

## IN MEMORIAM: GRIGORI E. MINTS

1939-2014

On May 29, 2014, ten days before his 75th birthday, Grigori ("Grisha") Mints died at Stanford, California of cardiac arrest; he had suffered a serious stroke a month before from which he never recovered. At the time of his death Mints held the position of Professor of Philosophy at Stanford University with courtesy appointments in Mathematics and Computer Science. His death unexpectedly cut short a distinguished and highly active career marked by a prodigious output of great breadth in logic and its applications. This included three books [1992, 1992a, 2000], another ten more of which he was an editor or translator, over 200 articles and over 3000 (!) reviews. His main contributions were to proof theory, constructive mathematics, intuitionistic logic, modal logic, and automated deduction.

Mints was born on June 7, 1939 in Leningrad, USSR (currently St. Petersburg, Russia). He obtained the B.S. and M.S. in Mathematics from Leningrad State University (currently St. Petersburg State University) in 1961, with a thesis on proof search in the classical predicate calculus. Working under the direction of Nikolai A. Shanin, Mints obtained the Ph.D. in Mathematics at the Leningrad S. U. in 1965, with a thesis on predicate and operator variants for theories of constructive mathematics (cf. the translation in [1965]). Finally, in 1990 he was awarded the D. Sc. in Mathematics at the Leningrad S. U. for a work on proof transformations and synthesis of programs. Mints was elected to the Estonian Academy of Sciences in 2008 and to the American Academy of Arts and Sciences in 2010.

From 1961 to 1979 Mints held the position of Research Associate at the Leningrad Branch of the Steklov Mathematics Institute. After submitting his request to emigrate from the Soviet Union in 1979, he resigned his position at the Steklov Institute so as not to endanger the situation of his colleagues there by his possible association with them. In the difficult period that followed, among other things Mints supported himself by doing programming jobs and translating books and articles on logic from English into Russian. Meanwhile he was able to establish connections with the Institute of Cybernetics in Tallinn, Estonia, where he obtained a part time position as Research Associate from 1980 to 1984. This turned into a full time position as Senior Research Associate from 1985 to 1991. Mints was finally permitted to emigrate to the United States in that year, when he was appointed Professor of Philosophy at Stanford University.

The direction of Mints' early work was determined to a large extent by the main interests of Nikolai A. Shanin, who, along with Andrei A. Markov, Jr., led a research group at the Steklov Institute devoted to "Russian-style" constructive mathematics.<sup>1</sup> Shanin's group also worked on automated reasoning, with emphasis on generating "natural" proofs, to which Mints made a number of contributions. His work in this period was also distinguished among other things by several publications on

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<sup>1</sup> In his article [1991], Mints surveyed work in the USSR on proof theory and constructive mathematics from 1925 to 1969. See also the article [2012a] with Sergey I. Nikolenko.

analogues of Herbrand's theorem for intuitionistic logic. Another highlight is the famous article, "What can be done in PRA?" [1980] (original Russian in 1976), whose main result was obtained independently by Charles Parsons and by Gaisi Takeuti. Mints' book [1992] contains the English translations from the Russian of a selection of thirteen of his articles on proof theory from the period up to 1979.<sup>2</sup> These concentrate on normalization theorems for classical, intuitionistic and modal systems as well as their applications to coherence theorems in category theory.

While in Tallinn, Mints studied the mathematical principles behind the program synthesizer PRIZ, designed by a group at the Institute of Cybernetics led by Enn Tyugu. Estonian computer scientists thought that their algorithm was complete, but Mints came up with an example that PRIZ could not handle. The algorithm was then improved, and Mints established the completeness of the new version in joint work with Tyugu in 1982.

At Stanford, Mints became one of the mainstays of the interdepartmental program in logic, teaching the subject at all levels, advising students, and directing doctoral dissertations. Together with Solomon Feferman, he led the seminar in logic and the foundations of mathematics. His research work continued unabated along all the general lines given above. In addition, among other things, his work [2005] with Philip Kremer on dynamic topological logic initiated an interesting new direction, and he contributed to linear logic for intuitionistic and natural deduction systems [1998, 1998a]. But, most importantly, in proof theory he was noted for almost single-handedly extending Hilbert's "epsilon substitution method" to various first-order and second-order subsystems of analysis, as in [1994, 2008, 2012, 2013], with work still in progress at the time of his death.

At the professional level Mints was a member of a number of editorial boards, and of program and organizing committees for various meetings, both national and international, in which he was also an active participant. Of special concern to him was the continued fostering of ties with colleagues in the former Soviet Union. The last conference that he helped organize and at which he spoke, entitled "Philosophy, Mathematics, Linguistics: Aspects of Interaction 2014", was held at the Steklov Institute in St. Petersburg in the month of April, 2014; cf. <http://www.pdmi.ras.ru/EIMI/2014/PhML/>. Sadly, it was from that meeting that he returned with an illness that led in the end to his death.

Besides his extensive and enduring contributions to our subject, Grisha Mints is remembered by his colleagues, friends and students with great affection as a very warm human being—always accessible, patient, and ready to help—and for his general intellectual enthusiasm married with a keen sense of humor illuminated by a surprising font of historical knowledge.

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<sup>2</sup> Most regrettably, the volume [1992] provides no information regarding the original publication data for these articles, not even their dates. These can be reconstructed from a C.V. that Mints prepared for the Stanford Philosophy Department in 2007 that is referred to but not repeated in later expansions of it.

Solomon Feferman (Email: feferman@stanford.edu)

Vladimir Lifschitz (Email: vl@cs.utexas.edu)

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