

# Lecture Notes in Computer Science

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A.R. Meyer M.A. Taitslin (Eds.)

## Logic at Botik '89

Symposium on Logical Foundations of Computer Science  
Pereslavl-Zalessky, USSR, July 3–8, 1989  
Proceedings

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# Andrei Petrovich Ershov

1931-1988

Andrei Petrovich Ershov, Academician of the USSR Academy of Sciences, died on December 8, 1988, after a long illness. He was a prominent Computer Scientist and Mathematician who chaired the Scientific Council on Cybernetics of the USSR Academy of Sciences.

Ershov possessed a profound sense of responsibility for the future of scientific research and was deeply involved in the development of Computer Science in the USSR. His work ranged from the promotion of computer education in the Soviet Union to the organization of researchers in the field of Theoretical Computer Science.

He was the author of fundamental works in the fields of theoretical programming, programming languages theory, theory of program schemata, and mixed computations. One of the first compilers for the ALGOL-60 programming language was developed under his supervision.

Ershov was known and regarded highly throughout the world for his efforts over two decades in promoting international contacts among Computer Scientists. He continued in this role to the end of his career, playing a significant part on the organizing committee of the *Logic at Botik '89* Symposium despite his illness.

Grateful memories remain in the hearts of his colleagues and friends as they grieve for Andrei Petrovich Ershov.

## Foreword

Although the Program Systems Institute of the USSR Academy of Sciences has only been located in Pereslavl-Zalessky since 1986, this symposium, *Logic at Botik, '89*, is not our first experience in organizing a meeting in the field of logical foundations of Computer Science. Other such meetings took place here previously within the framework of symposia on Artificial Intelligence; the largest of them was held in October 1986.

The Program Systems Institute pays careful attention to the development of theoretical foundations of Computer Science, in particular, to the investigation of topics in Logic, because we believe that without advanced fundamental research, it is impossible to achieve success in the field of applications, *e.g.*, in the development of software for scientific use. Research in the field of theoretical foundations is, in the final analysis, the only way that promises to advance programming from a craft to an industrial discipline.

I believe that successful development of science is impossible while barriers separate scientists. The Soviet Union is viewed by some as having fallen behind developed countries in the field of computer technology—although in theoretical Computer Science everything is seen to be OK. However, I am convinced that the “Iron Curtain” greatly damaged the development of science throughout the world, and not only in the Soviet Union. The new policy of *glasnost* provides an opportunity to change the situation.

These are the reasons why I championed the proposals of my colleagues to organize the international symposium on logical foundations of Computer Science “*Logic at Botik '89*” in Pereslavl-Zalessky. I hope that such meetings will become a tradition.

The papers in this volume, to my mind, demonstrate that the program is rich in content, successfully combining promising theoretical works and good applications of the theory. I would like to express my acknowledgements to all the members of the international program committee for doing the job of selecting papers and compiling the volume.

The members of the Organizing Committee, *Logic at Botik '89*, were

A. K. Ailamazian, *Chair*  
A.P. Ershov  
A.J. Kfoury  
K.A. Knorre  
G.F. Shvarts  
E.V. Stas  
A.P. Stolboushkin  
P. Urzyczyn

Invaluable help and support was given to the symposium by the Vice-President of the USSR Academy of Sciences, Academician Evgeny P. Velikhov. We met with warm support from town authorities of Pereslavl-Zalessky, especially that of Mayor Vladimir I. Shesterniov.

I am most grateful to A.P. Ershov who, despite illness, found the opportunity and strength to participate in the work of the organizing committee before his untimely death in December, 1988. I would like to thank A.P. Stolboushkin who played the largest part in organizational matters.

I express my sincere gratitude to all my colleagues who did their best to bring the symposium into being.

Prof. Alfred K. Ailamazian  
Director of Program Systems  
Institute of the USSR Academy of Sciences

Pereslavl-Zalessky  
February 1989

## Preface

This volume is the proceedings of *Logic at Botik, '89*, a symposium on logical foundations of Computer Science organized by the Program Systems Institute of the USSR Academy of Sciences and held at Pereslavl-Zalessky, USSR, July 3–8, 1989

Topics of interest mentioned in the call for papers were:

- Complexity of formal systems
- Constructive mathematics in computer science
- Denotational and operational semantics of programs
- Descriptive complexity
- Dynamic and algorithmic logics and schematology
- Formal tools to describe concurrent computations
- Lambda calculus and related topics
- Foundations of logic programming
- Logical foundations of data base theory
- Logics for knowledge representation
- Modal and temporal logics
- Type theory in programming
- Verification of programs

The Program Committee members were:

- J.M. Barzdins (Latvian State Univ.)
- J.Y. Halpern (IBM Almaden Research Center)
- A.R. Meyer (MIT)
- G.E. Mints (Inst. of Cybernetics Estonian Acad. Sci.)
- A.L. Semionov (Scientific Council on Cybernetics USSR Acad. Sci.)
- A.P. Stolboushkin (Program Systems Inst. USSR Acad. Sci.)
- M.A. Taitlin, *Chair* (Kalinin State Univ.)
- J. Tiuryn (Warsaw Univ.)

Arrangements were made for four invited lectures:

- Samson Abramsky, *Observational Logic and Process Semantics*
- Yuri L. Ershov, *Foundations of Semantical Programming*
- Yiannis N. Moschovakis, *A Mathematical Modeling of Pure, Recursive Algorithms*
- Gregory S. Tseitin, *Should Theory of Programming be Based on Predicate Logic?*

The program committee received forty-five abstracts and accepted twenty-two. Two were later withdrawn but one of the invited speakers was able to contribute a paper, and so this volume finally contains twenty-one full papers.

Final selection of papers was made at a meeting of the program committee in Tallinn, USSR, on December 14, 1988 attended personally by all the Soviet program committee members. The program committee members from outside the USSR were unable to attend, but they provided rankings and written comments which were fully taken into account in the final decisions.

The scope of the symposium was intended to be very broad, and in fact no submitted paper was rejected because it fell outside the scope of Logic in Computer Science. However, limits on the size of the program forced the committee to leave unselected many submitted papers worthy of publication. We would like to express our sincere thanks to everybody who submitted an abstract.

The papers in this volume represent many interesting trends in logical foundations of Computer Science, ranging from purely theoretical research to practical applications of theory. We hope the reader, like the symposium participants, finds the work reported here fruitful and stimulating.

A.R. Meyer, M.A. Taitlin  
Cambridge, Mass.  
February 1989

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