

LONDON MATHEMATICAL SOCIETY LECTURE NOTE SERIES

Managing Editor: Professor N. J. Hitchin, Mathematical Institute, University of Oxford, 24-29 St Giles, Oxford OX1 3LB, United Kingdom

The titles below are available from booksellers, or from Cambridge University Press at www.cambridge.org/mathematics

- 176 Adams memorial symposium on algebraic topology 2, N. RAY & G. WALKER (eds)
- 177 Applications of categories in computer science, M. FOURMAN, P. JOHNSTONE & A. PITTS (eds)
- 178 Lower K- and L-theory, A. RANICKI
- 179 Complex projective geometry, G. ELLINGSRUD *et al*
- 180 Lectures on ergodic theory and Pesin theory on compact manifolds, M. POLLICOTT
- 181 Geometric group theory I, G.A. NIBLO & M.A. ROLLER (eds)
- 182 Geometric group theory II, G.A. NIBLO & M.A. ROLLER (eds)
- 183 Shintani zeta functions, A. YUKIE
- 184 Arithmetical functions, W. SCHWARZ & J. SPILKER
- 185 Representations of solvable groups, O. MANZ & T.R. WOLF
- 186 Complexity: knots, colourings and counting, D.J.A. WELSH
- 187 Surveys in combinatorics, 1993, K. WALKER (ed)
- 188 Local analysis for the odd order theorem, H. BENDER & G. GLAUBERMAN
- 189 Locally presentable and accessible categories, J. ADAMEK & J. ROSICKY
- 190 Polynomial invariants of finite groups, D.J. BENSON
- 191 Finite geometry and combinatorics, F. DE CLERCK *et al*
- 192 Symplectic geometry, D. SALAMON (ed)
- 194 Independent random variables and rearrangement invariant spaces, M. BRAVERMAN
- 195 Arithmetic of blowup algebras, W. VASCONCELOS
- 196 Microlocal analysis for differential operators, A. GRIGIS & J. SJÖSTRAND
- 197 Two-dimensional homotopy and combinatorial group theory, C. HOG-ANGELONI *et al*
- 198 The algebraic characterization of geometric 4-manifolds, J.A. HILLMAN
- 199 Invariant potential theory in the unit ball of C^n , M. STOLL
- 200 The Grothendieck theory of dessins d'enfant, L. SCHNEPS (ed)
- 201 Singularities, J.-P. BRASSELET (ed)
- 202 The technique of pseudodifferential operators, H.O. CORDES
- 203 Hochschild cohomology of von Neumann algebras, A. SINCLAIR & R. SMITH
- 204 Combinatorial and geometric group theory, A.J. DUNCAN, N.D. GILBERT & J. HOWIE (eds)
- 205 Ergodic theory and its connections with harmonic analysis, K. PETERSEN & I. SALAMA (eds)
- 207 Groups of Lie type and their geometries, W.M. KANTOR & L. DI MARTINO (eds)
- 208 Vector bundles in algebraic geometry, N.J. HITCHIN, P. NEWSTEAD & W.M. OXBURY (eds)
- 209 Arithmetic of diagonal hypersurfaces over finite fields, F.Q. GOUVÉA & N. YUI
- 210 Hilbert C^* -modules, E.C. LANCE
- 211 Groups 93 Galway / St Andrews I, C.M. CAMPBELL *et al* (eds)
- 212 Groups 93 Galway / St Andrews II, C.M. CAMPBELL *et al* (eds)
- 214 Generalised Euler-Jacobi inversion formula and asymptotics beyond all orders, V. KOWALENKO *et al*
- 215 Number theory 1992–93, S. DAVID (ed)
- 216 Stochastic partial differential equations, A. ETHERIDGE (ed)
- 217 Quadratic forms with applications to algebraic geometry and topology, A. PFISTER
- 218 Surveys in combinatorics, 1995, P. ROWLINSON (ed)
- 220 Algebraic set theory, A. JOYAL & I. MOERDIJK
- 221 Harmonic approximation., S.J. GARDNER
- 222 Advances in linear logic, J.-Y. GIRARD, Y. LAFONT & L. REGNIER (eds)
- 223 Analytic semigroups and semilinear initial boundary value problems, KAZUAKI TAIRA
- 224 Computability, enumerability, unsolvability, S.B. COOPER, T.A. SLAMAN & S.S. WAINER (eds)
- 225 A mathematical introduction to string theory, S. ALBEVERIO, *et al*
- 226 Novikov conjectures, index theorems and rigidity I, S. FERRY, A. RANICKI & J. ROSENBERG (eds)
- 227 Novikov conjectures, index theorems and rigidity II, S. FERRY, A. RANICKI & J. ROSENBERG (eds)
- 228 Ergodic theory of Z^d actions, M. POLLICOTT & K. SCHMIDT (eds)
- 229 Ergodicity for infinite dimensional systems, G. DA PRATO & J. ZABCZYK
- 230 Prolegomena to a middlebrow arithmetic of curves of genus 2, J.W.S. CASSELS & E.V. FLYNN
- 231 Semigroup theory and its applications, K.H. HOFMANN & M.W. MISLOVE (eds)
- 232 The descriptive set theory of Polish group actions, H. BECKER & A.S. KECHRIS
- 233 Finite fields and applications, S. COHEN & H. NIEDERREITER (eds)
- 234 Introduction to subfactors, V. JONES & V.S. SUNDER
- 235 Number theory 1993–94, S. DAVID (ed)
- 236 The James forest, H. FETTER & B.G. DE BUEN
- 237 Sieve methods, exponential sums, and their applications in number theory, G.R.H. GREAVES *et al*
- 238 Representation theory and algebraic geometry, A. MARTSINKOVSKY & G. TODOROV (eds)
- 240 Stable groups, F.O. WAGNER
- 241 Surveys in combinatorics, 1997, R.A. BAILEY (ed)
- 242 Geometric Galois actions I, L. SCHNEPS & P. LOCHAK (eds)
- 243 Geometric Galois actions II, L. SCHNEPS & P. LOCHAK (eds)
- 244 Model theory of groups and automorphism groups, D. EVANS (ed)
- 245 Geometry, combinatorial designs and related structures, J.W.P. HIRSCHFELD *et al*
- 246 p -Automorphisms of finite p -groups, E.I. KHUKHRO
- 247 Analytic number theory, Y. MOTOHASHI (ed)
- 248 Tame topology and o-minimal structures, L. VAN DEN DRIES
- 249 The atlas of finite groups: ten years on, R. CURTIS & R. WILSON (eds)
- 250 Characters and blocks of finite groups, G. NAVARRO
- 251 Gröbner bases and applications, B. BUCHBERGER & F. WINKLER (eds)

Cambridge University Press & Assessment
 978-0-521-68568-9 — Methods in Banach Space Theory
 Edited by Jesus M. F. Castillo , William B. Johnson
 Frontmatter
[More Information](#)

- 252 Geometry and cohomology in group theory, P. KROPHOLLER, G. NIBLO & R. STÖHR (eds)
- 253 The q -Schur algebra, S. DONKIN
- 254 Galois representations in arithmetic algebraic geometry, A.J. SCHOLL & R.L. TAYLOR (eds)
- 255 Symmetries and integrability of difference equations, P.A. CLARKSON & F.W. NIJHOFF (eds)
- 256 Aspects of Galois theory, H. VÖLKLEIN *et al*
- 257 An introduction to noncommutative differential geometry and its physical applications 2ed, J. MADORE
- 258 Sets and proofs, S.B. COOPER & J. TRUSS (eds)
- 259 Models and computability, S.B. COOPER & J. TRUSS (eds)
- 260 Groups St Andrews 1997 in Bath, I, C.M. CAMPBELL *et al*
- 261 Groups St Andrews 1997 in Bath, II, C.M. CAMPBELL *et al*
- 262 Analysis and logic, C.W. HENSON, J. IOVINO, A.S. KECHRIS & E. ODELL
- 263 Singularity theory, B. BRUCE & D. MOND (eds)
- 264 New trends in algebraic geometry, K. HULEK, F. CATANESE, C. PETERS & M. REID (eds)
- 265 Elliptic curves in cryptography, I. BLAKE, G. SEROUSSI & N. SMART
- 267 Surveys in combinatorics, 1999, J.D. LAMB & D.A. PREECE (eds)
- 268 Spectral asymptotics in the semi-classical limit, M. DIMASSI & J. SJÖSTRAND
- 269 Ergodic theory and topological dynamics, M.B. BEKKÄ & M. MAYER
- 270 Analysis on Lie groups, N.T. VÁROPOULOS & S. MUSTAPHA
- 271 Singular perturbations of differential operators, S. ALBEVERIO & P. KURASOV
- 272 Character theory for the odd order theorem, T. PETERFALVI
- 273 Spectral theory and geometry, E.B. DAVIES & Y. SAFAROV (eds)
- 274 The Mandelbrot set, theme and variations, TAN LEI (ed)
- 275 Descriptive set theory and dynamical systems, M. FOREMAN *et al*
- 276 Singularities of plane curves, E. CASAS-ALVERO
- 277 Computational and geometric aspects of modern algebra, M.D. ATKINSON *et al*
- 278 Global attractors in abstract parabolic problems, J.W. CHOLEWA & T. DLOTKO
- 279 Topics in symbolic dynamics and applications, F. BLANCHARD, A. MAASS & A. NOGUEIRA (eds)
- 280 Characters and automorphism groups of compact Riemann surfaces, T. BREUER
- 281 Explicit birational geometry of 3-folds, A. CORTI & M. REID (eds)
- 282 Auslander-Buchweitz approximations of equivariant modules, M. HASHIMOTO
- 283 Nonlinear elasticity, Y. FU & R.W. OGDEN (eds)
- 284 Foundations of computational mathematics, R. DEVORE, A. ISERLES & E. SÜLI (eds)
- 285 Rational points on curves over finite fields, H. NIEDERREITER & C. XING
- 286 Clifford algebras and spinors 2ed, P. LOUNESTO
- 287 Topics on Riemann surfaces and Fuchsian groups, E. BUJALANCE *et al*
- 288 Surveys in combinatorics, 2001, J. HIRSCHFELD (ed)
- 289 Aspects of Sobolev-type inequalities, L. SALOFF-COSTE
- 290 Quantum groups and Lie theory, A. PRESSLEY (ed)
- 291 Tits buildings and the model theory of groups, K. TENT (ed)
- 292 A quantum groups primer, S. MAJID
- 293 Second order partial differential equations in Hilbert spaces, G. DA PRATO & J. ZABCZYK
- 294 Introduction to the theory of operator spaces, G. PISIER
- 295 Geometry and Integrability, L. MASON & YAVUZ NUTKU (eds)
- 296 Lectures on invariant theory, I. DOLGACHEV
- 297 The homotopy category of simply connected 4-manifolds, H.-J. BAUES
- 298 Higher operads, higher categories, T. LEINSTER
- 299 Kleinian Groups and Hyperbolic 3-Manifolds, Y. KOMORI, V. MARKOVIC & C. SERIES (eds)
- 300 Introduction to Möbius Differential Geometry, U. HERTTRICH-JEROMIN
- 301 Stable Modules and the D(2)-Problem, F.E.A. JOHNSON
- 302 Discrete and Continuous Nonlinear Schrödinger Systems, M. J. ABLORWITZ, B. PRINARI & A. D. TRUBATCH
- 303 Number Theory and Algebraic Geometry, M. REID & A. SKOROBOGATOV (eds)
- 304 Groups St Andrews 2001 in Oxford Vol. 1, C.M. CAMPBELL, E.F. ROBERTSON & G.C. SMITH (eds)
- 305 Groups St Andrews 2001 in Oxford Vol. 2, C.M. CAMPBELL, E.F. ROBERTSON & G.C. SMITH (eds)
- 306 Peyresq lectures on geometric mechanics and symmetry, J. MONTALDI & T. RATIU (eds)
- 307 Surveys in Combinatorics 2003, C. D. WENSLEY (ed.)
- 308 Topology, geometry and quantum field theory, U. L. TILLMANN (ed)
- 309 Corings and Comodules, T. BRZEZINSKI & R. WISBAUER
- 310 Topics in Dynamics and Ergodic Theory, S. BEZUGLYI & S. KOLYADA (eds)
- 311 Groups: topological, combinatorial and arithmetic aspects, T. W. MÜLLER (ed)
- 312 Foundations of Computational Mathematics, Minneapolis 2002, FELIPE CUCKER *et al* (eds)
- 313 Transcendental aspects of algebraic cycles, S. MÜLLER-STACH & C. PETERS (eds)
- 314 Spectral generalizations of line graphs, D. CVETKOVIC, P. ROWLINSON & S. SIMIC
- 315 Structured ring spectra, A. BAKER & B. RICHTER (eds)
- 316 Linear Logic in Computer Science, T. EHRHARD *et al* (eds)
- 317 Advances in elliptic curve cryptography, I. F. BLAKE, G. SEROUSSI & N. SMART
- 318 Perturbation of the boundary in boundary-value problems of Partial Differential Equations, D. HENRY
- 319 Double Affine Hecke Algebras, I. CHEREDNIK
- 321 Surveys in Modern Mathematics, V. PRASOLOV & Y. ILYASHENKO (eds)
- 322 Recent perspectives in random matrix theory and number theory, F. MEZZADRI & N. C. SNAITH (eds)
- 323 Poisson geometry, deformation quantisation and group representations, S. GUTT *et al* (eds)
- 324 Singularities and Computer Algebra, C. LOSSEN & G. PFISTER (eds)
- 326 Modular Representations of Finite Groups of Lie Type, J. E. HUMPHREYS
- 328 Fundamentals of Hyperbolic Manifolds, R. D. CANARY, A. MARDEN & D. B. A. EPSTEIN (eds)
- 329 Spaces of Kleinian Groups, Y. MINSKY, M. SAKUMA & C. SERIES (eds)
- 330 Noncommutative Localization in Algebra and Topology, A. RANICKI (ed)
- 334 The Navier-Stokes Equations, P. G. DRAZIN & N. RILEY

Cambridge University Press & Assessment
978-0-521-68568-9 — Methods in Banach Space Theory
Edited by Jesus M. F. Castillo , William B. Johnson
Frontmatter
[More Information](#)

London Mathematical Society Lecture Note Series. 337

Methods in Banach Space Theory

Proceedings of the V Conference
on Banach Spaces, Cáceres,
Spain, 13–18 September 2004

Edited by

JESÚS M. F. CASTILLO
Universidad de Extremadura

WILLIAM B. JOHNSON
Texas A&M University



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press & Assessment
978-0-521-68568-9 — Methods in Banach Space Theory
Edited by Jesus M. F. Castillo , William B. Johnson
Frontmatter
[More Information](#)



Shaftesbury Road, Cambridge CB2 8EA, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India
103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,
a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of
education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9780521685689

© Cambridge University Press & Assessment 2006

This publication is in copyright. Subject to statutory exception and to the provisions
of relevant collective licensing agreements, no reproduction of any part may take
place without the written permission of Cambridge University Press & Assessment.

First published 2006

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-68568-9 Paperback

Cambridge University Press & Assessment has no responsibility for the persistence
or accuracy of URLs for external or third-party internet websites referred to in this
publication and does not guarantee that any content on such websites is, or will
remain, accurate or appropriate.

Contents

Table of Contents pp. v–vi

Preface p. vii

Acknowledgements pp. ix–x

Picture: closing at the main lecture room p. xi

1. GEOMETRICAL METHODS

Saturated extensions, the attractors method and Hereditarily James Tree Spaces pp. 1–90

by Spiros A. Argyros, Alexander D. Arvanitakis and Andreas G. Tolias

The Daugavet property for Lindenstrauss spaces pp. 91–96

by J. Becerra and M. Martín

Weakly null sequences in the Banach space $C(K)$ pp. 97–131

by I. Gasparis, E. Odell and B. Wahl

2. HOMOLOGICAL METHODS

Yet another proof of Sobczyk's theorem pp. 133–138

by Félix Cabello Sánchez

The category of exact sequences of Banach spaces pp. 139–158

by Jesús M. F. Castillo and Yolanda Moreno

Extension problems for $C(K)$ spaces and twisted sums pp. 159–168

by N. J. Kalton

Palamodov's questions from Homological methods in the theory of locally convex spaces pp. 169–182

by Jochen Wengenroth

3. TOPOLOGICAL METHODS

Ordinal representability in Banach spaces pp. 183–196

by M. J. Campi n, J. C. Candeal, A. S. Granero and E. Indur in

Overclasses of the class of Radon-Nikod m compact spaces pp. 197–214

by Mari n Fabian

Convexity, compactness and distances pp. 215–237

by A. S. Granero and Marcos S nchez

4. OPERATOR THEORY METHODS

Weyl's and Browder's theorems through the quasi-nilpotent part of an operator pp. 239–252

by Pietro Aiena and Maria Teresa Biondi

Multiplications and elementary operators in the Banach space setting pp. 253–292

by Eero Saksman and Hans-Olav Tylli

Interpolation of Banach Spaces by the γ -method pp. 293–306

by Jes s Su rez and Lutz Weis

5. FUNCTION SPACE METHODS

Solvability of an integral equation in $BC(\mathbb{R}_+)$ pp. 307–316

by J. Caballero, B. L pez and K. Sadarangani

Harald Bohr meets Stefan Banach pp. 317–339

by Andreas Defant and Christopher Prengel

Selected problems on the structure of complemented subspaces of Banach spaces pp. 341–354

by Aleksander Pe czy ski

List of participants pp. 355–357

Picture: some like it fun. p. 358

Preface

In the end, mathematics is what matters. In addition to the contributors to this volume of proceedings, the Conference included talks by C. Benítez, F. Cobos, P. Domanski, G. Godefroy, W. B. Johnson, A. Molto, J. P. Moreno, P. L. Papini and R. Phelps among the main speakers, and Julio Flores, Yves Raynaud, F. Naranjo, José Orihuela, Pedro Martín, I. J. Cabrera, V. Montesinos, P. Hájek, Luis Oncina, G. Gruenhage, Fernando García, Vassilis Kanellopoulos, I. Villanueva, P. Bandyopadhyay, Sebastian Lajara, Diego Yañez, David Pérez-García, C. Michels, Bernardo Cascales, Pandelis Dodos, Antonio Pulgarín, M. Muñoz, José Rodríguez, Luz M. Fernández-Cabrera, Carmen Calvo, Juan Casado, Belmensnaoui Aqzzouz, Redouane Nouira, Antonio Martínez, Fernando Mayoral, María del Carmen Calderón Moreno, Luiza Amália de Moraes, J. A. Prado Bassas, My Hachem Lalaoui Rhali, Houcine Benabdellah, Rachid El Harti, Michael Stessin among the shorter talks.

The conference was organized, like this proceedings volume, in five sections,

- Geometrical methods
- Homological methods
- Topological methods
- Operator theory methods
- Function space methods

The idea was to organize Banach space theory (and related categories) according to the methods used to approach problems. Of course, the methods can overlap, and (fortunately) usually do, but typically one of the methods sticks out. This proceedings volume has been organized accordingly; so, in each of its five sections the reader will encounter survey and research papers describing the state-of-the-art in each of those areas. All together the sixteen papers depict a rather attractive panorama of modern infinite dimensional Banach space theory.

Acknowledgements

From September 13th to September 18th, 2004, the Banach space theory group of the Mathematics Department of the University of Extremadura played host to the V Conference on Banach spaces and related topics. The conference was sponsored by:

- Departamento de Matemáticas de la Uex
- Universidad de Extremadura
- Diputación de Cáceres
- Consejería de Educación de la Junta de Extremadura
- Caja de Extremadura

The editors of this proceedings volume express their gratitude to those organizations for financial support. The Junta de Extremadura must moreover be acknowledged for putting at our disposal the beautiful XVIth century palace “Complejo San Francisco”. We thank Cambridge University Press for making this volume proceedings a reality, and are grateful for the coordination efforts of Roger Astley and Catherine Appleton.

The conference united 86 participants from 14 countries, including leading specialists in the field. Thanks are due to the members of the Scientific Committee, Fernando Bombal, María Jesús Carro, Manuel González, Bob Phelps, and Angel Rodríguez Palacios, and to the main speakers of the conference for their generous participation. All related information can be found at the website <http://www.banachspaces.com/banach04>. Last but not least, on behalf of all the participants we thank the volunteer students for the truly outstanding effort they made throughout the conference, doing whatever had to be done with extra

Cambridge University Press & Assessment
978-0-521-68568-9 — Methods in Banach Space Theory
Edited by Jesus M. F. Castillo , William B. Johnson
Frontmatter
[More Information](#)

x

Acknowledgements

smiles: Sandra Anes, Patricia Arjona, Javier Cabello, María Fejo, Ruth García, José Navarro and Jesús Suárez.

