

## Preface

This volume contains papers selected for presentation at the 28th Symposium on Mathematical Foundations of Computer Science – MFCS 2003, held in Bratislava, Slovakia, August 25–29, 2003.

MFCS 2003 was organized by the Slovak Society for Computer Science and the Comenius University in Bratislava, in cooperation with other institutions in Slovakia. It was supported by the European Association for Theoretical Computer Science and the Slovak Research Consortium for Informatics and Mathematics.

The series of MFCS symposia, organized alternately in the Czech Republic, Poland and Slovakia since 1972, has a well-established tradition. The MFCS symposia encourage high-quality research in all branches of theoretical computer science. Their broad scope provides an opportunity to bring together specialists who do not usually meet at specialized conferences. The previous meetings took place in Jablonna, 1972; Štrbské Pleso, 1973; Jadwisin, 1974; Mariánské Lázně, 1975; Gdańsk, 1976; Tatranská Lomnica, 1977; Zakopane, 1978; Olomouc, 1979; Rydzina, 1980; Štrbské Pleso, 1981; Prague, 1984; Bratislava, 1986; Carlsbad, 1988; Porąbka-Kozubnik, 1989; Banská Bystrica, 1990; Kazimierz Dolny, 1991; Prague, 1992; Gdańsk, 1993; Košice, 1994; Prague, 1995; Kraków, 1996; Bratislava, 1997; Brno, 1998; Szklarska Poręba, 1999; Bratislava, 2000; Mariánské Lázně, 2001; and Warsaw-Otwock, 2002.

The MFCS 2003 Proceedings consists of 7 invited papers and 55 contributed papers. The latter were selected by the Program Committee from a total of 137 submitted papers. The following program committee members took part in the evaluation and selection of submitted papers (those denoted by \* took part in the selection meeting in Bratislava on May 10, 2003): Julian Bradfield\* (Edinburgh), János Csirik (Szeged), Pierpaolo Degano (Pisa), Mariangiola Dezani-Ciancaglini\* (Torino), Krzysztof Diks (Warsaw), Juhani Karhumäki\* (Turku), Marek Karpinski (Bonn), Mojmir Křetínský\* (Brno), Werner Kuich (Vienna), Jan van Leeuwen (Utrecht), Christoph Meinel (Trier), Leszek Pacholski (Wrocław), David Peleg\* (Rehovot), José D.P. Rolim (Geneva), Branislav Rován\* (Bratislava, *Chair*), Jan Rutten (Amsterdam), Jiří Šíma\* (Prague), Paul Spirakis\* (Patras), Ulrich Ultes-Nitsche (Fribourg), Peter Vojtáš\* (Košice, *Vice-chair*), and Igor Walukiewicz (Bordeaux).

We would like to thank all Program Committee members for their meritorious work in evaluating the submitted papers, as well as the following referees who assisted the Program Committee members:

F. Ablayev, L. Aceto, C.J. van Alten, A. Ambainis, G. Andrejková, M. Andreou, F. Arbab, V. Auletta, S. Bala, F. Bartels, M. Bellia, Y. Benenson, L. Bertossi, B. Blanchet, N. Blum, H.L. Bodlaender, F.S. de Boer, M. Bojanczyk, M.M. Bonsangue, M. Boreale, A. Bucciarelli, H. Buhrman, C. Busch, R. Čada, O. Carton, I. Černá, B. Chlebus, P. Chrzastowski-Wachtel, K. Ciebiera,

A. Condon, F. Corradini, B. Courcelle, P. Crescenzi, M. Crochemore, A. Czuma, C. Damm, J. Dassow, A. Di Pierro, V. Diekert, S. Dziembowski, P. Eliáš, L. Epstein, K. Etessami, E. Fachini, S. Fedin, M. Fellows, P. Flajolet, L. Fortnow, D. Fotakis, F. Franěk, M.P. Frank, R. Freund, S. Fröschle, S. Fujita, Z. Fülöp, F. Gadducci, G. Galbiati, A. Gambin, V. Geffert, R. Gennaro, M. GhasemZadeh, K. Golab, R. Govindan, G. Gramlich, S. Gruner, K. Grygiel, V. Halava, T. Harju, T. Hartman, M. Hauptmann, L.A. Hemaspaandra, M. Hermann, P. Hertling, E.A. Hirsch, M. Hirvensalo, J. Honkala, C.S. Iliopoulos, S. Irani, R. Irving, G.F. Italiano, P. Jančar, K. Jansen, G. Jirásková, J. Kari, D. Kavvadias, C. Kenyon, L. Kirousis, V. Klotz, G. Kortsarz, V. Koubek, O. Koval, L. Kowalik, D. Kowalski, S. Krajčí, J. Kratochvíl, M. Krause, V. Kreinovich, A. Kučera (Brno), A. Kučera (Prague), M. Kufleitner, A. Kulikov, M. Kunc, C. Kupke, P. Kůrka, M. Kurowski, S. Lasota, R. Lencses, M. Lenisa, S. Leonardi, M. Lewenstein, C. Lhoussaine, U. de'Liguoro, L. Liquori, M. Liśkiewicz, J. Longley, M. Loreti, Z. Lotker, A. de Luca, B. Luttik, M. Maidl, Ch. Makris, A. Malinowski, A. Marchetti-Spaccamela, B. Martin, J. Matoušek, G. Mauri, M. Mavronicolas, F. Mera, F. Meyer auf der Heide, M. Mlotkowski, B. Monien, F. de Montgolfier, K. Morita, Ph. Moser, F. Mráz, M. Mucha, R. Neruda, R. Niedermeier, S. Nikolettseas, D. Niwinski, D. Nowotka, D. Oddoux, D. von Oheimb, V. van Oostrom, B. Palano, A. Panholzer, V. Papadopoulou, L. Parida, R. Paturi, G. Paun, R. Pelánek, A. Pelc, J. Pelikán, P. Penna, E. Petre, J.-E. Pin, W. Plandowski, M. Ploščica, E. Porat, Š. Porubský, O. Powell, J. Power, M. Przybylski, P. Pudlák, F. van Raamsdonk, V. Řehák, M. Repický, P. Rychlikowski, W. Rytter, P. Sankowski, V. Sassone, P. Savický, Ch. Scheideler, V. Schillings, U. Schöning, N. Schweikardt, G. Semanišin, M. Serna, J. Sgall, R. Silvestri, L. Škarvada, R. Solis-Oba, D. Sonowska, P. Sosík, D. Spielman, S. St James, I. Stark, A. Štědrý, C. Stirling, J. Strejček, T. Suel, G. Sutre, L. Sznu, L. Tendera, Sh.-H. Teng, P. Tesson, D. Thérien, W. Thomas, L. Trevisan, E. Tronci, T. Truderung, U. Vaccaro, M.Y. Vardi, F.-J. de Vries, T. Waleń, D. Walukiewicz-Chrzaszcz, I. Wegener, P. Weil, D. West, M. Westermann, P. Widmayer, Th. Wilke, Th. Worsch, InSeon Yoo, Sh. Yu, R. Yuster, S. Žák, M. Zawadowski, H. Zhang, T. Zwissig.

EATCS offered a Best Student Paper Award for the best paper submitted to MFCS and authored solely by students. The Program Committee decided to give this award in 2003 to Gregor Gramlich (Institut für Informatik, Johann Wolfgang Göthe-Universität, Frankfurt) for his paper “Probabilistic and Nondeterministic Unary Automata.”

As the editors of these proceedings, we are much indebted to all contributors to the scientific program of the symposium, especially to the authors of papers. Special thanks go to those authors who prepared the manuscripts according to the instructions and made life easier for us. We would also like to thank those who responded promptly to our requests for minor modifications and corrections in their manuscript. The database and electronic support system for the Program Committee was designed by Miroslav Chladný who, together with Miroslav Zervan, made everything run smoothly. Our special thanks go to Miroslav Chladný

for most of the hard technical work in preparing this volume. We are also thankful to the members of the Organizing Committee who made sure that the conference ran smoothly in a pleasant environment. Last, but not least, we want to thank Springer-Verlag for excellent co-operation in the publication of this volume.

Bratislava, June 2003

Branislav Rován  
Peter Vojtáš



MFCs 2003

---

28th International Symposium on  
MATHEMATICAL FOUNDATIONS OF COMPUTER  
SCIENCE

August 25–29, 2003, Bratislava

---

## Organized by

*Slovak Society for Computer Science*

*Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava*

## Supported by

*European Association for Theoretical Computer Science*

*Slovak Research Consortium for Informatics and Mathematics*



## Program Committee

Julian Bradfield (Edinburgh), János Csirik (Szeged), Pierpaolo Degano (Pisa), Mariangiola Dezani-Ciancaglini (Torino), Krzysztof Diks (Warsaw), Juhani Karhumäki (Turku), Marek Karpinski (Bonn), Mojmír Křetínský (Brno), Werner Kuich (Vienna), Jan van Leeuwen (Utrecht), Christoph Meinel (Trier), Leszek Pacholski (Wrocław), David Peleg (Rehovot), José D.P. Rolim (Geneva), Branislav Rován (Bratislava, *Chair*), Jan Rutten (Amsterdam), Jiří Šíma (Prague), Paul Spirakis (Patras), Ulrich Ultes-Nitsche (Fribourg), Peter Vojtáš (Košice, *Vice-chair*), and Igor Walukiewicz (Bordeaux)

## Organizing Committee

Miroslav Chladný, Vanda Hambáľková, Rastislav Kráľovič, Zuzana Kubincová, Marek Nagy, Martin Nehéz, Dana Pardubská (*Chair*), Edita Ričányová, Branislav Rován, Miroslav Zervan



<http://www.springer.com/978-3-540-40671-6>

Mathematical Foundations of Computer Science 2003  
28th International Symposium, MFCS 2003, Bratislava,  
Slovakia, August 25-29, 2003, Proceedings  
Rovan, B.; Vojtas, P. (Eds.)  
2003, XIII, 692 p., Softcover  
ISBN: 978-3-540-40671-6