

Sobolev Institute of Mathematics Celebrates Its Fiftieth Anniversary

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On May 18, 1957, the Soviet government approved the initiative of academicians M. A. Lavrent'ev (1900–1980), S. L. Sobolev (1908–1989), and S. A. Khristianovich (1908–2000) to create a new type of research center in Siberia which would integrate research institutes of all basic scientific, technological, and humanitarian disciplines, such as mathematics, physics, mechanics, chemistry, geology, biology, history, economics, etc. It was decided to build the center near Novosibirsk, approximately 3,000 kilometers east of Moscow. The center has the status of a branch of the Academy of Sciences of the USSR, and academician M. A. Lavrent'ev was appointed as its head.

During the next five to ten years, 24 research institutes,¹ the Novosibirsk State University, and numerous apartment blocks and cottages for researchers and staff were built in a picturesque pine forest on the coast of a man-made lake. It was the beginning of the famous Akademgorodok (which means academy town), to which songs and books are devoted [1] and which was built by a generation of enthusiasts devoted to the triumph of science and human intellect: their fathers were victors over fascism; their brothers launched the first Sputnik and the first astronaut.

Within the framework of that ambitious project, the Institute of Mathematics was opened in 1957. The founding father and the first director of the institute was academician Sergej Sobolev,² one of the most prominent mathematicians of the twentieth

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¹During the next fifty years the number of institutes was nearly doubled.

²In 1986 academician M. M. Lavrent'ev (a son of M. A. Lavrent'ev) was named his successor, followed by academician Yu. L. Ershov, who has been on duty since 2002.

century [2]. The main idea was to invite prominent mathematicians from Moscow and Leningrad³ who were willing to move to Siberia, together with their disciples. This idea was successfully realized. Let me list just a few members of the Academy of Sciences of the USSR⁴ who have worked within the Institute's walls for years or decades:

- A. D. Alexandrov (1912–1999): One of the greatest Russian geometers of the twentieth century, founder of the Soviet school of geometry “in the large”, who is known worldwide due to his contributions to the theory of mixed volumes and the theory of surfaces “in the large”, the theory of metric spaces with bounded curvature and the theory of Monge-Ampère equations, the maximum principle for elliptic partial differential equations, and the foundations of relativity [3].

- L. V. Kantorovich (1912–1986): A Nobel Prize winner in economics (1975), one of the creators of a mathematical approach to economics based on the study of linear extremal problems; his investigations in functional analysis, computational mathematics, the theory of extremal problems, and the descriptive theory of functions and set theory strongly affected those subjects and gave rise to new fields of research [4].

- A. A. Lyapunov (1911–1973): Starting with descriptive set theory under the supervision of N. N. Luzin (1883–1950), he later worked on mathematical aspects of cybernetics and linguistics; he was awarded the “Computer Pioneer” medal from the IEEE Computer Society (1996).

- A. I. Mal'tsev (1909–1967): The founder of the Siberian school of algebra and logic, his contributions were mainly to algebra (group theory, theory of rings, topological algebra), and mathematical

³Now St. Petersburg.

⁴Now the Russian Academy of Sciences.

logic (theory of algorithms) and its applications to algebra [5].

- S. L. Sobolev (1908–1989): He contributed mainly to the theory of waves in solids, the theory of equations of mathematical physics, functional analysis, the theory of cubature formulas; he introduced a new class of functional spaces, now known as Sobolev spaces, and the notion of a generalized solution to a partial differential equation [6].

In the early 1990s, the Institute of Mathematics was named after S. L. Sobolev and, since that time, has been called the Sobolev Institute of Mathematics, or SIM for short. At the beginning of 2007 there were 282 research fellows at SIM, among them 9 members of the Russian Academy of Sciences, 108 professors, and 165 fellows with Ph.D. degrees.⁵

In general, SIM fellows devote themselves to pure research without having obligations to spend time on undergraduate teaching, though many of them supervise postgraduate students and, as a part-time job, give lectures or even teach undergraduate students at the Novosibirsk State University. SIM fellows work in most of the fields of modern mathematics. In order to provide the reader with an impression of how wide the variety of research is, we list just a few groups headed by members of the Russian Academy of Sciences and mention some of their latest books and research interests:

- Mathematical logic (Yu. L. Ershov [7] and S. S. Goncharov [8] lead a group of mathematicians who work in algebra, mathematical and applied logic, information theory, and philosophy of mathematics).

- Group theory (V. D. Mazurov [9] is head of the laboratory dedicated to classification of finite groups, recognition of finite simple groups by their element orders, groups of automorphisms of free groups, etc.).

- Real functions, potential theory, geometry (Yu. G. Reshetnyak [10] and his disciples develop geometry “in the large”, the theory of quasiconformal and quasiregular mappings, the theory of Sobolev spaces, and other fields of mathematics related to geometry and analysis).

- Partial differential equations (M. M. Lavrent’ev [11] and V. G. Romanov [12] and their colleagues work on differential equations, inverse and ill-posed problems, tomography, computational and applied mathematics).

- Dynamical systems (I. A. Tajmanov [13] and research fellows of his laboratory study dynamical systems and related problems of geometry, analysis and partial differential equations).

- Probability theory and statistics (A. A. Borovkov [14] and his scientific school study limit

⁵In fact SIM has its department in Omsk (the next city with a population of more than one million west of Novosibirsk, 700 km apart), which additionally includes 9 professors and 27 fellows with Ph.D. degrees.

theorems of the theory of probability (including boundary value problems, analysis of large deviations, and functional limit theorems), ergodicity and stability of random processes, asymptotic methods of mathematical stochastics, asymptotic analysis of multidimensional Markov chains, etc.).

- Numerical analysis (S. K. Godunov [15] is known worldwide due to a method for calculating shock waves which is usually referred to as the Godunov method. He contributed to the theory of difference schemata and especially to the theory of difference methods for the numerical solution of problems in gas dynamics, to the problems of guaranteed accuracy in numerical linear algebra, to the theory of ordinary differential equations, and to many other fields of mathematics and mechanics).

Approximately twenty-five permanent research seminars are held at SIM. Every year two to four international conferences are organized.

SIM has the right to award the Ph.D. degree or habilitation in the following fields: mathematical logic, algebra and number theory, mathematical analysis, geometry and topology, differential equations, and computational mathematics. Each year SIM enrolls twelve postgraduate students⁶ in these fields. These students are supposed to complete their Ph.D. theses in three years.

The SIM library is one of the best mathematical libraries in Russia east of the Ural Mountains. It contains approximately 150,000 items: more than 30,000 books (including about 20,000 books in foreign languages, including a few books published in the seventeenth century) and more than 100,000 issues of journals (including about 75,000 issues of foreign journals).

SIM publishes several journals on mathematics and applied mathematics in Russian: *Algebra and Logic*,⁷ *Discrete Analysis and Operations Research*,⁸

⁶Additionally, the Omsk department enrolls four students.

⁷ISSN 0373-9252; a cover-to-cover English translation is available.

⁸ISSN 1560-7542 for Series I and ISSN 1560-9901 for Series II; for selected articles an English translation is available in the Journal of Applied and Industrial Mathematics, ISSN 1990-4789.



Sergej Sobolev.

Photographs courtesy of the Sobolev Institute.



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Mathematical Transactions,⁹ *The Siberian Journal for Industrial Mathematics*,¹⁰ *Siberian Mathematical Journal*,¹¹ and *Siberian Electronic Mathematical Reports*.¹²

SIM is involved in numerous Russian and international research programs; it has been a partner of Zentralblatt MATH for more than ten years. Many mathematicians who started their careers as SIM fellows have received international honors for their contributions to mathematics and have received professorships all over the world. To name a few of them, we mention Efim Zel'manov (awarded a Fields Medal in 1994, he is now a professor at the University of California, San Diego) and Ivan Shestakov (awarded the 2007 Moore Research Article Prize, he is now a professor at the University of São Paulo, Brazil).

A conference dedicated to the Institute's fiftieth anniversary took place in Novosibirsk September 18-22, 2007. It was attended by 276 participants from eighteen Russian cities and from Canada, France, Germany, Hungary, Italy, Kazakhstan, the Netherlands, Slovenia, Switzerland, Ukraine, the United Kingdom, and the U.S.A.

Detailed information can be found on the Institute's website, <http://math.nsc.ru/english.html>.

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¹⁰ISSN 1560-7518; for selected articles an English translation is available in the *Journal of Applied and Industrial Mathematics*, ISSN 1990-4789

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