology*." (p. 259)

(1) A. N. Prior, "Existence in Leśniewski and Russell," in *Formal Systems and Recursive Functions*, ed. by Crosley and Dummett, North Holland (1963).

34. Sanders, John T. 1996. "Stanisław Leśniewski's Logical Systems." *Axiomathes* no. 3:407-415.

"In conclusion, it is to be emphasized again that Lesniewski's motive in building his systems was to formalize intuition. Kearns remarks that in attempting to formalize intuition rather than to devise just any sort of system which "works," Leśniewski is choosing to understand rather than simply to invent.(25)

That is, the construction of the Lesniewskian systems is an examination and elaboration of basic intuitions about the world and about language.

It is difficult, however, to pin down just what it was that Leśniewski was trying to understand - whether it was language or the world. For although intuitions are surely about the world, they are themselves linguistic in character: Kearns may be correct in suggesting that Lesniewski's intuition is best described as knowledge of how language must be if it is to adequately and efficiently represent the world.(26)

This emphasizes the linguistic element of Leiniewski's work. But might not his intuition be described equally fairly as knowledge of what the world must be like,

given the distinctive linguistic character of intuitions? In such a formulation, the ontological element of the systems may be seen, along with the justification for Kotarbinski's remark that Lesniewski's Ontology is in fact a "theory of what there is, or general principles of being".(27) Perhaps the best formulation would be that Leiniewski's Ontology is a theory of what restrictions pure logic places on what can be. This avoids Kearns's objection that the Kotarbitiski remark ignores Lesniewski's nominalistic philosophical view, while preserving a kind of ontological characterization of the system. For Leśniewski's nominalism enters the scene only in Mereology: Protothetic and Ontology are independent of it.(28)" (p. 413)

(25) [Kearns 1967], 62-63.

(26) [Kearns 1967], 63.

(27) Kotarbiński, as quoted in [Luschei 1962], 149 and [Kearns 1967], 62; cf. [Lejewski 1958], 152-153 for a similar view of Ontology.

References

[Kearns 1967] J.T. Keams, "The Contribution of Leśniewski," *Notre Dame Journal of Formal Logic*, 8, 61-93.

[Lejewski 1958] C. Lejewski, "On Leśniewski's Ontology", *Ratio*, 1, 150-176-

[Luschei 1962] E.C. Luschei, *The Logical Systems of Leśniewski*, North-Holland, Amsterdam-

35. Schäfer, Burkhard. 1998. "Leśniewski-quantifiers and modal arguments in legal discourse." *Logic and Logical Philosophy* no. 6:133-155.
Abstract: "Following an idea first proposed by Jerzy Wróblewski, this paper examines the usefulness of formal logic for comparative legal analysis. Subject of the comparison are the doctrines of mistake and attempt in German and English criminal law. These doctrines are distinguished by the interaction of deontic, epistemic and alethic modalities. I propose a purely extensional logic which is based on Leśniewski's substitutional interpretation of quantification to analyse differences in the logical structure of the various criminal law doctrines."
36. Scharle, Thomas W. 1962. "A diagram of the functors of the two-valued propositional calculus." *Notre Dame Journal of Formal Logic* no. 3:243-255.
"By means of arranging the functors of the two-valued propositional calculus in a certain array (to be described below), we find that several properties of the functors are related. Such properties are connected to the possibilities of defining some functors by others, and thus in the diagram we have displayed definitional connections between certain sets of functors.
In this paper we first present the method of diagramming, and certain helpful connections within the diagram, then several theorems on definitions within the propositional calculus. We are then able to show that there are three exhaustive classes for single functors in terms of definitions, of such a nature that we are able to give axioms for a large number of functors.
The paper is concluded with some further consideration on definability in special cases." (p. 243)
37. ———. 1962. "Note on my paper 'A diagram of the functors of the two-valued propositional calculus'." *Notre Dame Journal of Formal Logic* no. 3:287-288.
38. Schumann, Andrew. 2013. "On Two Squares of Opposition: the Leśniewski's Style Formalization of Synthetic Propositions." *Acta Analytica* no. 28:71-93.
Abstract: "In the paper we build up the ontology of Leśniewski's type for formalizing synthetic propositions. We claim that for these propositions an unconventional square of opposition holds, where a, i are contrary, a, o (resp. e, i) are contradictory, e, o are subcontrary, a, e (resp. i, o) are said to stand in the subalternation. Further, we construct a non-Archimedean extension of Boolean algebra and show that in this algebra just two squares of opposition are formalized: conventional and the square that we invented. As a result, we can claim that there are only two basic squares of opposition. All basic constructions of the paper (the new square of opposition, the formalization of synthetic propositions within

- ontology of Leśniewski's type, the non-Archimedean explanation of square of opposition) are introduced for the first time."
39. Simons, Peter M. 1981. "A note on Leśniewski and free logic." *Logique et Analyse* no. 24:415-420.
 "The aim of this note is to correct a misconception which may arise from a paper by Karel Lambert and Thomas Scharle(1) in which systems of free logic as they have been developed in the past quarter century or so in America are compared with the logic, in particular the Ontology, of Leśniewski. I shall draw out some consequences for what I believe is a correct view of the relationship between free logic and Ontology."
 (1) Karel Lambert and Thomas Scharle, «A translation theorem for two systems free logic», *Logique et Analyse* 10 (1967), 328-341.
40. ———. 1982. "On understanding Leśniewski." *History and Philosophy of Logic* no. 3:165-191.
 Reprinted in: Peter Simons, *Philosophy and Logic in Central Europe from Bolzano to Tarski. Selected Essays*, Dordrecht: Kluwer 1992, pp. 227-258.
 "This paper assesses those features of Leśniewski's ontology which make it difficult to understand for logicians accustomed to more orthodox systems of logic. It is seen that certain general features of presentation and content can, by selective acceptance or modification, be accommodated with a fairly orthodox viewpoint. The chief difficulty lies in the interpretation of Leśniewski's names, and the constant "'?'"'. Four interpretations are suggested in turn: Leśniewski's names as monadic predicates; as class terms; as common nouns; and as empty singular or plural terms. This last and least orthodox interpretation is argued to be the most suitable, but it is shown how it can be made to live in harmony with either the common noun or the class interpretation."
41. ———. 1983. "A Lesniewskian Language for the Nominalistic Theory of Substance and Accident." *Topoi* no. 2:99-110.
 "The power of Leśniewski's language and his understanding of the quantifiers as being without existential import enabled him to express without heavy ontological commitment to abstract entities what other philosophers could only say provided they accepted such entities. So it is not surprising that Leśniewski and his followers have tended to be nominalists, both in the traditional sense which involves denying the existence of universals, and in the sense coined by Goodman (4) which involves denying the existence of sets. The possession of a Lesniewskian language leaves room for nominalism in a way which most other languages do not. Some exponents of Leśniewski have followed Kotarbiński in adhering to an extremely sparse form of reism, according to which the only things that exist are spatio-temporally extended bodies.(5) But while the adoption of a Lesniewskian language opens the way for such an ontology, it does not entail its acceptance. Lejewski has shown how a Lesniewskian type of language may be developed to allow the adumbration of a multicategorical ontology, say one involving both concrete individuals and abstract sets,(6) and I have sketched elsewhere how this idea may be naturally extended to form a basis for a simple theory of types.(7) But even within Leśniewski's language as it stands, a Platonist may quite happily claim the right to talk about the abstract entities which he recognises.(8) The point is that Lesniewskian languages free the metaphysician from having to accept the existence of certain entities simply in order to get a language of sufficient expressive power for his purposes. However they do not bind the metaphysician to reism." (p. 99)
 (4) * I present a theory of classes as many in my 'Plural Reference and Set Theory', in B. Smith (ed.), *Parts and Moments*, Philosophia, Munich, 1981.
 (5) See N. Goodman, 'A World of Individuals', in *Problems and Projects*, Bobbs-Merrill, Indianapolis, 1972, pp. 155-172.
 T. Kotarbiński, *Gnosiology*, Pergamon, Oxford, 1966, p. 55f.
 Kotarbiński was not the first reist. Brentano's reism predates Kotarbiniski's, and Leibniz flirts with the position: cf. his *New Essays on Human Understanding*,

- C.U.P., Cambridge, 1981, p. 217, a passage quoted by both Brentano and Kotarbiński. Since Leibniz's flirtation consists in suggesting that perhaps accidents (and they alone) are not real, his official position is the same as that adopted in this paper. Brentano's reism, unlike Kotarbiński's accepts souls as well as bodies.
- (6) C. Lejewski, 'A System of Logic for Bicategorical Ontology', *Journal of Philosophical Logic* 3 (1974), 265-283.
- (7) Cf. § 9 of my 'On Understanding Leśniewski', [1982].
- (8) This would apply to what Lejewski calls a 'unicategorical Platonist': cf. his 'Ontology and Logic', in S. Körner (ed.), *Philosophy of Logic*, Blackwell, Oxford, pp. 1-27, esp. p. 6. The bicategorical Platonist (ibid.) needs a bicategorical language. But because of the nature of Lesniewskian languages, the opponent of Platonism can still meaningfully discourse with the Platonist without accepting his ontological commitments, thus solving Quine's problem of 'Plato's beard': 'On What There Is', in *From a Logical Point of View*, Harper & Row, New York, 1953, p. 1f.
42. ———. 1984. "A Brentanian basis for Lesniewskian logic." *Logique et Analyse* no. 27:297-398.
Reprinted in: Peter Simons, *Philosophy and Logic in Central Europe from Bolzano to Tarski. Selected Essays*, Dordrecht: Kluwer 1992, pp. 259-269.
43. ———. 1985. "Leśniewski's logic and its relation to classical and free logics." In *Foundations of Logic and Linguistic. Problems and Their Solutions: A Selection of Contributed Papers from the VIIIth International Congress of Logic, Methodology, and Philosophy of Science, held in Salzburg from the 11th-16th July, 1983*, edited by Dorn, Georg and Weingartner, Paul, 369-402. New York: Plenum Press.
Reprinted in: Peter Simons, *Philosophy and Logic in Central Europe from Bolzano to Tarski. Selected Essays*, Dordrecht: Kluwer 1992, pp. 271-293.
44. ———. 1985. "A Semantics for Ontology." *Dialectica* no. 39:193-216.
Reprinted in: Peter Simons, *Philosophy and Logic in Central Europe from Bolzano to Tarski. Selected Essays*, Dordrecht: Kluwer 1992, pp. 295-318.
45. ———. 1985. "Leśniewski's Logic and its Relation to Classical and Free Logics." In *Foundations of Logic and Linguistics: Problems and Their Solutions*, edited by Dorn, Georg and Weingartner, Paul, 369-400. New York: Springer Science+Business Media New.
Reprinted in: Peter Simons, *Philosophy and Logic in Central Europe from Bolzano to Tarski. Selected Essays*, Dordrecht: Kluwer 1992, pp. 271-293.
46. ———. 1987. *Parts: A Study in Ontology*. Oxford: Clarendons Press.
"That most modern ontology passes mereology by is due to the inadequacy of CEM [Classical extensional mereology] as a conceptual instrument capable of use in the variety of issues found in ontology, coupled with a historically misinformed supposition that mereology is something for nominalists only. If I am right about the formal nature of mereology, it should be neutral on the issue of nominalism/realism. If mereology can be applied universally (and that has not been shown here, because we have not discussed abstract objects), then it should regain a central position in ontology; along with existence and identity, it should take us to the heart of many ontological issues. The topics covered in Parts II and III are meant to show this: Part II for existence in and through time, for identity, matter, and form, and Part III for essence, dependence, substance, unity, integrity, and form. It is notable how many of the issues in Part III are under-represented in the contemporary literature, although they loom large in traditional ontology, where it was felt to pay to be discriminating about different kinds of parts, as the quotation from Aquinas at the beginning of this section shows.
The contemporary field ontologist is better equipped than his predecessors because he is familiar with formal systems, a device we owe to Leibniz. The acquisition of this tool does not render the old resources—experience, wit, authority, the lore of language—obsolete, but it shifts the ontologist's role. He now has a theoretically endless supply of formal templates to hold up to the untamed phenomena, and his job now consists in fair part in constructing such formal systems and testing them

for their applicability. It is tempting to be led by the attraction of internal properties of the formalism either into taking the world to be tamer than it is, or into a relativistic, pragmatic attitude to ontology which can be seen at its most significant in Quine. Such attraction, for which again Leibniz is responsible, lies behind CEM's two errors of omission and two of commission. For different regions, we need different templates, and it is mainly the templates which must be bent to fit, not the world. In the case of mereology, this fails to descend to utter relativism because the theory has a formal skeleton and a range of analogous fleshings out which provides unity in the diversity." (pp. 363-364)

47. ———. 1992. "Lesniewskian Term Logic." *Lingua e Stile* no. 27:25-45.
- "Students of traditional logic, by which I mean the central core of categorical syllogistic with whatever further forms were studied at the time, were drilled in putting the sentences occurring in arguments into «correct logical form», and present-day students do no different when replacing their natural language sentences by the formulas or semiformulas of predicate logic. Both procedures involve doing some violence to natural modes of expression. A sentence like *Whoever flies saves time* must be replaced by something like *Every flier is a time-saver* by traditional logicians and by *For all x: if x flies then x saves time* by modern logicians. As this makes clear, different logical systems may compete in offering prepared forms proximate to a natural specimen, so there may be a real choice as to which system is preferable for a given purpose. This is familiar to observers of modern logic since there are competing logics of definite descriptions, modality, and so on. Of course, if we confine attention just to the opposition between categorical syllogistic and predicate logic, there seems to be no contest. Predicate logic is expressively much the more powerful system, and as these two are the only two logical systems to have enjoyed widespread acceptance as tools for analysing validity of natural arguments, it might seem that only predicate logic remains as a general vehicle for workaday argument assessment. But the large number of introductory logic textbooks which still contain material on categorical syllogistic bears witness to the fact that, within its more limited sphere, the traditional logic of terms is widely felt to be a more natural and useful alternative to monadic predicate logic. Historical interest alone could not compensate for the inconveniences of introducing two quite different systems, with their different sentential analyses, laws, and terminology, to cover the same ground.
- It is apparent that one disadvantage of predicate logic for these purposes is its use of bound individual variables, which natural languages do not have, and which they can simulate and match only by rather tortuous use of pronouns and pronominal phrases. Of course this helps to account for the greater perspicuity of predicate logic once we leave the simplest sentences behind, but at the most elementary level it is a hindrance. The singular term/predicate analysis of simple predications compels common noun phrases and adjectives used attributively to appear as syntactically inseparable parts of predicates, which correspond most closely to verb phrases in natural language. Again, this is not a huge sacrifice, but it is pervasive, is felt to be unnatural, and contributes to beginners' difficulties in learning logic.
- So it is worth considering from a practical and pedagogical point of view whether, in order to gain the considerable benefits conferred by predicate logic - quantification, multiple generality, relational predicates - it is necessary to put up with the disagreeable features of standard predicate logic. I shall argue that it is not, and that a more natural and flexible medium for which to prepare natural language sentences and arguments is provided by the term logic invented around 1920 by Stanisław Leśniewski (1886-1939) and usually known as Ontology. (*)" (pp. 25-26)
- (*) The possible confusion of the system of logic with the branch of metaphysics of the same name is not a danger in this context, and in any case I will write the name of the system with a capital letter. Sometimes Ontology is called the Calculus of Names, but this is misleading, since much more than names are involved. It would be nice to have a better name for Ontology.

48. ———. 1992. "Existential propositions." *Grazer Philosophische Studien* no. 42:229-259.
 Summary: "By considering a wide and expressly classified range of examples from natural and logical languages, I attempt to isolate from other concomitants the features of existential sentences which make them existential. One such concomitant is the imputation of singularity. There are many ways to say something exists, and their relationships are charted. I deny that there is anything in reality called existence, or any special existential facts."
 "So far we have considered how the expression of existence can be divorced from devices expressing singular or plural, and so these features are inessential to the expression of existence as such, but reflect, as it turns out, either the grammatical number of an open nominal or the meaning of a numerical quantifier, or both. Examination of classical logic alone, with its embedded prejudice in favour of the singular, does not prepare us for this discovery: we need to consider a wider range of languages such as natural languages or Leśniewskian. By the same score, there is another dimension of variation covered by neither classical nor Lesniewskian logic, namely the distinction between count and mass nominals." (p. 240)
49. ———. 1993. "Nominalism in Poland." In *Polish Scientific Philosophy: The Lvov-Warsaw School*, edited by Coniglione, Francesco, Poli, Roberto and Wolenski, Jan. Amsterdam: Rodopi.
 Reprinted in Jan Srzednicki, Zbigniew Stachniak (eds.), *S. Leśniewski's Systems: Protothetic*, Dordrecht: Kluwer 1998, pp. 1-22.
 "Several prominent Polish philosophers were nominalists. This paper concentrates mainly on the views of Leśniewski and Kotarbiński, in the belief that their views are the most interesting in themselves, the most historically important, and present most clearly the difficulties and challenges that nominalism has to face." (p. 1 of the reprint)
 (...)
 "Conclusion
 The influence of Leśniewski and Kotarbiński goes beyond Tarski of course. Another of their students, Czesław Lejewski, is a staunch defender of a reism which is committed to unverifiable theses which even Kotarbiński was reluctant to accept. (51) Lejewski has also, more than any other follower of Leśniewski, gone out of his way to show how to accommodate within Ontology talk which is ostensibly about abstract entities like classes,(52) and to furnish language within which a Lesniewskian nominalist can carry on a dialogue with his Platonist opponent.(53) No doubt there are other Polish nominalists whose thinking was influenced by Leśniewski and Kotarbiński. A more exhaustive cataloguing of the extent of Polish nominalism is something I shall not undertake here, because what is important is not a head-count but the issue of principle: does Polish nominalism contribute essentially to answering the question whether nominalism is correct? My answer is plainly that it does, and the main problem which needs to be overcome is the one at the heart of the discussions between Quine and Leśniewski: can a powerful higher-order logical language avoid commitment to abstract entities? Thanks to the work of Leśniewski, Kotarbiński, their associates and students, we are closer to an answer than before." (p. 18 of the reprint)
 (51) Cf. Lejewski (1976). Lejewski told me that when Kotarbiński received a copy of this he replied that he was not prepared to go as far.
 (52) Lejewski (1985).
 (53) Lejewski (1974).
 References
 Lejewski, C. (1974). 'A System of Logic for Bicategorical Ontology', *Journal of Philosophical Logic* 3, 265-283.
 Lejewski, C. (1976). 'Outline of an Ontology', *Bulletin of the John Rylands University Library of Manchester* 59,127-147.

- Lejewski, C. (1985). 'Accommodating the Informal Notion of Class within the Framework of Leśniewski's Ontology', *Dialectica* 39, 217-241.
50. ———. 1994. "Discovering Leśniewski: *Collected Works*." *History and Philosophy of Logic* no. 15:227-235.
"This discussion review examines the English edition of Leśniewski's *Collected Works*. Points emphasized include: the early (pre-symbolic) period, the quality of translation and typesettings, and the scandalously outdated bibliography."
51. ———. 1994. "Leśniewski and Generalized Quantifiers." *European Journal of Philosophy* no. 2:65-84.
"Generalized quantifier theory is usually dated to the 1957 paper 'On a generalization of quantifiers' by Andrzej Mostowski. After some use by mathematical logicians, including Lindstrom's 1966 paper 'Predicate logic with generalized quantifiers' it became widely known as a topic of investigation on the borderlines between logic and linguistics with the publication in 1981 of the paper 'Generalized quantifiers and natural language' by Jon Barwise and Robin Cooper. The subject has since expanded rapidly: it has an appealing simplicity and the essentials can be mastered quite quickly.
In this paper I put forward two theses. The first is historical and is the claim that there is a significant anticipation of certain key aspects of generalized quantifier theory in the logic of Stanisław Leśniewski (1886-1939), one of the founders and prime movers of the Warsaw group of logicians in the inter-war years. The second thesis builds on this anticipation and is the claim that Leśniewski's logic provides a framework for working on generalized quantifiers which has definite logical and ontological advantages over the rather eclectic mixture of ordinary language, standard predicate logic, and set theory in terms of which generalized quantifier theory is generally pursued." (p. 65)
52. ———. 1995. "Leśniewski and ontological commitment." In *Stanisław Leśniewski aujourd'hui*, edited by Miéville, Denis and Vernant, Denis, 103-116. Grenoble: Recherches sur la Philosophie et le Langage.
Abstract: "In the dispute between Quine and Leśniewski as to whether quantification of higher-order variables views Platonistic ontological commitments, it was Leśniewski (who answered negatively) who was right. I analyse here the notion of ontological commitment and show that the axioms and rules of Leśniewski's logic remain valid even if there are no objects. The fact that there is nevertheless a plurality of different propositive logical constant in this case is to be explained by the « primeval fact » of logic, that truth is not falsity, that to be true is not to be false."
53. ———. 2002. "Reasoning on a Tight Budget: Leśniewski's Nominalistic Metalogic." *Erkenntnis* no. 56:99-122.
"How can one be a logician and yet believe that there are no abstract entities such as properties, sets, or expression types? Stanisław Leśniewski showed how. Leśniewski was one of the original practitioners of metalogic, and through the influence of his ideas and example on the Polish school many of his incidental ideas entered the mainstream, but his own nominalistic approach to metalogic did not. One of his major achievements was to formulate scrupulous metalogical descriptions of and directives for certain formal systems. The key idea is that directives are not descriptions of actually existing (abstract) expression types but detailed instructions on what expression tokens, if produced, are to count as axioms, definitions, and the acceptable products of inference rules, in a logical system which may grow in time by the addition of new token expressions. The directives are appended to a series of some fifty prescriptive metalogical definitions called 'terminological explanations'. One of these, a definition of 'definition' in protothetic, comprises over two sides of dense symbols in eighteen independent clauses. The terminological explanations are justly notorious for their density and impenetrability, and Leśniewski himself typically took three semesters to work through them with graduate students.

This paper aims to smooth the way for a better understanding of Lesniewski's distinctive approach to metalogic. After outlining Lesniewski's philosophical background and illustrating his dissatisfaction with the inexactness of the metalogical practice of his time, I briefly explain the nature of his own system of the foundations of mathematics, before elucidating the idiosyncrasies of his concretist inscriptional approach and his reasons for adopting it. The approach is then illustrated with simple examples from propositional logic." (p. 99)

54. ———. 2006. "Things and Truths: Brentano and Leśniewski, Ontology and Logic." In *Actions, Products, and Things: Brentano and Polish Philosophy*, edited by Chrudzimski, Arkadiusz and Łukasiewicz, Dariusz, 83-106. Frankfurt: Ontos Verlag.
- "When Stanisław Leśniewski went to Lwów in 1910 to study with Kazimierz Twardowski, he was already acquainted with the philosophy of what he later called "the Austrian School", by which he meant Franz Brentano and his students, especially Anton Marty and Edmund Husserl, whose works initially captivated Leśniewski. This knowledge had been acquired during Leśniewski's philosophical education in Germany, Russia and Switzerland, but it is very likely that his doctoral supervisor Twardowski would have made further aspects of Brentano's work known to him. Despite this, and despite the often remarkable convergences between the philosophical views of Brentano and Leśniewski, there is little evidence of direct influence of the former on the latter. We have the testimony of Leśniewski's friend and colleague Tadeusz Kotarbiński that the latter's even closer philosophical parallels to Brentano's work were acquired independently.(1) Leśniewski did interact with Brentano's views, but only at the very beginning of his career, and unsuccessfully. Later parallels are just that: parallels, and we are unlikely to come upon significant new evidence as to whether there was or was not any direct influence, positive or negative. Brentano and his philosophy were part of the philosophical wallpaper in Twardowski's Lwów, but Leśniewski's interests soon came to settle on logic and the foundations of mathematics, and such figures as Russell, Frege, Cantor and Zermelo quickly outranked Brentano in their importance for his views. Nevertheless, the parallels are real, interesting, and revealing." (p. 83)
- (1) Cf. Kotarbiński 1976, 195, where he points out that his reism, elaborated by him in 1929, owed nothing to Brentano despite Twardowski having been Brentano's student and Kotarbiński being Twardowski's student. The explanation was the late change of mind of Brentano, which took him out of the orbit Twardowski knew into a reism which was not widely read or appreciated when it first appeared around 1914.
- References
- Kotarbiński, T. 1976. Franz Brentano as Reist. In: L. McAlister, ed., *The Philosophy of Brentano*. London: Duckworth, 194–203.
55. ———. 2006. "Leśniewski, Stanisław." In *Encyclopedia of Philosophy. Second edition*, edited by Borchert, Donald M., 290-293. Farmington Hills, MI: Thomson Gale.
- "Leśniewski had definite ideas about the intellectual economy of logic. A system ought to have as few primitive notions, axioms, and directives as possible; the axioms ought to be as short as possible, logically independent, and organic—that is, not contain provable theses as subformulas. The search for ever shorter axioms was a general feature of the Warsaw School, which Leśniewski and his followers sometimes pursued at the expense of defending controversial aspects of the systems, such as their interpretation of quantification, their radical nominalism, and their thoroughgoing extensionalism." (p. 293)
56. ———. 2006. "Real Wholes, Real Parts: Mereology without Algebra." *The Journal of Philosophy* no. 103:597-613.
- "Although the concept of a part is one of the oldest and most ubiquitous of formal concepts, formal theories of part and whole, or mereologies, emerged only around

1914-1916, independently, in the works of two philosopher-logicians: A.N. Whitehead and Stanisław Leśniewski. Whitehead developed his account of part and whole to serve the abortive fourth volume of *Principia Mathematica*. Mereology was the basis of his theory of extensive abstraction, which he employed in "La theorie relationniste de l'espace." (1) Whitehead went on to employ mereology and extensive abstraction to define geometric elements such as points and lines in his *Principles* of 1919. (2)

(...)

"In 1916 Leśniewski put forward the first axiomatization of this theory of part and sum, under the title "Foundations of the General Theory of Sets," but he later changed the name to "mereology" to avoid confusion with what he called "official" set theory. (5) A definitive account of mereology was published in a series of articles from 1927-31 with the title "On the Foundations of Mathematics". (pp. 598-599)

(...)

"Conclusion

Mereology is an essential part of ontology, but it can easily be overused. For instance, several important computer ontologies use only two formal relations among entities: *is_a* and *part_of*. (39) Even if these are interpreted sensibly, (40) this places far too much burden on mereology, not to mention inclusion, exemplification, or whatever *is_a* is supposed to represent. Even formal ontology is a good deal richer than this. But in particular it cannot be assumed that because the part-relation behaves in one way in one domain -- in the ontology of spatiotemporal regions, say -- that it must behave similarly elsewhere. All that can be guaranteed a priori is that the part-concept has the formal characteristics which are analytic of it. (41) When it comes to the honest toil of investigating the principles governing what objects are parts of others, and what collections of objects compose others, it appears that most ontologists have been following the paradigm of abstract algebra when it would have been better to take a lead from sciences such as geology, botany, anatomy, physiology, engineering, which deal with the real. (42)

(1) Whitehead, "La théorie relationniste de l'espace," *Revue de Metaphysique et de Morale*, xxiii (1916): 423-54. This talk was delivered in April 1914. The published version is a translation of the now lost English original.

(2) Whitehead, *An Enquiry Concerning the Principles of Natural Knowledge* (New York: Cambridge, 1919; 2nd ed., 1925).

(39) For example, **Gene Ontology**

(40) That they usually are not is the justified complaint of Barry Smith, "Beyond Concepts: Ontology as Reality Representation," in Varzi and Laure Vieu, eds., *Formal Ontology and Information System* Amsterdam: IOS, 2004), pp. 73-84.

(41) Simons, *Parts*, p. 362

(42) A mereologist who has remained quietly unfazed by algebra is David Sanford: see his "The Problem of the Many, Many Composition Questions, and Naive Mereology," *Nous*, xxvii (1993): 219-28; and "Temporal Parts, Temporal Portions, and Temporal Slices: An Exercise in Naive Mereology," xv (1996): 21-33.

57. ———. 2009. "Leśniewski's Logic." In *Handbook of the History of Logic: Vol. 5. Logic from Russell to Church*, edited by Gabbay, Dov M. and Woods, John, 305-320. Amsterdam: Elsevier.

"In the course of the 1920s Leśniewski submitted his rigorous but unformalized reasonings regarding propositions, objects, collections and parts to a process of progressive formalization. The axioms of his 1916 mereology were rendered into a formalized axiomatic mereology, where undefined expressions meaning 'part of' and 'collection of' were taken as primitive. This rendering of mereology and its immediate consequences suffered two drawbacks: the expression for 'collection of' needed to be defined in terms of 'part of' before being inserted into the axioms; and the logical principles governing names and name-forming functors were not made explicit. The former was easily remedied by a new axiomatization; the latter required another logical system, one dealing with names, predicates, and other functors. This system, which picked up where the early papers left off, but now

ditched the notions of connotation and property, Leśniewski came to call 'ontology', because he saw it as a general theory of objects in the sense of Aristotle.

But ontology had its own logical presuppositions, a logic of propositions or "theory of deduction" as Whitehead and Russell had called it. This most basic theory of logical first principles Leśniewski called 'protothetic'. For him it included not just the standard truth-functional connectives, but also higher functors and the basic principles governing the logic of quantifiers." (p. 307)

58. ———. 2014. "Arithmetic in Leśniewski's Ontology." In *The History and Philosophy of Polish Logic: Essays in Honour of Jan Wolenski*, edited by Mulligan, Kevin, Kijania-Placek, Katarzyna and Placek, Tomasz, 227-241. New York: Palgrave Macmillan.

"Jan Wolenski and I shared more than a merely antiquarian interest in Leśniewski however. Like myself, Jan also considered that Leśniewski had been somewhat poorly portrayed in subsequent literature, both by Lesniewski's often ignorant detractors and by his often equally uncritical admirers. We both take a somewhat more detached view than the latter, enabling us, as we think, to give a fair assessment of his important contributions.

I am concerned to exhibit some of the striking advantages of doing more things Lesniewski's way even today, and this paper falls into that category." (p. 228)

(...)

"Lesniewski's ontology (the logical system) goes beyond standard Frege-Russell style predicate logic because it is more liberal with its names. Whereas standard predicate logic has only singular names, to which free logic adds empty names, ontology in addition allows plural names: names of several individuals. But it stops there. In a sense it doesn't take multitudes or groups (the objective counterparts of plurals) fully seriously, since a plural term is just one term for many individuals. We can have predicates true of multitudes, and with our numerical predicates we have seen how this allows us to bring arithmetic down a level by comparison with its standard (non-set-theoretic) treatment, where numerical terms are quantifiers, or predicates of predicates. And in Lesniewski's logic we have to use analogous numerical constants from ever higher types to continue the story. However, the illustration from kindergarten arithmetic shows that we naturally use the very same numerical terms for groups as for individuals, and indeed for groups of any desired level or order." (p. 239)

(...)

"While the final form of such a theory is not yet certain, it holds out a number of promises. The first is that it will allow a type-free account of arithmetic that is still beyond Leśniewski. The second is that the principles of Peano arithmetic in this system will have a much weaker existential requirement for their truth: by dint of the ability to ramify multitudes up to any finite order, no more than two individuals are required to kick-start an infinite hierarchy and so ensure that every finite cardinality predicate is satisfied. This is not to give up on Lesniewskian ontological neutrality, since it remains a non-logical fact that even one individual exists, but we can be assured that in any universe we care about, in particular our own, Peano arithmetic will be true.

And finally, the endless resources of such a system of multitudes holds out the promise of doing something that, following Quine, has been universally assumed to be impossible, namely to provide a nominalistically acceptable formal semantics for predicate logic, of first or higher order. These are heady prospects, and tasks for another time. But it all starts from the first step of Leśniewski having the courage and foresight to retain plurally referring names when all around him the logical world was rejecting them." (p. 240)

59. ———. 2018. "Stanisław Leśniewski: Original and Uncompromising Logical Genius." In *The Lvov-Warsaw School. Past and Present*, edited by Garrido, Ángel and Wybraniec-Skardowska, Urszula, 209-221. Cham (Switzerland): Birkhäuser. Abstract: "Stanisław Leśniewski was one of the two originators and drivers of the Warsaw School of logic. This article describes his work chronologically, from his

early philosophical work in Lvov to his highly original logical systems of protothetic, ontology and mereology. His struggles to overcome logical antinomies, his absolute commitment to logical clarity and precision, and his antipathy towards set theory made his nominalistic approach to logic among the most original of the twentieth century, while his early death and the loss of his papers meant his work was only gradually discovered and appreciated outside Poland."

60. ———. 2018. "Leśniewski and Mereology." In *The Lvov-Warsaw School. Past and Present*, edited by Garrido, Ángel and Wybraniec-Skardowska, Urszula, 337-359. Cham (Switzerland): Birkhäuser.

Abstract: "This paper surveys mereology, the theory of parts and wholes, focussing on its origins in Leśniewski, and noting its intended employment as a surrogate for set theory.

We examine parallel and independent work by Whitehead, Leonard and Goodman, and outline the subsequent adventures of mereology, both in its formal guises and in its now intensive application within philosophical ontology."