

## Logic Colloquium '90

Since their inception, the Perspectives in Logic and Lecture Notes in Logic series have published seminal works by leading logicians. Many of the original books in the series have been unavailable for years, but they are now in print once again.

This volume, the 2nd publication in the Lecture Notes in Logic series, is the proceedings of the Association for Symbolic Logic meeting held in Helsinki, Finland, in July 1990. It contains 18 papers by leading researchers. These papers cover all fields of mathematical logic from the philosophy of mathematics, through model theory, proof theory, recursion theory, and set theory, to the connections of logic to computer science. The articles published here are still widely cited and continue to provide ideas for ongoing research projects.

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## LECTURE NOTES IN LOGIC

**A Publication of The Association for Symbolic Logic**

This series serves researchers, teachers, and students in the field of symbolic logic, broadly interpreted. The aim of the series is to bring publications to the logic community with the least possible delay and to provide rapid dissemination of the latest research. Scientific quality is the overriding criterion by which submissions are evaluated.

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LECTURE NOTES IN LOGIC 2

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*Logic Colloquium '90*

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ASL Summer Meeting in Helsinki

*Edited by*

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ASSOCIATION FOR SYMBOLIC LOGIC



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## FOREWORD

The 1990 European Summer Meeting of the Association for Symbolic Logic was held in Finland from July 15 to July 22, 1990. The meeting was called *Logic Colloquium '90* and it took place in the Porthania building of the University of Helsinki as part of the program of the 350th anniversary of the university.

The meeting was attended by 140 registered participants and 31 accompanying persons, from 23 different countries. The organizing bodies were the Department of Mathematics of the University of Helsinki, The Philosophical Society of Finland, and The Finnish Mathematical Society. Financial support was received from the Ministry of Education of Finland, The Academy of Finland, Suomen Kulttuurirahasto Foundation, UNESCO, Rolf Nevanlinna Institute, and IUHPS.

The Organizing Committee of the meeting consisted of Aapo Halko, Heikki Heikkilä, Lauri Hella, Taneli Huuskonen, Tapani Hyttinen, Kerkko Luosto, Ilkka Niiniluoto (vice chairman), Juha Oikkonen, and Jouko Väänänen (chairman), all from the University of Helsinki.

The Program Committee consisted of Peter Aczel (Manchester), Max Dickmann (Paris), Heinz-Dieter Ebbinghaus (Freiburg), Jens Fenstad (Oslo), Jaakko Hintikka (chairman, Boston), Wilfrid Hodges (London), Alistair Lachlan (Vancouver), Azriel Levy (Jerusalem), Heikki Mannila (Helsinki), Ilkka Niiniluoto (Helsinki), Juha Oikkonen (Helsinki), and Jouko Väänänen (secretary, Helsinki).

The program of the meeting is listed on the following pages. Warren Goldfarb, Ronald Jensen, Phokion Kolaitis, Per Martin-Löf, Alan Mekler, and Hugh Woodin did not contribute a paper to the proceedings. As comparison between the contents of this book and the actual program reveals, some authors made an agreement with the editors to contribute a slightly different paper from the one read in the meeting. Also Joan Moschovakis and Alan Silver were approached by the editors and they submitted the paper they read in a contributed papers session of the meeting.

The editors are indebted to Heikki Heikkilä, Yiannis Moschovakis, Martti Nikunen, and Hannele Salminen for their help during the preparation of this volume. We owe special thanks to Herbert Enderton for the substantial work he has done in putting together the final manuscript.

Juha Oikkonen  
Jouko Väänänen

### Invited talks of Logic Colloquium '90

- WILFRIED BUCHHOLZ (München)  
*Cut-elimination in uncountable logic and collapsing functions*
- BARRY COOPER (Leeds)  
*Definability and global degree theory*
- PATRICK DEHORNOY (Caen)  
*About the word problem for free left distributive groupoids*
- HANS-DIETER DONDER (München)  
*On  $\omega_1$ -complete filters*
- DOV GABBAY (London)  
*Labelled deductive systems*
- WARREN GOLDFARB (Harvard)  
*On Gödel's philosophy*
- JAAKKO HINTIKKA (Boston)  
*Is there completeness in mathematics after Gödel?*
- IAN HODKINSON (London)  
*An axiomatisation of the temporal logic with until and since over real numbers*
- RONALD JENSEN (Oxford)  
*Remarks on the core model*
- HAIM JUDAH (Bar-Ilan)  
 *$\Delta^1_3$ -sets of reals*
- PHOKION KOLAITIS (Santa Cruz)  
 1. *Logical definability and complexity classes*  
 2. *Model theory of finite structures*  
 3. *0-1 laws*
- RICHARD LAVER (Boulder)  
*Elementary embeddings of a rank into itself*
- PER MARTIN-LÖF (Stockholm)  
*Logic and metaphysics*
- ALAN MEKLER (Vancouver)  
*Almost free algebras: 20 years of progress*
- GRIGORI MINTS (Stanford)  
*Gentzen-type systems and resolution rule for modal predicate logic*
- YIANNIS MOSCHOVAKIS (Los Angeles)  
*Sense and denotation as algorithm and value*
- TULENDE MUSTAFIN (Karaganda)  
*On similarities of complete theories*

## VIII

LUDOMIR NEWELSKI (Wrocław)

*Geometry of finite rank types*

FRANÇOISE POINT (Paris)

*Decidability problems for theories of modules*

JEAN-PIERRE RESSAYRE (Paris)

*Discrete subrings of real closed fields and applications to polynomial time  
computability*

SAHARON SHELAH (Jerusalem)

*Indiscernibility*

HUGH WOODIN (Berkeley)

*Large cardinals and descriptive set theory*

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