

# Foreword

In 1996 the International Federation for Information Processing (IFIP) established its first Technical Committee on foundations of computer science, TC1. The aim of IFIP TC1 is to support the development of theoretical computer science as a fundamental science and to promote the exploration of fundamental concepts, models, theories, and formal systems in order to understand laws, limits, and possibilities of information processing.

This volume constitutes the proceedings of the first IFIP International Conference on Theoretical Computer Science (IFIP TCS2000) – Exploring New Frontiers of Theoretical Informatics – organized by IFIP TC1, held at Tohoku University, Sendai, Japan in August 2000.

The IFIP TCS2000 technical program consists of invited talks, contributed talks, and a panel discussion. In conjunction with this program there are two special open lectures by Professors Jan van Leeuwen and Peter D. Mosses.

The decision to hold this conference was made by IFIP TC1 in August 1998, and since then IFIP TCS2000 has benefited from the efforts of many people; in particular, the TC1 members and the members of the Steering Committee, the Program Committee, and the Organizing Committee of the conference. Our special thanks go to the Program Committee Co-chairs:

*Track (1):* Jan van Leeuwen (U. Utrecht), Osamu Watanabe (Tokyo Inst. Tech.)

*Track (2):* Masami Hagiya (U. Tokyo), Peter D. Mosses (U. Aarhus).

The details of the conference were planned by the Steering Committee with the help of the PC Co-chairs. The Steering Committee members are

Giorgio Ausiello (U. Roma "La Sapienza") *Chair*

Wilfried Brauer (TU München)

Takayasu Ito (Tohoku U.)

Michael O. Rabin (Harvard U.)

John Staples (U. Queensland)

Joseph Traub (Columbia U.)

Professor Michael O. Rabin of Harvard University accepted our invitation to be the banquet speaker of IFIP TCS2000.

IFIP TCS2000 and the IFIP Technical Committee TC1 gratefully acknowledge the partial support provided by Tohoku University and Sendai Tourism & Convention Bureau, and the cooperation of the following organizations:

Information Processing Society of Japan

Japan Society of Software Science and Technology

European Association of Theoretical Computer Science

Association of Symbolic Logic

Association for Computing Machinery-SIGACT

We would like to thank Plamen Nedkov and Dorothy Hayden of the IFIP office for their assistance on IFIP procedures, and we also thank Alfred Hoffman of Springer-Verlag for his assistance in the publication of the proceedings. Masahiko Ohtomo, Shinya Miyakawa, Nobuto Izumi, and Takuya Ohishi of Tohoku University lent their assistance in making local arrangements and in preparing the proceedings and the conference web pages. Finally, we would like to express our sincere thanks to all those who helped organize, and participated in, the IFIP TCS 2000 conference for their invaluable contributions.

May 2000

*Giorgio Ausiello*  
*Takayasu Ito*  
Conference Co-chairs

# Preface

IFIP TCS 2000 is the first international conference organized by IFIP TC1, whose activities cover the entire field of theoretical computer science. Reflecting the current activities in theoretical computer science the major topics of the conference were chosen, forming the two tracks:

Track (1) on Algorithms, Complexity, and Models of Computation,  
Track (2) on Logic, Semantics, Specification, and Verification.

The program of IFIP TCS 2000 included the presentations of eighteen contributed papers of Track (1) and fourteen contributed papers of Track (2). The Program Committee selected them from forty submissions to Track (1) and thirty submissions to Track (2), with the help of additional referees.

The invited speakers consist of the three keynote plenary invited speakers, and the three invited speakers for each track; they were chosen by the Steering Committee and the PC Co-chairs.

This volume constitutes the record of the technical program, consisting of the contributed papers and the invited talks. We had the pleasure of chairing the program committee of the first IFIP International Conference on Theoretical Computer Science with collaboration of the conference chairs. We are extremely grateful to Takayasu Ito and his staff, who helped us in making and announcing the call for papers, the program, and their web pages, and in preparing the proceedings.

We would like to express our thanks to the other members of the Program Committee and the additional referees, who are listed below, for their help in reviewing all submissions and for selecting the papers.

May 2000

*Jan van Leeuwen*  
*Osamu Watanabe*  
*Masami Hagiya*  
*Peter D. Mosses*  
Co-chairs

## Program Committee

### Track (1) on Algorithms, Complexity, and Models of Computation

Ricardo Baeza-Yates (U. Chile)  
Siu-Wing Cheng (Hong Kong U. Science & Tech.)  
Felipe Cucker (City U. Hong Kong)  
Rosario Gennaro (IBM T.J. Watson Research)  
Alan Gibbons (U. Liverpool)  
Andrew V. Goldberg (InterTrust STAR Lab, USA)  
Ernst Mayr (TU München)  
Hiroshi Nagamochi (Kyoto U.)  
Kouichi Sakurai (Kyushu U.)  
Jan van Leeuwen (U. Utrecht)  
Paul Vitanyi (CWI, Amsterdam)  
Osamu Watanabe (Tokyo Inst. Tech.)  
Jiří Wiedermann (Academy of Sciences, Prague)  
Takashi Yokomori (Waseda U.)

### Track (2) on Logic, Semantics, Specification, and Verification

Samson Abramsky (U. Edinburgh)  
Egidio Astesiano (U. Genova)  
Luca Cardelli (Microsoft, Cambridge)  
Javier Esparza (TU München)  
Masami Hagiya (U. Tokyo)  
Naoki Kobayashi (U. Tokyo)  
Peter D. Mosses (U. Aarhus)  
Benjamin Pierce (U. Pennsylvania)  
Davide Sangiorgi (INRIA, Sophia Antipolis)  
John Staples (U. Queensland)  
Andrzej Tarlecki (Warsaw U.)  
P. S. Thiagarajan (Chennai Math. Inst., India)  
Kazunori Ueda (Waseda U.)

## Additional Referees

### Track (1) on Algorithms, Complexity, and Models of Computation

Hee-Kap Ahn	Martin Raab
Paul Dunne	Wojciech Rytter
Toshihiro Fujito	Yasubumi Sakakibara
Leszek Gasieniec	Peter Savicky
Mordecai Golin	Mark Scharbrodt
Alexander Hall	Jack Snoeyink
Toru Hasunuma	Sei-ichi Tani
Alejandro Hevia	Takeaki Uno
Klaus Holzapfel	Ulrich Voll
Costas S. Iliopoulos	Ronald de Wolf
Marcel Jirina Jr.	Deng Xiao-Tie
Satoshi Kobayashi	Yin-Feng Xu
Petr Kurka	Xiao Zhou
Kazuhisa Makino	Binhai Zhu
Eiji Miyano	Michele A.A. Zito
Ken-ichi Morita	

### Track (2) on Logic, Semantics, Specification, and Verification

Gilles Barthe	Ed Kazmierczak
Marek Bednarczyk	Yoshiki Kinoshita
Lars Birkedal	Barbara Koenig
Andrzej Borzyszkowski	Beata Konikowska
Ahmed Bouajjani	Mark Lillibridge
Colin Boyd	Kamal Lodaya
Julian Bradfield	Adam Malinowski
Luca Cattani	Bruno Marre
Antonio Cerone	Richard Mayr
Witold Charatonik	Toshiro Minami
Robert Colomb	Tetsuya Murai
Satoshi Fujita	Uwe Nestmann
Colin Fidge	Shin-ya Nishizaki
Cedric Fournet	Michael Norrish
Jacques Garrigue	Christian Queinnec
Robert Glück	R. Ramanujam
Andrew D. Gordon	Peter J. Robinson
Therese Hardin	Christine Roeckl
Daniel Hirschhoff	Giuseppe Rosolini
Paul Jackson	Takafumi Sakurai
Michael Johnson	Philip Scott
Jan Jurjens	Perdita Stevens

Colin Stirling  
Paul Strooper  
Eijiro Sumii

Wang-Chiew Tan  
Moshe Vardi  
Marek Zawadowski

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