

BOOK REVIEWS

BERNSTEIN, JOSEPH; HINICH, VLADIMIR; MELNIKOV, ANNA (Eds)
– *Studies in Lie Theory*, Dedicated to A. Joseph on his Sixtieth Birthday,
Birkhäuser, Boston-Basel-Berlin, Progress in Mathematics, vol. 243, 2006,
xxii+494p., CHF 138.-/EUR*88.-, ISBN 0-8176-4342-7.

This volume is dedicated to Anthony Joseph on the occasion of his 60th birthday. A conference entitled *Representations of Lie Algebra* was held in his honour at the Weizmann Institute, Rehovot, in July 2002. Subsequently, distinguished experts in representation theory and related areas were invited to contribute survey and research articles, which comprise this volume.

The focus here is on semisimple Lie algebras and quantum groups, the central subjects in representation theory to which the contribution of Tony Joseph is difficult to overestimate. For over three decades the impact of his work has been seminal and has changed the face of the subject.

The introductory part of the volume consists of a short note by Jacques Dixmier describing the beginnings of Tony's entry into mathematics, followed by the speech of Denise at the dinner honouring her husband. From Denise, the participants got a glimpse into another side of Tony's personality.

The scientific part of the volume begins with two surveys which give an overview of the central topics in representation theory to which Tony Joseph made his mark: the first, written by W.McGovern, describes Joseph's main input into the theory of primitive ideals in semisimple Lie algebras; the second, coauthored by D. Farkas and G. Letzter, is devoted to the study made by A. Joseph of quantized enveloping algebras. Thereafter, 16 research articles cover a number of different topics in representation theory. The second part of this volume contains 16 research articles covering a number of varied and interesting topics in representation theory.

DEUTSCH, ANDREAS; DORMANN, SABINE – *Cellular Automaton Modeling of Biological Pattern Formation*, Characterization, Applications, and Analysis, Birkhäuser, Boston-Basel-Berlin, 2004, 54p., Hardcover, CHF 148.-/EUR 92.-*, ISBN 0-8176-4281-1.

The originality of this work lies in the systematic exposition of two important areas of math-biology and biocomputing: cellular automata&pattern formation modeling. Preliminary material presents the historic development and main features of cellular automata: continuous & discrete modeling techniques and methods are examined. While there are various books dealing with continuous morphogenetic models, nothing in current literature focuses on discrete models of interacting cellular systems by self-assembly.

This book fills gap and is organized into three parts. The first part of the book deals with general principles, theories and models of pattern formation, the second part with cellular automata modelling, and the third part with application. Besides applications in medicine and immunobiology, extensions to other fields are presented.

Features: *Presents examples to show how typical cellular interactions as adhesion, alignment, contact guidance, and reversal are analyzed with automaton models *Discusses morphogenetic applications that show the possibilities for systematic analysis using models and analytical tools in other areas. *Analyzes relationships of the discrete cellular automata and continuous models. *Presents cellular automata as a new modeling tool Professional researchers in applied mathematics, computational physics, computer science, and biology interested in a cellular automata approach to modelling will find this book essential for their work. Graduates and advanced undergraduates in biomodeling will find the book an accessible interdisciplinary approach and presentation of the topic.

BOGOMOLOV, FEDOR; TSCHINKEL, YURI (Eds.) – *Geometric Methods in Algebra and Number Theory*, Birkhäuser, Boston-Basel-Berlin, Progress in Mathematics, vol 235, 2004, viii+370p., Hardcover, CHF 118.-/EUR 78.-*, ISBN 0-8176-4349-4.

The transparency and power of geometric constructions has been a source of inspiration for generations of mathematicians. Although more sophisticated and subtle constructions have replaced the Greek techniques of intersecting lines and conics, what remains unchallenged is the beauty and persuasion of pictures, communicated in words or drawing. All papers are strongly influenced by geometric ideas and intuition, covering such topics

as moduli spaces, Shimura varieties, D -modules, p -adic methods (motivic integration), and number theoretic applications (rational points).

The authors have been charged with the task of making the ideas and constructions in their papers accessible to a broad audience, by placing their results into a wider mathematical context. The collection as a whole offers a representative sample of modern problems in algebraic and arithmetic geometry. It can serve as an intense introduction for graduate students and others wishing to pursue research in these areas.

Most results discussed in this volume have been presented at the conference "Geometric methods in algebra and number theory" in Miami, December 2003. We thank the Department of Mathematics at the University of Miami for help in organizing this conference.

BUCUR, DORIN; BUTTAZZO, GIUSEPPE – *Variational Methods in Shape Optimization Problems*, Progress in Nonlinear Differential Equations and Their Applications, Birkhäuser, Boston-Basel-Berlin, 2005, viii+216p., Hardcover, CHF 88.00/EUR 62.06, ISBN 0-8176-4359-1.

This volume started as a collection of the lecture notes from two courses given in the academic year 2000-2001 by the authors at the Dipartimento di Matematica Università di Pisa at Scuola Normale Superiore di Pisa respectively. The courses were mainly addressed to Ph.D. students and required as background the topics in functional analysis that are typically covered in undergraduate courses. Subsequently, more material has been added to the original base of lecture notes. However, the style of the work remains quite informal and follows, in large part, the lectures as given.

The study of shape optimization problems encompasses a wide spectrum of academic research with numerous applications to the real world. In this work these problems are treated from both the classical and modern perspectives and target a broad audience of graduate students in pure and applied mathematics, as well as engineers requiring a solid mathematical basis for the solution of practical problems. Key topics features include: 1. Presents foundational introduction to shape optimization theory; 2. Poses several open problems for further research; 3. Substantial bibliography and index.

The work also contains a substantial, yet hardly exhaustive, bibliography. The compilation of a more complete list of references would be prohibitive due to the rapid development of the field and the tremendous volume of associated papers that are regularly published on the subject.

Driven by good examples and illustration and requiring only a standard knowledge in the calculus of variations, differential equations, and functional

analysis, the book can serve as a text for a graduate course in computational methods of optimal design and optimization, as well as an excellent reference for applied mathematicians addressing functional shape optimization problems.

MÜLLER, PAUL F.X. – *Isomorphisms between H^1 spaces*, Monografie Matematyczne, New Series vol.66, Birkhäuser Verlag, Basel-Boston-Berlin, xiv+453p., Hardcover, CHF 158.-/EUR 98.-, ISBN 3-7643-2431-7.

This book presents a through and self-contained presentation of H^1 and its known isomorphic invariants, such as the uniform property, the dimension conjecture, and dichotomies for the complemented subspaces.

The necessary background is developed from scratch. This includes a detailed discussion of the Haar system, together with the operators that can be built from it (averaging projections, rearrangement operators, para-products, Calderon-Zygmund singular integrals). Complete proofs are given for the classical martingale inequalities of C. Fefferman, Burkholder, and Khinchine-Kahane, and for large deviation inequalities. Complex interpolation, analytic families of operators, and the Calderon product of Banach lattices are treated in the context of H^p spaces.

Throughout the book, special attention is given to the combinatorial methods developed in the field, particularly J. Bourgain's proof of the dimension conjecture, L. Carleson's biorthogonal system in H^1 , T. Figiel's integral representation, W.B. Johnson's factorization of operators, B. Maurey's isomorphism, and P. Jones' proof of the uniform approximation property. An entire chapter is devoted to the study of combinatorics of colored dyadic intervals.

TAMMA, VALENTINA; CRANEFIELD, STEPHEN; FININ, TIMOTHY W.; WILLMOTT, STEVEN (Eds.) – *Ontologies for Agents: Theory and Experiences*, Whitestein Series in Software Agent Technologies, Birkhäuser Verlag, Basel-Boston-Berlin, 2005, x+345p., Softcover, CHF 58.00/ EUR* 38.00, ISBN 3-7643-7237-0.

The volume aims at providing a comprehensive review of the diverse efforts covering the gap existing between the two main perspectives on the

topic of ontologies for multi-agent system. On the one hand, there is the knowledge modelling perspectives; i.e. how ontologies should be modelled and represented in order to be effectively used in agent systems. On the other hand, there is the agent perspective; what kind of capabilities should be exhibited by an agent in order to make use of ontological knowledge and to perform efficient reasoning with it.

In practice, the application areas of these technologies often overlap, for example: e-commerce, intelligent information integration, and web services. Increasingly, the multi-agent systems and ontology research communities are seeking to work together to solve common problems. A key focus to this joint working is emerging in ideas for the semantic web. Both ontologies and agent technologies are central to the semantic web, and their combined use will enable the sharing of heterogeneous, autonomous knowledge sources in a scalable, adaptable and extensible manner.

The volume collects the most significant papers of the AAMAS 2002 and AAMAS 2003 workshop on ontologies for agent system, and the EKAW 2002 workshop on ontologies for multi-agent systems.

BRION, MICHEL; KUMAR, SHRAWAN – *Frobenius Splitting Methods in Geometry and Representation Theory*, Progresses in Mathematics, Birkhäuser, Boston-Basel-Berlin, 2004, viii+250p., Hardcover, CHF 116.00/EUR*72.00, ISBN 0-8176-4191-2.

The theory of Frobenius splitting has made a significant impact in the study of the geometry of flag varieties and representation theory. This work, unique in book literature, systematically develops the theory and covers all its major development. Key features: -Concise, efficient exposition unfolds from basis introductory material on Frobenius splitting-definitions, properties and examples-to cutting edge research-Studies in detail the geometry of Schubert varieties, their syzygies, equivariant embeddings of reductive groups, Hilbert Schemes, canonical splittings, good filtrations, among other topics- Applies Frobenius splitting methods to algebraic geometry and various problems in representations theory-Many examples, exercises, and open problems suggested throughout-Comprehensive bibliography and index. This book will be an excellent resources for mathematicians and graduate students in algebraic geometry and representation theory of algebraic groups.

ROHWER, CARL – *Nonlinear Smoothing and Multiresolution Analysis*, International Series of Numerical Mathematics, vol. 150, Birkhäuser Verlag, Basel-Boston-Berlin, 2005, xiv+137p., Hardcover, CHF 128.00/EUR*78.00, ISBN 3-7643-7229-X.

This monograph presents a new theory for analysis, comparison and design of nonlinear smoothers, linking to establish practices. Although a part of mathematical morphology, the special properties yield many simple, powerful and illuminating results leading to a novel nonlinear multiresolution analysis with pulses that may be as natural to vision as wavelet analysis is to acoustics. Similar to median transforms, they have the advantages of a supporting theory, computational simplicity, remarkable consistency, full trend preservation, and a Parseval-type identity. This interesting book can be considered as a simple introduction to the so called LULU-theory and the practical use of LULU-smoothers leading up to a full Multiresolution Analysis of any finite sequences. The attempt has been to present the subject in a way that is retrospectively ordered to some extent, but preserves some of the twisted paths that intuition initially suggested.

The book contains the following chapters: 1. Operators and Sequences; 2. Basic Rank Selectors, Pulses and Impulses; LULU-Smoothers, Signals and Ambiguity; 4. LULU-Intervals and Similar Smoothers; 5. Smoothing and Approximation with Signals; 6. Variation Reduction and Shape Preservation; 7. Multiresolution Analysis of Sequences; 8. The Discrete Pulse Transform; 9. Fair Comparison with Linear Smoothers; 10. Interpretation and Future.

KAASHOEK, MARINUS A.; SEATZU, SEBASTIANO; VAN DER MEE, CORNELIS (Eds.) – *Recent Advances in Operator Theory and its Applications*, The Israel Gohberg Anniversary Volume, Operator Theory Advances and Applications, vol. 160, Birkhäuser Verlag, Basel-Boston-Berlin, 2005, vi+478p., Hardcover, CHF 278.00/EUR* 168.00, ISBN 3-7643-7290-7.

This book contains a selection of carefully refereed research papers, most of which were presented at the 14th International Workshop on Operator Theory and its Applications (IWOTA) held at Cagliari, Italy (June 24-27, 2003). The papers, many of which have been written by leading experts in the field, concern a wide variety of topics in modern operator theory and applications, with emphasis on differential operators and numerical methods. Included are papers on the structure of operators, spectral theory of differential operators, theory of pseudo-differential operators and Fourier

integral operators, numerical methods for solving nonlinear integral equations, singular integral equations, and Toeplitz systems. Other main topics covered are inverse problems for canonical systems, factorization methods, metric constrained interpolation, mathematical system theory, and elements of multivariable operator theory. The book will be of interest to a wide audience of pure and applied mathematicians and engineers.

FALK, MICHAEL; HÜSLER, JÜRIG; REISS, ROLF-DIETER – *Laws of Small Numbers: Extremes and Rare Events*, Second, revised and extended edition, Birkhäuser Verlag, Basel-Boston-Berlin, 2004, xiii+376p., ISBN 3-7643-2416-3.

Una dintre repartițiile probabiliste discrete, cu numeroase aplicații practice, este repartiția Poisson, cunoscută și sub numele de legea evenimentelor rare (evenimente cu probabilități mici). Aproximarea repartiției probabiliste binomiale prin repartiția Poisson constituie punctul de plecare în formularea legilor numerelor mici. Printre primii cercetători care au remarcat utilizarea practică a acestei aproximări a fost economistul Ladislaus von Bortkiewicz (1868-1931) care în anul 1898 a publicat cartea intitulată "Legea numerelor mici". Alături de evenimentele rare, în cadrul legilor numerelor mici, este inclus și studiul repartițiilor probabilistice ale statisticilor de ordine extreme (teoria valorilor extreme). Aceste statistici reprezintă minimum sau maximum unei familii finite de variabilele aleatoare reale (extreme univariate) sau vectori aleatori reali (extreme multivariate).

Această carte este a doua ediție, revizuită și extinsă a primei ediții, publicată în anul 1994. Conținutul cărții este structurat în trei părți. Pentru subiectele din prima parte, ipoteza de lucru este cea a datelor de observație independente stochastic și identic repartizate. După fundamentarea legilor funcționale ale numerelor mici se prezintă aplicații ale acestora la estimarea densității de probabilitate, analiza regresiei și determinarea repartițiilor probabilistice ale statisticilor extreme. Extremele univariate sunt studiate folosind repartiția Pareto generalizată. Partea a doua, care a fost adăugată acestei ediții, cuprinde 130 pagini și este destinată extremelor multivariate, în aceeași ipoteză de lucru ca în prima parte. Cadrul în care se studiază statisticile extreme este cel al reprezentării Pickands. Pentru a ușura studiul teoretic și practic al extremelor multivariate se folosește o nouă descompunere spectrală a repartițiilor multivariate în repartiții univariate. Analog cazului univariat, teoria extremelor multivariate folosește repartiția Pareto generalizată multivariată. Subiectele tratate în a treia parte se bazează pe

ipoteza că datele de observație nu mai sunt independente stochastice și identic repartizate. Ideile de bază ale evenimentelor rare și statisticilor extreme sunt aplicate șirurilor aleatoare staționare și nestaționare. Un spațiu considerabil se alocă proceselor gaussiene staționare și nestaționare. În legătură cu teoria estimării, care aparține statisticii matematice, se prezintă o aplicație privind seriile cronologice nestaționare, întâlnite în domeniul ecologiei.

Aspectele teoretice ale subiectelor tratate sunt accesibile celor ce posedă cunoștințe de bază din teoria probabilităților și teoria proceselor stochastice (procesele punctuale și gaussiene). Aplicațiile prezentate pot folosi celor interesați de modelarea stochastică a fenomenelor din domenii ca: inginerie, asigurări, finanțe, hidrologie, ecologie.

E. Nenciu

SAHAI, HARDEO; OJEDA, MARIO MIGUEL – *Analysis of Variance for Random Models*, volume II: Unbalanced Data. Theory, Methods, Applications and Data Analysis, Birkhäuser, Basel-Boston-Berlin, 2005, xxv+480p., ISBN 0-8176-3229-8.

Analiza varianței (analiza dispersională) este o metodă statistică de analiză a datelor de observație, în ipoteza că asupra acestora acționează, simultan, mai mulți factori determinați sau aleatori. Pentru prima dată, această metodă a fost introdusă de R.A. Fisher, recunoscut ca fondatorul statisticii moderne.

Această carte reprezintă al doilea volum dintr-o monografie având ca scop studiul diferitelor metode și tehnici privind estimarea punctuală, estimarea confidențială (estimarea prin intervale de încredere) și testarea ipotezelor statistice pentru modele liniare cu factori aleatori (modele aleatoare). Subiectele tratate se bazează pe cursurile și seminariile susținute de către autori, la mai multe universități din Mexic, Brazilia, Peru, Spania. Criteriul principal de clasificare a modelelor analizei varianței este numărul de observații considerate pentru fiecare combinație de nivele ale factorilor (numărul de observații din fiecare celulă). Dacă toate celulele planului experimentului au același număr de observații atunci datele se numesc echilibrate, iar modelul corespunzător se numește ortogonal. În caz contrar, datele se numesc neechilibrate, iar modelul corespunzător se numește neortogonal. Urmând această clasificare, se studiază în volumul I modelele ortogonale și în volumul II modelele neortogonale. Conținutul volumului este structurat în 9 capitole și 15 apendixuri. Principalele procedee de obținere a datelor de observație sunt selecția cu revenire și selecția bayesiană. Colectivitatea statistică din care provin datele este considerată finită. În aceste presupuneri, se rezolvă probleme de estimare și testare pentru planuri experimentale cu 1, 2, 3 și mai

mulți factori aleatori (primele 6 capitole). În cazul a cel puțin 2 factori, se studiază modele fără interacțiune și cu interacțiune între factori. Ultimele 3 capitole sunt destinate aceluiași probleme (estimare și testare) în cazul când datele de observație sunt dispuse în cuiburi. Unele metode și tehnici pentru modelul ortogonal nu mai sunt valabile pentru modelul neortogonal. Un prim exemplu în acest sens îl reprezintă chiar relația fundamentală a analizei varianței. Potrivit acestei relații, varianța totală (o sumă de pătrate) se descompune în mai multe componente care, la rândul lor, sunt tot varianțe.

În modelul ortogonal descompunerea este unică și pentru testarea ipotezelor se folosește testul F . În modelul neortogonal apar sume de produse simetrice, descompunerea nu mai este unică și pentru testarea ipotezelor se folosește testul raportului de verosimilitate. Fiecare capitol, pe lângă o bibliografie bogată, conține exemple numerice, prelucrare cu software standard (SAS, SPSS și BMDP). Apendixurile conțin concepte, termeni și rezultate utilizate în volum. Cele mai multe dintre acestea se referă la algebra matriceală. În acest sens, remarcăm folosirea în studiul modelelor cu date neechilibrate a pseudoinversei (inversa generalizată) unei matrici.

Prin întregul conținut acest volum poate servi ca manual pentru un curs de Analiza datelor, cu reale posibilități de aplicabilitate în domenii ca: agricultură, biologie, medicină, econometrie, științe sociale.

E. Nenciu

MOSZYŃSKA, MARIA – *Selected Topics in Convex Geometry*, Birkhäuser, Boston-Basel-Berlin, 2005, xvi+226p., CHF 78.00/EUR* 48.000, ISBN 0-8176-4396-6.

The field of convex geometry has become a fertile subject of mathematical activity in the past few decades. This book examines in detail those topics in convex geometry that are concerned with Euclidean space. The theory is enriched by numerous examples, illustrations, and exercises.

The book consists in three parts:

In the first part, the author presents the Hadwiger theorems on functionals as main topics. After some basic notions of metric geometry, in particular of Euclidean geometry, and geometry of convex sets, in Chapter 4 there are studied maps of the family \mathcal{K}^n of compact convex subsets of \mathbf{R}^n into itself, for instance the Steiner symmetrization, which is used in the proof of one of two rounding theorems. Chapter 6 deals with convex polytopes, their role in the class \mathcal{K}^n and the equivalence by dissection. In the end of this part one can find applications, in particular Crofton formulae, which can be considered as the origin of geometric tomography.

In Part 2 the reader is given a survey on curvature and surface area measures and extensions of the class of convex bodies. This part contains the following chapters: 10. Curvature and Surface Area Measures 11. Sets with Positive Reach. Convexity Ring 12. Selectors for Convex Bodies and 13. Polarity.

Part 3 is devoted to the important class of star bodies and selectors for convex and star bodies, including a presentation of two famous problems of geometric tomography: the Shephard problem and the Busemann–Petty problem.

Selected Topics in Convex Geometry requires of the reader only a basic knowledge of geometry, linear algebra, analysis, topology, and measure theory. The book can be used in the classroom setting for graduates courses or seminars in convex geometry, geometric and convex combinatorics, and convex analysis and optimization. Researchers in pure and applied areas will also benefit from the book.

Marian Ioan Munteanu

LYNCH, STEPHEN – *Dynamical systems with applications using MATLAB*, Birkhäuser, Basel-Boston-Berlin, 2004, xv+459p., 68.48 EUR, ISBN 0-8176-4321-4.

Discrete and continuous dynamical systems are treated in this book with the aid of the numerical software MATLAB, Simulink and the Symbolic Math Toolbox. Recall that MATLAB and Simulink are registered trade marks of the MathWorks, Inc. For MATLAB product information you can contact The MathWorks, Inc., 3 Apple Hill drive, Natick, MA 01760-2098 USA, 508-647-7000, fax: 508-647-7101, info@mathworks.com, www.mathworks.com/.

A broad fields of topics are covered and several examples from Mathematics, but also from sciences like Physics (nonlinear optics, electrical circuits), Biology (population dynamics, epidemiology), Chemistry (reaction kinetics) and Economics are detailed. Treating all these problems with MATLAB over 60 programs are include; note also that the source code of these programs can be downloaded from the web. An important aspect, useful for beginners, is that no prerequisites or advanced techniques (e.g. from modern and functional analysis) are needed to understand the contents. Also, a preliminary chapter, namely Chapter 0, is a quick tutorial introduction to MATLAB by examples and problems.

Each chapter begins with a full description of its Aims and Objectives and is closed by a list of MATLAB programs, a set of examples and Bibliography. The first six chapters are devoted to the discrete framework while

the next ten chapters deal with continuous dynamical systems. Chapter 17 treats a modern subject, *Neural Networks*, and chapter 18 provides an introduction to Simulink. The final chapter contains the solutions to exercises. Two appendices are included: MATLAB Program File Index and Simulink Model File Index.

The book is very well written and can be used as a basic material for various undergraduate and graduate courses.

Mircea Crasmareanu

BEN M., CHEN; ZONGLI, LIN; YACOV, SHAMASH – *Linear Systems Theory, A Structural Decomposition Approach*, Birkhäuser, Boston, 2004, Control Engineering Series, xiii+415p., ISBN 0-81763-779-6.

Structural decompositions of various types of linear systems, including autonomous, unforced or unsensed, strictly proper, nonstrictly proper, and descriptor or singular systems are the main subjects of the book.

In order to understand linear systems and also to provide insight to facilitate the solution of control problems related to stabilization, disturbance decoupling, robust and optimal control, we need the structural properties of them. A lot of applications in industrial process control, aircraft and ship control, process automation control, and many other types of engineering systems can be found.

The authors use structural decomposition for an overall system in order to obtain various subsystems, each with distinct properties. These subsystems and their interconnections lead us to a deep insight in understanding feedback control systems, looking also for desired closed-loop performance, stability, and robustness. There are a lot of exercises, as well as algorithms utilizing the Linear Systems Toolkit (MATLAB-based), in order to reinforce and demonstrate the concepts treated in the book.

Topics covered include: Basic Concepts of Linear Systems Theory, Decomposition of Unforced and/or Unsensed Systems, Proper Systems and their Properties, Decomposition of Descriptor Systems and their Properties, Cascade and Inner-Outer Factorizations, Structural Assignment through Sensor/Actuator Selections, State Feedback Control with Time-Scale and Eigenstructure Assignment, Disturbance Decoupling with Static Output Feedback....

This book can be used as a textbook for students and professionals in aeronautics and astronautics, applied mathematics, chemical, electrical and mechanical engineering.

Mihai Gontineac

CAPASSO, VICENZO; BAKSTEIN, DAVID – *An Introduction to Continuous-Time Stochastic Processes Theory, Models, and Applications to Finance, Biology, and Medicine*, Birkhäuser, Boston, 2005, xi+343 p., Hardcover, ISBN 0-8176-3234-4.

This book is a systematic and self-consistent introduction to the theory of continuous-time stochastic processes. The scope of this book is profoundly educational, related to modeling real-world problems with stochastic methods and it is addressed to three main groups: mathematicians working in a different field, scientists and professionals from an academic background and to graduate students.

The book is divided into three main parts. In Part I, from chapters 1-4, the authors present the foundations of the mathematical theory of stochastic processes and stochastic calculus, together with tools and methods needed in Part II (chapters 5 and 6), which is dedicated to major scientific areas of applications. The third part consist of appendices and explains certain problems in greater depth (e.g., stability of ODEs).

In the first chapter are provided the fundamentals of probability theory following an approach based on Lebesgue measure theory due to Kolmogorov. Basic concepts from this theory are furthermore provided in appendix A. Chapter 2 gives an introduction to the mathematical theory of stochastic processes in continuous-time, including martingales and Markov processes. Also are introduced two fundamental classes of processes: Poisson and Wiener and, more general, the class of Levy processes. Further, a significant introduction to marked point processes is also given as a support for the analysis of relevant applications. Chapter 3 is based on Ito theory: it is defined the Ito integral, some fundamental results of Ito calculus are introduced, as well as related results like the martingale representation theorem. Chapter 4 is devoted to the analysis of stochastic differential equations driven by Wiener processes and Ito diffusions, and demonstrates the connection with partial differential equations of second order, via Dynkin and Feynman-Kac formulas.

Chapter 5 is dedicated to financial applications, to the economic concept of arbitrage-free markets and shows the connection with martingales and Girsanov theorem. It is also dedicated to the standard Black-Scholes theory and the relation with PDE and the Feynman-Kac formula. The next chapter presents fundamental models of population dynamics such as birth and death processes. Furthermore, it deals with an area of important modern research, namely the fundamentals of self-organizing systems, focusing on the social behavior of multiagent systems, with some applications to economics ("price herding"). It also includes a particular application to the neurosciences, illustrating the importance of stochastic differential equations driven by both Poisson and Wiener processes.

Problems and additions are proposed at the end of the volume, listed

by chapter. They are stimulus for discussing further concepts related to the topics of this book, key topics covered including: Interacting particles and agent-based models (and colonies), Population dynamics: from birth and death processes to epidemics, Financial market models: the non-arbitrage principle, Contingent claim valuation models, Risk analysis in insurance.

Eduard Rotenstein

NOVAK, S., SZAJOWSKI, K. (Eds.) – *Advances in Dynamic Games: Applications to Economics Finance, Optimization and Stochastic Control*, Annals of the International Society of Dynamic Games, vol. 7, Birkhäuser, Boston-Basel-Berlin, 2005, xv+679p., 181.90 EUR, ISBN 0-8176-4362-1.

This book contains selected papers based on presentations at the 9th International Symposium on Dynamic Games and Applications held in Adelaide, South Australia in December 2000.

The topics of interest are divided into six parts. The first part is devoted to repeated games and stochastic games, and the second part treats differential dynamic games.

In the third part are studied various extensions of stopping games, and in the fourth part are presented some applications of dynamic games to economics, finance and queuing theory.

Numerical methods and algorithms for solving dynamic games are studied in the fifth part, while the final part is devoted to Parrondo's games. Here are described two versions of Parrondo's games with a simple DTMC analysis of them.

C. Smadici

FREEDEN, W.; MICHEL, V. – *Multiscale Potential Theory, With Applications to Geoscience*, Applied and Numerical Harmonic Analysis, Birkhäuser, 2004, xviii+510 p., Hardcover, ISBN 0-8176-4105-X.

The book *Multiscale Potential Theory* represents a self-contained work which can provide a basis for the scientists interested in the areas related to multiscale (geo)potential theory. The models and methods employed show how various large and small-scale processes may be addressed by a single scientific modelling framework for potential determination. The general purpose of this approach is to gain a much more precise and detailed

description of the Earth's gravitational field from terrestrial, airborne and spaceborne data. The work comprises two main parts: Part I treats well-posed boundary-value problems of potential theory and elasticity; Part II examines ill-posed problems of satellite technology. This book presents a mathematical demonstration of how Runge-Walsh type solutions in potential theory can be formulated as multiscale representations that are both accurate and tractable in computation. Also, harmonic wavelets methods are used to solve the gravimetry problem.

Multiscale Potential Theory can be used as a reference book by graduate students and researchers in the fields of geomathematics, applied mathematics and geophysics.

Mircea Birsan

KULISH, PETR P.; MANOJLOVIC, NENAD; SAMTLEBEN, HENNING (Eds) – *Infinite Dimensional Algebras and Quantum Integrable Systems*, Progress in Mathematics, vol. 237, Birkhäuser Verlag, Basel-Boston-Berlin, 2005, 272p., Hardcover CHF 138.-/EUR 88.-*, ISBN 3-7643-7215-X.

I think that some words about title are necessary. Since the early days of quantum mechanics, i.e. the beginning of previous century, a theory in analogy with classical mechanics is a continuous search. One topic of great interest in this direction is a "good" definition of *integrability*, a notion which in classical setting was clarified by Liouville around 1850 and Arnold around 1960.

Returning to the book under review let us note that it contains the invited lectures at the conference with the same title who was held in July 2003 at the University of Algarve, Faro, Portugal, as a satellite workshop of the XIV International Congress on Mathematical Physics.

The contents is as follows:

- E. Frenkel, *Gaudin Model and Opers*, p. 1-58,
- O.A. Castro-Alvaredo and A. Fring, *Integrable Models with Unstable Particles*, p. 59-87,
- V.G. Kac and M. Wakimoto, *Quantum Reduction in the Twisted Case*, p. 89-131,
- A. Gerasimov, S. Kharchev and D. Lebedev, *Representation Theory and Quantum Integrability*, p. 133-156,
- H.E. Boos, V.E. Korepin and F.A. Smirnov, *Connecting Lattice and Relativistic Models via Conformal Field Theory*, p. 157-173,
- Kanehisa Takasaki, *Elliptic Spectral Parameter and Infinite-Dimensional Grassmann Variety*, p. 175-203,

-Takashi Takebe, *Trigonometric Degeneration and Orbifold Wess-Zumino-Witten Model*. II, p. 205-224,

-L.A. Takhtajan and Lee-Peng Teo, *Weil-Petersson Geometry of the Universal Teichmüller Space*, p. 225-233,

-V. Tarasov, *Duality for Knizhnik-Zamolodchikov and Dynamical Equations, and Hypergeometric Integrals*, p. 235-263.

As can be seen, is impressive the contribution of Russian and Japanese Schools of Mathematics. In conclusion, an useful book for experts!

Mircea Crasmareanu

DA PRATO, GIUSEPPE – *Kolmogorov Equations for Stochastic PDEs*, Advances Courses in Mathematics CRM Barcelona, Birkhäuser Verlag, Basel-Boston-Berlin, 2004, 189p., Softcover, CHF 52.-/EUR 32.-*, ISBN 3-7643-7216-8.

Materialul conținut în această carte reprezintă o dezvoltare a unui curs ținut de către autor în anul 1997 la Centrul de cercetări matematice din Barcelona. Subiectul cărții îl constituie ecuațiile Kolmogorov corespunzătoare unor ecuații cu derivate parțiale stochastice particulare ca: ecuații reacție-difuzie, ecuația Burgers și ecuația Navier-Stokes în cazul bidimensional. Ecuațiile Kolmogorov corespunzătoare sunt ecuații eliptice sau parabolice, cu o infinitate de variabile. Pentru fiecare tip de ecuație se studiază semigrupul de trecere împreună cu ireductibilitatea, proprietatea tare Feller, măsurile invariante și generatorul infinitezimal ale semigrupului. Sunt considerate acele ecuații cu derivate parțiale stochastice care pot fi aduse la o anumită formă ce descrie, din punct de vedere aplicativ, evoluția unui sistem dinamic infinit dimensional perturbat printr-un zgomot aditiv. În fiecare caz, se demonstrează existența și unicitatea unei soluții integrale (mild solution). Conținutul cărții este structurat în următoarele capitole: 1. Introducere și preliminarii, 2. Perturbații stochastice ale ecuațiilor liniare, 3. Ecuații diferențiale stochastice cu neliniarități Lipschitz, 4. Ecuații reacție-difuzie, 5. Ecuația stohastică Burgers, 6. Ecuația Navier-Stokes în cazul bidimensional.

Prin caracterul elementar și compact de prezentare, materialul din această carte poate acoperi programa unui curs de un an, destinat absolvenților în specializările Matematică sau Fizică. Pentru o bună înțelegere a conținutului cărții sunt necesare cunoștințe referitoare la procese stochastice, măsuri gaussiene, analiză funcțională, ecuații diferențiale stochastice în cazul finit dimensional și ecuații cu derivate parțiale.

Elena Nenciu

AMBROSIO, LUIGI; GIGLI, NICOLA; SAVARÉ, GIUSEPPE – *Gradient Flows in Metric Spaces and in the Space of Probability Measures*, Birkhäuser Verlag, Basel-Boston-Berlin, 2005, vii+333p., Softcover CHF 52.00/EUR 34.24, ISBN 3-7643-2428-7.

Cartea este structurată în două părți și un apendice. Subiectul primei părți (4 capitole) îl reprezintă fluxurile gradient în spații metrice. După definirea noțiunilor de derivată metrică a unei curbe absolut continue cu valori într-un spațiu metric complet și gradient superior (tare și slab) al unei funcționale definite pe un spațiu metric complet se studiază existența curbelor de pantă maximală, în spații Hilbert și Banach, împreună cu aproximarea variațională a lor. Subiectul celei de a doua părți (7 capitole) îl conține fluxurile gradient în spațiul măsurilor de probabilitate pe un spațiu Hilbert separabil. Dintre temele abordate în această parte, amintim: teorema de dezintegrare în cazul spațiilor metrice separabile Radon, condiții necesare și suficiente pentru problema de transport optimal, în formularea lui Monge, caracterizarea curbelor absolut continue în spațiul măsurilor de probabilitate pe un spațiu Hilbert-separabil, cu ajutorul ecuației de continuitate, o reprezentare probabilistică a ecuației de continuitate, proprietăți de convexitate ale funcționalei entropie relativă, proprietăți de diferențabilitate ale distanței Wasserstein între două măsuri de probabilitate pe un spațiu metric separabil Radon, legătura dintre funcționalele entropie relativă și informație Fisher. Cartea se încheie cu un apendice conținând precizări referitoare la noțiuni și rezultate folosite în cele două părți.

Fiecare dintre cele două părți ale cărții poate fi studiată independent de cealaltă. Prima parte se adresează celor interesați de Analiză în spații metrice, iar a doua parte este destinată aplicațiilor în domenii ca teoria măsurii, teoria probabilităților și ecuații cu derivate parțiale. Legătura dintre cele două părți ale cărții este realizată de faptul că spațiul măsurilor de probabilitate furnizează un model important la care se aplică teoria "metrică".

Elena Nenciu