

## Preface

This Festschrift is published in honor of Yuri Gurevich, on the occasion of his 75th birthday. Yuri Gurevich has made fundamental contributions to the broad spectrum of logic and computer science, including decision procedures, the monadic theory of order, abstract state machines, formal methods, foundations of computer science, security, and much more. Many of these areas are reflected in the articles in this Festschrift and in the presentations at the “Yurifest” symposium, which was held in Berlin, Germany, on September 11 and 12, 2015.

Yuri has spent his life in three different countries—the Soviet Union, Israel, and the USA—and has worked in at least as many scientific fields: on the interface between algebra and logic in the Soviet Union, on the monadic theory of order in Israel, and on logic and computer science in the USA. As Yuri would point out, with characteristic understatement, he has “always had a taste for foundational questions.”<sup>1</sup>

The best known work of Yuri’s Soviet period is on the decision problem for the ordered abelian groups. His 1964 thesis proved the decidability of the first-order theory of these groups; later, he showed the decidability of the richer theory that includes quantification over convex subgroups. Yuri also worked on the decision problem for first-order logic, completing in particular the decision problem for the prefix-vocabulary fragments of pure logic of predicates and functions. In Israel, Yuri worked with Saharon Shelah on the monadic theory of linear orders. The Forgetful Determinacy Theorem of Gurevich and Harrington is from this period as well. The theorem asserts the existence of a special kind of winning strategy in a class of infinite games, and has led to a greatly simplified proof of Michael Rabin’s result that the monadic theory of two successors is decidable.

In 1982, the University of Michigan hired Yuri as a professor of computer science on the promise that the algebraist and logician would become a computer scientist. And, indeed, Yuri immediately began making deep contributions to his new field. There are numerous results in complexity theory, in particular on average-case complexity. Yuri also worked on many questions on the interface between logic and computer science, including the introduction, together with Erich Grädel, of metafinite model theory, and the formulation of the conjecture that there is no logic that captures polynomial time computability on unordered structures.

Yuri felt that, while many foundational questions in mathematical logic had been settled, the foundational questions about computer science and the nature of computation were still wide open. To answer some of these questions, Yuri invented abstract state machines (ASMs). Unlike most other formal methods at the time, ASMs are operational, rather than declarative. Yuri’s “ASM thesis” states that every algorithm can be faithfully represented as an ASM. In 1998, Jim Kajiya at Microsoft Research

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<sup>1</sup> Yuri Gurevich. *Logician in the land of OS: Abstract State Machines in Microsoft*. Invited talk at LICS 2001.

realized the potential of ASMs and invited Yuri to start a new group, the Foundations of Software Engineering (FSE) group. At Microsoft, Yuri made many contributions involving ASMs, including the notion of “choiceless polynomial time” computation, and also many other contributions to computer science topics not directly related to ASMs, such as efficient file transfer, software testing, security, and authorization.

To a great number of researchers in algebra, logic, and computer science, Yuri Gurevich is a unique integrating figure, a cherished colleague, and a dear friend. In 2010, on the occasion of Yuri’s 70th birthday, a symposium took place in Brno, the Czech Republic, that brought together many of Yuri’s collaborators. Now, five years later, we have again asked Yuri’s colleagues to come together for a symposium and to contribute to a volume in his honor. This Festschrift is the result of this effort. The articles cover a wide range of topics and still merely give a glimpse of the scope and depth of Yuri’s many areas of interest.

The Yurifest symposium was co-located with the 24th EACSL Annual Conference on Computer Science Logic (CSL 2015). The editors would like to thank the organizers of CSL for their help with many practical issues. The symposium received generous support from the German Research Foundation (DFG) and from Microsoft Research. Thanks are also due to the anonymous referees of the contributions to this volume, and, last but not least, to the contributors for their immediate and enthusiastic commitment to participating in the second Yurifest.

*To Yuri Gurevich, the great logician in the land of OS, with deep admiration, gratitude, and affection. Happy birthday!*

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Fields of Logic and Computation II

Essays Dedicated to Yuri Gurevich on the Occasion of  
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