

Contents

10 Ordinary differential equations and dynamical systems (continued)

<i>Robert Ghrist</i>	
Braids and differential equations	1
<i>Anton Gorodetski, Brian Hunt and Vadim Kaloshin*</i>	
Newton interpolation polynomials, discretization method, and certain prevalent properties in dynamical systems	27
<i>Bryna Kra</i>	
From combinatorics to ergodic theory and back again	57
<i>Patrice Le Calvez</i>	
From Brouwer theory to the study of homeomorphisms of surfaces	77
<i>Michael Shub</i>	
All, most, some differentiable dynamical systems	99
<i>Anton Zorich</i>	
Geodesics on flat surfaces	121

11 Partial differential equations

<i>Stefano Bianchini</i>	
Asymptotic behavior of smooth solutions for partially dissipative hyperbolic systems and relaxation approximation	147
<i>Patrick Gérard</i>	
Nonlinear Schrödinger equations in inhomogeneous media: wellposedness and illposedness of the Cauchy problem	157
<i>François Golse</i>	
The periodic Lorentz gas in the Boltzmann-Grad limit	183
<i>Matthew J. Gursky</i>	
Conformal invariants and nonlinear elliptic equations	203
<i>Hitoshi Ishii</i>	
Asymptotic solutions for large time of Hamilton–Jacobi equations	213
<i>Mario Pulvirenti</i>	
The weak-coupling limit of large classical and quantum systems	229
<i>Ovidiu Savin</i>	
Symmetry of entire solutions for a class of semilinear elliptic equations	257
<i>Sylvia Serfaty</i>	
Vortices in the Ginzburg–Landau model of superconductivity	267

*In case of several authors, invited speakers are marked with an asterisk.

<i>Neil S. Trudinger</i>	
Recent developments in elliptic partial differential equations of Monge–Ampère type	291
<i>Luis Vega</i>	
The initial value problem for nonlinear Schrödinger equations	303
<i>Juan J. L. Velázquez</i>	
Singular solutions of partial differential equations modelling chemotactic aggregation	321

12 Mathematical physics

<i>Alberto S. Cattaneo</i>	
From topological field theory to deformation quantization and reduction	339
<i>Bernard Derrida</i>	
Matrix ansatz and large deviations of the density in exclusion processes	367
<i>Jean-Michel Maillet</i>	
Correlation functions of the XXZ Heisenberg spin chain: Bethe ansatz approach	383
<i>Marcos Mariño</i>	
Gromov–Witten invariants and topological strings: a progress report	409
<i>Igor Rodnianski</i>	
The Cauchy problem in General Relativity	421
<i>Christoph Schweigert*, Jürgen Fuchs, and Ingo Runkel</i>	
Categorification and correlation functions in conformal field theory	443
<i>Avy Soffer</i>	
Soliton dynamics and scattering	459
<i>Cédric Villani</i>	
Hypocoercive diffusion operators	473

13 Probability and statistics

<i>Anton Bovier</i>	
Metastability: a potential theoretic approach	499
<i>Raphaël Cerf</i>	
On Ising droplets	519
<i>Amir Dembo</i>	
Simple random covering, disconnection, late and favorite points	535
<i>Peter Donnelly</i>	
Modelling genes: mathematical and statistical challenges in genomics	559
<i>K. David Elworthy* and Xue-Mei Li</i>	
Geometric stochastic analysis on path spaces	575

<i>Jianqing Fan* and Runze Li</i>	
Statistical challenges with high dimensionality: feature selection in knowledge discovery	595
<i>Alice Guionnet</i>	
Random matrices and enumeration of maps	623
<i>Steven P. Lalley</i>	
The weak/strong survival transition on trees and nonamenable graphs	637
<i>Yves Le Jan</i>	
New developments in stochastic dynamics	649
<i>Peter McCullagh* and Jie Yang</i>	
Stochastic classification models	669
<i>Andrei Okounkov</i>	
Random partitions and instanton counting	687
<i>Dominique Picard* and Gérard Kerkycharian</i>	
Estimation in inverse problems and second-generation wavelets	713
<i>Wendelin Werner</i>	
Conformal restriction properties	741

14 Combinatorics

<i>Alexander Barvinok</i>	
The complexity of generating functions for integer points in polyhedra and beyond	763
<i>Mireille Bousquet-Mélou</i>	
Rational and algebraic series in combinatorial enumeration	789
<i>Jim Geelen, Bert Gerards*, and Geoff Whittle</i>	
Towards a structure theory for matrices and matroids	827
<i>Mark Haiman</i>	
Cherednik algebras, Macdonald polynomials and combinatorics	843
<i>Jeong Han Kim</i>	
Poisson cloning model for random graphs	873
<i>Tomasz Łuczak</i>	
Randomness and regularity	899
<i>Imre Z. Ruzsa</i>	
Additive combinatorics and geometry of numbers	911
<i>Francisco Santos</i>	
Geometric bistellar flips: the setting, the context and a construction	931
<i>Robin Thomas</i>	
A survey of Pfaffian orientations of graphs	963

15 Mathematical aspects of computer science

<i>Manindra Agrawal</i>	
Determinant versus permanent	985
<i>Alexander S. Holevo</i>	
The additivity problem in quantum information theory	999
<i>Jon Kleinberg</i>	
Complex networks and decentralized search algorithms	1019
<i>Omer Reingold</i>	
On expander graphs and connectivity in small space	1045
<i>Tim Roughgarden</i>	
Potential functions and the inefficiency of equilibria	1071
<i>Ronitt Rubinfeld</i>	
Sublinear time algorithms	1095
<i>Luca Trevisan</i>	
Pseudorandomness and combinatorial constructions	1111

16 Numerical analysis and scientific computing

<i>Pavel Bochev and Max Gunzburger*</i>	
Least-squares finite element methods	1137
<i>Zhiming Chen</i>	
A posteriori error analysis and adaptive methods for partial differential equations	1163
<i>Ricardo G. Durán</i>	
Error estimates for anisotropic finite elements and applications	1181
<i>Nira Dyn</i>	
Linear subdivision schemes for the refinement of geometric objects	1201
<i>Randall J. LeVeque</i>	
Wave propagation software, computational science, and reproducible research	1227
<i>Yvon Maday</i>	
Reduced basis method for the rapid and reliable solution of partial differential equations	1255
<i>Endre Süli</i>	
Finite element algorithms for transport-diffusion problems: stability, adaptivity, tractability	1271

17 Control theory and optimization

<i>Vivek S. Borkar</i>	
Ergodic control of diffusion processes	1299

<i>Stephen Boyd</i>	
Convex optimization of graph Laplacian eigenvalues	1311
<i>Oleg Yu. Emanouilov (Imanuvilov)</i>	
Controllability of evolution equations of fluid dynamics	1321
<i>Arjan van der Schaft</i>	
Port-Hamiltonian systems: an introductory survey	1339
<i>Olof J. Staffans</i>	
Passive linear discrete time-invariant systems	1367
<i>Enrique Zuazua</i>	
Control and numerical approximation of the wave and heat equations	1389

18 Application of mathematics in the sciences

<i>Russel E. Caflisch</i>	
Multiscale modeling for epitaxial growth	1419
<i>Emmanuel J. Candès</i>	
Compressive sampling	1433
<i>Vicent Caselles</i>	
Total variation based image denoising and restoration	1453
<i>Michael Griebel* and Jan Hamaekers</i>	
A wavelet based sparse grid method for the electronic Schrödinger equation	1473
<i>Claude Le Bris</i>	
Mathematical and numerical analysis for molecular simulation: accomplishments and challenges	1507
<i>Martin A. Nowak</i>	
Evolutionary dynamics of cooperation	1523
<i>David Nualart</i>	
Fractional Brownian motion: stochastic calculus and applications	1541
<i>Anders Szepessy</i>	
Atomistic and continuum models for phase change dynamics	1563

19 Mathematics education and popularization of mathematics

<i>Petar S. Kenderov</i>	
Competitions and mathematics education	1583
<i>Alan Siegel</i>	
Understanding and misunderstanding the Third International Mathematics and Science Study: what is at stake and why K-12 education studies matter	1599
<i>Ian Stewart</i>	
Mathematics, the media, and the public	1631

<i>Michèle Artigue, Ehud de Shalit, and Anthony Ralston</i>	
Panel A: Controversial issues in K-12 mathematical education	1645
<i>Lee Peng Yee, Jan de Lange, and William Schmidt</i>	
Panel B: What are PISA and TIMSS? What do they tell us?	1663
<i>Fr. Ben Nebres, Shiu-Yuen Cheng, Konrad Osterwalder, and Hung-Hsi Wu</i>	
Panel C: The role of mathematicians in K-12 mathematics education	1673

20 History of mathematics

<i>Leo Corry</i>	
On the origins of Hilbert's sixth problem: physics and the empiricist approach to axiomatization	1697
<i>Niccolò Guicciardini</i>	
Method versus calculus in Newton's criticisms of Descartes and Leibniz	1719

Special activity

<i>Sebastià Xambó Descamps, Hyman Bass, Gilda Bolaños Evia, Ruedi Seiler, and Mika Seppälä</i>	
e-learning mathematics	1743
Author index	1769