— . 1990. *Теория доказательств в СССР (1925-1969)*, в кн.: *Современная логика: проблемы теории, истории и применения в науке* (Л.: Изд-во Ленинграский. ун-та.), Ч. 1, с. 66.

— . 1991. *Proof theory in the USSR 1925 – 1969*, Journal of Symbolic Logic **56**, 385-424.

P.S. NOVIKOV. 1977. *Конструктивная математическая логика с точки зрения классической*, М.: Наука.

D. PRAWITZ. 1965. *Natural deduction: a proof-theoretical study*, Stockholm/Göteborg/Uppsala, Almqvist & Wiksell.

M.M. TROITSKIJ. 1886. *Учебник логики с одробными указаням ма историю и состояние этой науки в России и других странах*, Москва.

J. VAN HEIJENOORT. 1957. *Review of Gerhard Gentzen, Recherches sur la déduction logique, Jean Ladrière, translator*, Journal of Symbolic Logic **22**, 350–351.

— . 1970. *Review of A.V. Idel'son & G.E. Minc (editors), Математическа теория логического вывода*, Journal of Symbolic Logic **35**, 323-325.

— . 1970a. *Review of G.E. Minc, «Теорема Эрбрана для исчисления предикатов с равенством и функциональными символами», and English translation by L.F. Boron*, Journal of Symbolic Logic **35**, 325.

— . 1971. *Review of various papers of G.E. Minc*, Journal of Symbolic Logic **36**, 524–528.

— . 1975. *Herbrand*; 15pp. ts.; 18 May. Jean van Heijenoort Papers, Box 1, Archives of American Mathematics, University of Texas at Austin. Copy in I.H. Anellis's private archives.

S.A. Yanovskaya. 1948. *Основания математики и математическая логика*, в кн.: *Математики в СССР за тридцат лет, 1917-1947* (А.Г. Курош, А.И. Маркушевич & П.В. Рашевский, ред.; М-Л.. ГИТТЛ), 9–50.

— .1959. *Математическая логика и основани математики*, в кн.: *Математики в СССР за сорок лет, 1917-1957*, тм. 1 (М., Физматгиз), 13–120.

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Alexandra Getmanova, *Logic*, Moscow, Progress Publishers, 1989, А. Ивин, *По законам логики*, Москва, Молодая гвардиа, 1983, and A. Getmanova, M. Panov & V. Petrov, *Logic made simple: a dictionary*, Moscow, Progress Publishers, 1990.

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The logic textbooks that were commonly used in the former Soviet Union differed in several respects from those used in the West, for example, in the United States. Some of this disparity is no doubt resultant from the different educational levels of the two societies, but much of the difference results from diverging pedagogical goals and philosophies.

Modern Logic readers no doubt familiar with Scripta Technica, Incorporated's translation, under the title *Introduction to elementary mathematical logic*, of Avram Aronovich Stolyar's *Элементарное введение в математическую логику*, edited by Elliott Mendelson (first published by MIT Press in 1970, reprinted by Dover Publications in 1985) may also recall that Stolyar's text was originally written to serve as a beginning textbook in mathematical logic for Soviet high school mathematics students. In the United States, the material covered in such a textbook is likely to be found in an upper division mathematics department logic course or a graduate-level philosophy department logic course. Only part of this difference will be explained by the fact that a secondary school in the former Soviet Union (and in Europe) is roughly equivalent to senior high school and junior college in the United States.*

Getmanova's *Logic* is a translation by Stephen Smith of her textbook *Логика* for pedagogical school students. Progress Publishers had also published a Spanish translation of the book.

The two books under consideration here deal with much of the material covered in a standard American philosophy department "Introduction to Logic" course, and cover such topics as the relation of logic to language as a tool of reasoning, the nature of judgments and propositions, truth-functional logic, syllogistic reasoning (and in particular the use of the categorical syllogism), the concept of proof (especially for informal argumentation), paradoxes and sophisms. Getmanova's book also treats hypothetical reasoning, especially the hypothetical syllogism, and goes more deeply into inductive reasoning. Her book, unlike Ivin's, contains exercises for students, and both present their subject from a philosophical perspective.

Getmanova's book might easily be called a book on dialectical-materialist (diamat) philosophy in which the topic for discussion is logic, and readers will find the customary references to Marx and Lenin, especially in the more philosophical chapters; but such a characterization would not reveal the extent of the attention given by its very professional treatment of classical logic. Getmanova's approach has the distinct advantage over typical introductory formal logic textbooks found in America in that it gives students a feeling that logic has concrete applications to everyday reality. Ivin's book on "The Laws of Logic" feels much less like a textbook, and is written in a breezier style, reflected in the cartoon-like drawings that are scattered through the text and intended to illustrate the discussion with a touch of humor. Thus, for example, in a section called "One and the Same Subject", we find (p. 25) a drawing of an explorer crawling along the floor of a desert and looking up

* There was a program at Montclair College in New Jersey, begun in the late 1970s, with the goal of introducing philosophy courses, including logic, into the American primary or secondary school curriculum. The hero of the textbooks for these courses is 'Harry Stotlemeier.' It was reported recently on the LOGIC-L listserve that this program continues and has met with some success.

at a sign with some (apparently) Arabic writing, under which is also written "200 km," and in a section on "Other Laws" in the chapter on the laws of logic, we see (p. 133) a man shrugging his shoulders and holding in one hand the expression "2 + 2 = 5." Although Ivin's book covers some of the same material as Getmanova's, his book may more properly be considered to be a book on philosophy of logic than a textbook. There are, in Ivin's book, for example, no exercises.

Aleksandra Denisovich Getmanova is Doctor of Science (Philosophy) and Professor in the Department of Philosophy of Moscow's Lenin Teacher Training Institute. Her work has been concentrated on the concept of negation in classical and non-classical logics, especially multiple-valued logics, history of logic, philosophy of logic and philosophy of mathematics. Getmanova's forte, however, is philosophy of logic and systems of multiple-valued logics.

In a monograph on negation in formal logical systems which was summarized in her LMPS '87 paper *Negations in classical and non-classical logics* (in V.L. Rabinovich (ed.), *Abstracts, 8th International Congress of Logic, Methodology and Philosophy of Science, LMPS '87, Moscow, USSR, 17—22 August, 1987,* (Moscow Institute of Philosophy of the Academy of Sciences of the USSR, 1987), vol. 4, part 1, sect. 6, pp. 221–224), Getmanova surveys twenty different logical systems and identifies about forty kinds of negation. Thus, we are told that while negation is the same for propositions and for classes in classical two-valued logic, there may be several different kinds of negation at work in certain systems of non-classical logics, both multiple-valued logics and constructive logics; there are, for example, three kinds of negation—direct, reenforced, and reduction—in Markov's constructive logic, two kinds of negation in Post's *m*-valued logic, but only one in the three-valued logics of Goodstein, Heyting, and Łukasiewicz, and three kinds in Reichenbach's three-valued system. Getmanova's goal is to determine the general characteristics common to all types of negation.

During the forty year period following the revolution, it became necessary for mathematics to justify itself as either a useful science or as at least a science which did not violate the ideological principles of revolutionary Marxism and which consequently was in philosophical harmony with diamat. Thus, in an old paper on the relation of logic and mathematics in systems of the *Principia mathematica type* (*О соотношений логики и математики в системах типа Principia mathematica*, in *Логические исследования* (Moscow, pp. 189–217)) from 1959, Getmanova sought to disprove the logistic thesis of the derivability of mathematics from logic by appealing to Gödel's incompleteness theorem and to Gödel's distinction between the concepts of logic and metalogic, followed by an appeal for additional evidence to Bochvar's work on the consistency of P.S. Novikov's extended calculus which Novikov obtained by allowing denumerably infinite conjunction and disjunction to be adjoined to the classical propositional calculus.

Getmanova wrote this paper at a time when logicians and mathematicians still found it necessary to engage in "self-criticism" and defend themselves against the philosophical-ideological criticisms directed against formal logic, according to which logic, as empty formalism, was at best useless, at worst, even dangerous, because it challenged or contradicted the metaphysical assumptions of diamat. For diamat philosophers, the paradoxes and Gödel's incompleteness results provided a new and strong basis for their arguments against formal logic. Getmanova's paper displays a serious interest in mathematical logic accompanied by a sophisticated and technically competent preparation. As a result partly of the workmanlike studies of Getmanova and other philosophers of logic like her, and especially the more technical work of historians of logic such as Sof'ya Yanovskaya and logicians such as Bochvar and Novikov, I.S. Narskij was able finally to declare, in his epic policy-making paper of 1966 *О положений в логике и ее месте в университетском образований* (Философские наук 3, 101–110) on the situation in logic and on its place in university education, which set the ground-rules for role that logic should play in university education, that traditional logic no longer exists, that formal logic now *is* mathematical logic. Narskii's declaration indicated that mathematical logic had at last found a comfortable status within the Soviet diamat world-view, so that logicians no longer needed to expend energy in polemical justification and defense of their work. It also showed that Soviet philosophers had reached not only a level of acceptance of mathematical logic, but even a high level of technical proficiency thanks to the reforms of the 1950 logic curriculum.

Aleksandr Arkhipovich Ivin is Doctor of Science (Philosophy) and a well-known logician. He works at the Institute for Scientific Information for Social Science of the Academy of Sciences. His areas of specialization include the logical analysis of evaluative and normative reasoning, temporal logic, causality and determinism, and history of logic. His earlier works include books on the logic of norms (1973) and on foundations of the logic of valuation (1970).

Both Ivin's book and Getmanova's contain historical information. In Ivin's book, the discussions of the history of logic are woven into the philosophical considerations of the laws of logic and can therefore be found throughout the entire book. Getmanova devotes a separate chapter to history of logic. The last chapter (Chapter VIII) of her book is called "Stages in the Development of Logic as a Science and the Main Trends is Modern Symbolic Logic" [sic] . Of the seventy-seven pages in this chapter, the first half (pp. 263–296) may be said to be strictly historical and carry us from the logics of ancient India and Greece to the *Principia mathematica.* The second half of the chapter (pp. 296–339) is also of historical interest and describes the work of Brouwer, Heyting, Markov, and many others in the development of constructive logics, the work of Post, Goodstein, Heyting, and Łukasiewicz, Reichenbach, N.A. Vasiliev [Vasil'ev], Curry, Church, Bochvar, Lewis, and others in the development of various systems of non-classical logics — modal logics,

multiple-valued and paraconsistent logics, and positive (negationless) logics, including the author herself through her development of an infinite-valued logic as a generalization of Post's *m*-valued logic. The first half of the chapter serves as a historical introduction for the second half, while the historical discussions in the second half serve as a background for the exposition of some of the non-classical systems under consideration.

The historical section includes a discussion of a number of Russian philosophers and logicians. For those who do not read Russian, readers of the English translation of N.I. Styazhkin's *History of mathematical logic from Leibniz to Peano* (MIT Press, 1969) will already know the names of P.S. Poretskij and E.L. Bunitskij and can learn more about their contributions to algebraic logic from Styazhkin, while those interested in non-classical logic, especially multiple-valued and paraconsistent logics, but who do not read Russian, will already be familiar with the work of N.A. Vasil'ev through the writings of such people as A.I. Arruda and N.C.A. da Costa, from Duffy's review (this JOURNAL, vol. 1, pp. 71–82) of V.A. Bazhanov's biography of Vasil'ev, and Cavaliere's review (this JOURNAL, vol. 2, pp. 52–76) of the Smirnov edition of Vasil'ev's selected papers, to name a few examples. The great value of Getmanova's book to those who do not read Russian is that it can introduce them for the first time to the development of logic in Russia in the eighteenth and nineteenth centuries, however sketchily (pp. 276–280). The reader will also be introduced for the first time, however briefly, to work of the eighteenth-century logician Dmitrii Sergeevich Anichkov and nineteenth-century logicians Michael Ivanovich Karinskij and his student Leonid Vasil'evich Rutkovskij, as none of them received any attention in Styazhkin's book. Anichkov's contributions (which are also briefly considered in I.H. Anellis's paper *Theology against logic: the origins of logic in Old Russia*, in History and Philosophy of Logic 13 (1992), 15–42) include an analysis and classification of modal judgments. Both Karinskij and Rutkovskij studied the nature and structure of inference and sought to classify the various types of inference. Thus they might be said to be pioneers of proof theory. Karinskij was especially concerned with the construction of an axiomatic-deductive system which took the relation of equivalence, that is identity, as its primitive. Rutkovskii on the other hand, recognized other relations, such as similarity, as having the same logical status as identity. Rutkovskij is especially known for his work on inductive inference, although Getmanova does not say so. The biggest surprise for readers unfamiliar with the history of logic in Russia will come from the inclusion in Getmanova's survey of such names as Alexander Radishchev, Vissarion Belinskij, Nicholas Chernyshevsky, and Alexander Herzen, all of whom will be known primarily, if not exclusively, for their literary work and their place in the history of social-political philosophy.† But contemporary Russian historians of logic have given serious attention to

† Russian thinkers frequently expressed their ideas in literary forms, as a means of "hiding" politically "dangerous" ideas from the censor. Of course, unlike the academics Anichkov, Bunitskii, Karinskii, Rutkovskii, or Vasil'ev, these literary and figures will not and cannot be counted as

their thoughts on logic, informal reasoning, rhetoric, and, in Belinskij's case, dialectical reasoning, all of which were expressed in their literary work rather than through academic treatises. The inclusion of Michael Lomonosov's name will be somewhat less surprising, since he was a contributor to so many fields of study, from chemistry to history to linguistics and literature, although, like Herzen, Belinskij and the others, he will still not ordinarily be considered by many to be a logician. (The contributions of Radishchev, Lomonosov are also very briefly discussed in Anellis's *Theology against logic*).

There is one historical point in Getmanova's book which is, if not erroneous, then certainly misleading. Speaking of Vasil'ev's development of a logic in which the Law of Excluded Middle is absent, we read (p. 279) that

> In the footsteps of another Russian logician, S.O. Shatunovsky, he [Vasiliev] expressed the idea of the non-universality of the law of excluded middle. Whereas Shatunovsky came to this idea as a result of a thorough study of the specifics of mathematical proof as applied to infinite sets, Vasiliev came to this conclusion through his study of the particular propositions considered in traditional logic.

This would appear to imply that Vasiliev's work came after Shatunovskij's or that it was inspired by Shatunovskij's work. The late Sof'ya Aleksandrevna Yanovskaya, a historian of logic and historian of mathematics who had been a student of Shatunovskij's in Odessa, stated in her survey (published in 1948) of the history of foundations of mathematics and mathematical logic in the USSR for the period 1917-1947, that Shatunovskij was the first to consider the status of the law of excluded middle as a foundational question. This occurred in Shatunovskij's 1917 textbook on algebra as the study of the congruence of functional modules. But Vasil`ev was clearly the first to develop a system of non-aristotelian logic, a logic without excluded middle, in a series of papers, most of which appeared between 1910 and 1912. Shatunovskij's influence was rather on the post-World War II generation of Soviet logicians, such as D.A. Bochvar, who developed systems of multiple-valued logics and set theories, and on A.A. Markov, who developed the algorithmic brand of constructive logic.

It would be easy to dismiss the problem as a translator's error, since English translations published by Progress Publishers and by Mir Publishers have a notorious history of being poor, especially for technical works where the translator is far from an expert in the subject of the book being translated (see, for example, Elliott Mendelson's remarks in the *Journal of Symbolic Logic* **51**, p. 829, on Yurii L. Ershov and E.A. Palyutin, *Mathematical logic*, revised English translation by Vladimir Shokurov, Moscow, Mir, 1984). But it is

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professional logicians. Neither will the versatile academic polymath Lomonosov be counted, strictly, as a professional logician in the sense of Anichkov, *et al.*

not entirely clear that the translator alone is the culprit here. We are reminded in particular that Getmanova is a philosopher of logic, not really either a research logician or even a professional historian of logic, so that her remarks here must be taken *cum grano salis*.

There are a number of typographical errors in Smith's translation of Getmanova's book. Whether these are the result of the translator's unfamiliarity with the subject and its literature combined with the nature of the sometimes peculiar transliteration of foreign names into Russian, or to poor proofreading by the compiler of the index, is uncertain. I counted four errors in the index involving the names of such logicians as Wilhelm Ackermann (given in the index as 'Ackerman' but spelled correctly in the text on pp. 324–325) and David Hilbert (given in the index as 'Hulbert' but spelled correctly on p. 329). The other examples are the misspelling as 'Broks' of Curry's middle name and reversing the order of Peirce's given middle name and his adopted middle name. Incidentally, Leibniz is spelled 'Leibnitz' in the text and 'Leibniz' in the index; and on p.334, we find the spelling 'Vasilyev', but the spelling 'Vasiliev' on pp. 279–280.

The primary value of Getmanova's book for those who do not read Russian is that it will give them a means to make a comparison between Soviet and American logic textbooks written for the entry-level philosophy department logic course and permit them to gain an accurate view of the type of introductory logic course taught by their Soviet colleagues, both with respect to content and pedagogical methodology. It would be useful for those teaching informal logic or beginning formal logic courses to compare their textbooks — for example Robert Fogelin and Walter Sinnot-Armstrong's *Understanding arguments: An introduction to informal logic* or Irving Copi's *Introduction to logic* — with Getmanova's book.

Getmanova, Panov, and Petrov's *Logic made simple: a dictionary*, is an English translation by Sergei Syrovatkin of their *Логика: просто о сложном Словарь*. Mikhail Ivanovich Panov (b. 1947) is Doctor of Philosophy, and a member of the Central Soviet of Philosophical (Methodological) Seminars of the Presidium of the Academy of Sciences of the USSR and an associate editor of the journal *Philosophia Mathematica*. He is a specialist on the history and philosophy of intuitionism and the author of *Методологические проблемы интуиционистикой математики* (Moscow, Nauka, 1984). Vasilij V. Petrov (b. 1949) is Doctor of Philosophy and a member of the Academy of Social Sciences. His main interests center on philosophical problems of language and cognitive science. Their dictionary is historically interesting but uneven and incomplete.

This book, as its title suggests, is essentially for novices, and for those who have already had a first introduction to logic; it is intended to provide a conceptual and historical overview of the entire subject. I confess, however, that I do not understand the principles of selection chosen. The entry on "Algebra of Logic", which is exclusively historical, receives two paragraphs which constitute approximately half of a page. Nowhere in the two paragraphs (pp. 10–11) are we told what the algebra of logic may be, or how it differs, if at

all, from propositional logic. Boole, Jevons, Schröder, Poretskij, and Peirce are mentioned here. Elsewhere, Boole receives his own separate entry (pp. 44-46), as does Poretskij (p. 259), but Jevons, Peirce, and Schröder do not. The fact that pages 160–177 are missing from one of the two copies I received does not account for this lapse — namely for the absence of an entry for Jevons. On the other hand, Saint Augustine receives a few lines less than four full pages (pp. 27–30). The explanation in the "Preface" (p. 3) that they chose to "select only the most vital information," and to include entries on those "men who have made the most outstanding (outstanding from our own point of view, of course) contributions to logic." What that "point of view" may be they do not say, however. The authors do admit in their "Preface" that their title "is something of an exaggeration" (p. 3). For the reason which I have indicated, I would add that their admission is something of an understatement.

Typographical errors in Getmanova, Panov, and Petrov's *Logic made simple* include the misspelling (p. 260) of the Sheffer stroke as the "Scheuffer"stroke operation.

One goal of the work is to provide enjoyable reading. Therefore there are no entries providing accounts of technical details of mathematical logic, and those entries that deal with technical aspects of logic are concerned with the material that one might find in a textbook such as Getmanova's *Logic*. Perhaps — and only *perhaps*, as it is nowhere said — this dictionary was meant to accompany Getmanova's *Logic*, to serve as some kind of gloss. And *perhaps* — and only *perhaps*, as it is nowhere said — this accounts for the need not to dwell on historical figures who have received due attention in the historical chapter of Getmanova's *Logic*. The authors further relieve the burden on their readers of over-seriousness by inserting the occasional illustrative cartoons; thus, for example, the entry of "Definition of Concept" (pp. 89–92) includes the story (p. 91) of Plato's definition of man as a featherless biped and Diogenes's response of turning a plucked chicken loose at Plato's lecture; this is accompanied by a cartoon of a plucked chicken having the caption "Here is Plato's man."

I had met Panov personally, and he struck me as too intense and serious a person to have written or been involved in the writing of a frivolous work, so I therefore doubt that the idea of adding the cartoons was his. For readers of Russian, the Russian original of this dictionary doubtlessly invites comparison with N.I. Kondakov's *Логический словарь* (Moscow, Nauka, 1971) and points up the appeal that a new edition of a dictionary like Kondakov's would have. For English readers, a translation of a contemporary version of Kondakov's dictionary would be more interesting and valuable. *Logic made simple*, however, is better suited to collateral reading in a course that uses Getmanova's *Logic* or, in its Russian version, as collateral reading for users of Ivin's book.