Bulletin bibliographique

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BULLETIN BIBLIOGRAPHIQUE

Généralités

Dave BENSON. — **Music: a mathematical offering.** — Un vol. broché, 17,5 × 25, de XIII, 411 p. — ISBN 0-521-61999-8. — Prix: £25.99. — Cambridge University Press, Cambridge, 2007.

Since the time of the Ancient Greeks, much has been written about the relationship between mathematics and music: from harmony and number theory, to musical patterns and group theory. Benson provides a wealth of information here to enable the teacher, the student or the interested amateur to understand, at varying levels of technicality, the real interplay between these two ancient disciplines. The story is long as well as broad, and involves physics, biology, psychoacoustics, the history of science and digital technology as well as, of course, mathematics and music. Starting with the structure of the human ear and its relationship with Fourier analysis, the story proceeds via the mathematics of musical instruments to the ideas of consonance and dissonance, and then to scales and temperaments. This is a must-have book if you want to know about the music of the spheres or digital music and many things in between.

Jean-Jacques COLIN, Jean-Marie MORVAN. — **Nombres réels, suites: exercices corrigés avec rappels de cours.** — Avec la participation de Rémi MORVAN. — Bien débuter en mathématiques, L1, L2, L3, classes préparatoires. — Un vol. broché, 14,5 × 20,5, de 151 p. — ISBN 2-85428-747-9. — Prix: €17.00. — Cépaduès-Editions, Toulouse, 2006.

Cet ouvrage propose à la fois des rappels de cours et des exercices corrigés de façon particulièrement détaillée, classés par ordre de difficulté croissante. Le lecteur pourra ainsi progresser à son rythme et de façon autonome dans cette discipline. Chaque chapitre est agrémenté de pages historiques, qui replacent les résultats énoncés dans leur contexte. Sont notamment abordées les propriétés des nombres réels, les notions délicates de bornes supérieures et bornes inférieures d'une partie, puis les notions de suites convergentes, suites extraites, suites de Cauchy, suites récurrentes, etc... Les exercices proposés sont typiques des questions posées aux examens et aux concours. Une fois ces notions assimilées, le lecteur pourra sans difficultés s'engager dans des études plus avancées.

György DARVAS. — **Symmetry: cultural-historical and ontological aspects of science-arts relations: the natural and man-made world in an interdisciplinary approach.** — Translated from the Hungarian by David Robert Evans. — Un vol. broché, 17×24, de XI, 508 p. — ISBN 3-7643-7554-X. — Prix: SFr. 105.00. — Birkhäuser, Basel, 2007.

All of us have a certain conception of what symmetry means, at least as far as its main forms are concerned (like mirror-reflection or rotation, but only rarely translation). What are the common features of these transformations? How can one generalise them to explain similar phenomena that appear in different arts and sciences? What other forms of symmetry can we include in the scope of our study by the application of these generalised rules? How can a common phenomenon lend possible solutions from one discipline to another? Did you know that symmetry is a universal concept that has appeared in all cultures since prehistoric times, accompanying us through the history of mankind? What important role have asymmetries like the one-handedness of the neutrino played in the formation of matter, from the assumed Big Bang through to the asymmetries of the human brain? This book tries to explain these and a number of related questions. This is the first comprehensive book on the topic since the publication of H. Weyl's popular book on symmetry more than fifty years ago. It is relevant to almost all fields of science where symmetry appears as a phenomenon or is applied as a method, and where the concept is present in contemporary sciences, humanities and arts.

Philip J. DAVIS. — **Mathematics and common sense: a case of creative tension.** — Un vol. relié, 16×24, de XLVI, 242 p. — ISBN 1-56881-270-1. — Prix: US$34.95. — A.K. Peters, Wellesley, Massachusetts, 2006.

Mathematics and its applications are amphibians that live between common sense and the irrelevance of common sense, between what is intuitive and what is counterintuitive, between the obvious and the esoteric. The tension that exists between these pairs of opposites is a source of its creative strength. Addressed to all who are curious about mathematics and who wonder about its nature and the role it plays in society, this book provides discussions and examples from the simple to the more abstruse.

Michele EMMER, (Editor). — **Mathematics and culture IV.** — Un vol. relié, 16×24, de VIII, 253 p. — ISBN 3-540-34254-0. — Prix: €49.95. — Springer, Berlin, 2007.

Gaudi's dream which will be reached finalizing the construction of the "Sagrada Familia" in Barcelona, the victory of the Swiss sailboat "Alinghi", which won America's Cup, films such as "A beautiful Mind" and "Enigma", the theatrical play based on the life of Galois, the images of the Dutch graphic artist M.C. Escher, cryptography, comics. What do all these topics have in common? Mathematics, of course. This book focuses on the important role of mathematics in culture. It shows how very complex links between mathematics and culture can be not only interesting and stimulating, but also fun.

Leith HATHOUT. — **Crimes and mathdemeanors.** — Illustrated by Karl H. Hofmann. — Un vol. broché, 13,5×20,5, de IX, 196 p. — ISBN 1-56881-260-4. — Prix: US$14.95. — A.K. Peters, Wellesley, Massachusetts, 2007.

A collection of short detective stories, providing an exciting new challenge for young adults who have graduated beyond the ever-popular *Encyclopedia Brown* mysteries series and are interested in applying high school level mathematics and physics to solve problems. The main character, Ravi, is a 14-year old math genius who helps the local police to solve cases. Each chapter is a detective story with a mathematical puzzle at its core that Ravi is able to solve; the author invites the reader to solve the case on his or her own and then explains the mathematics used to find the solution to the puzzle. As a complement to a mathematics curriculum, these

memorable short stories motivate students to work through problems without the usual intimidation of textbooks. The book can also serve as a teaching tool to reinforce such concepts as deductive reasoning, trigonometry, probability, combinatorics, and physics.

Deanna HAUNSPERGER, Stephen KENNEDY, (Editors). — **The edge of the universe: celebrating 10 years of Math Horizons.** — Un vol. relié, 22×28,5, de XII, 303 p. — ISBN 0-88385-555-0. — The Mathematical Association of America, Washington, D.C., distributed by Cambridge University Press, Cambridge, 2007.

Math Horizons celebrates the people and ideas that are mathematics. Containing the editors' selection from the first ten years of the magazine's existence, this volume features exquisite expositions of mathematics accessible at the level of an undergraduate or advanced high school student. Broad and appealing, the coverage also includes fiction with mathematical themes; literary, theatrical, and cinematic criticism; humor; history; and social history. Mathematics is shown as a human endeavor through biographies and interviews of mathematicians and users of mathematics including artists, writers, and scientists. The puzzles, games, and activities throughout make it a valuable resource for student math clubs. Though especially appealing to undergraduate math majors, professors of mathematics, and high school teachers and their students, anyone with an interest in mathematics will delight in engaging this volume. Like the magazine from which it is drawn, this collection is an eclectic and wide-ranging look at the culture of mathematics.

Gilbert HELMBERG. — **Getting acquainted with fractals.** — Un vol. relié, 18×25, de 177 p. — ISBN 978-3-11-019092-2. — Prix: €72.90. — Walter de Gruyter, Berlin, 2007.

This text provides a mathematically oriented introduction to fractals, with a focus upon three types of fractals: fractals of curves, attractors for iterative function systems in the plane, and Julia sets. The presentation is on an undergraduate level, with an ample presentation of the corresponding mathematical background, e.g., linear algebra, calculus, algebra, geometry, topology, measure theory and complex analysis. The text is complemented by more than 170 coloured illustrations. — *From the contents:* Fractals and dimension: The game of deleting and replacing. The box-counting dimension. The Hausdorff dimension. — Iterative function systems: The space of compact subsets of a complete metric space. Contractions in a complete metric space. Affine iterative function systems. — Iteration of complex polynomials: General theory of Julia sets. Julia sets for quadratic polynomials. The Mandelbrot set. Generation of Julia sets.

George MAROULIS, Theodore SIMOS, (Editors). — **Trends and perspectives in modern computational science: lectures presented at the International Conference of Computational Methods in Sciences and Engineering 2006 (ICCMSE 2006), Chania, Crete, Greece.** — Lecture series on computer and computational sciences, vol. 6. — Un vol. broché, 17×25, de VII, 591 p. — ISBN 90-04-15541-4. — Prix: €79.00. — Brill, Leiden, 2006.

This volume contains a collection of the lectures of the invited speakers and symposium organizers presented at the International Conference of Computational Methods in Science and Engineering (ISSMSE 2006), held in Chania, Greece, October 2006. The content of the papers bears upon new developments of computational science pertinent to physics, chemistry, biology, medicine, mathematics and engineering. Molecular science is a privileged ground for the application and evaluation of new mathematical tools and computational methods. In recent years, novelty and progress with greatest conceivable speed is common experience. This flavor of research findings carrying many consequences for distant fields is easily evidenced in the lectures collected in this volume.

Laurent MAYET, (Directeur). — **Le mystère des nombres.** — Poche-Le Pommier, n° 10. — Sciences et Avenir Hors Séries. — Un vol. broché, 11×18, de 212 p. — ISBN 978-2-7465-0319-9. — Prix: €9.00. — Le Pommier, Paris, 2007.

Sait-on que l'on produit chaque année plusieurs centaines de nouveaux théorèmes en théorie des nombres? Les mathématiciens explorent les nombres à la manière des explorateurs abordant des terres inconnues. Le plus étonnant au fond est que ces «créations de l'esprit» trouvent fréquemment des applications dans les sciences expérimentales. Un voyage au pays des nombres, amusant, instructif et profond, qui permet d'en comprendre la nature et la puissance, et de répondre à toutes sortes de questions comme: Qu'est-ce qu'un nombre? Comment le fabrique-t-on? Quel est son sens? Les nombres sont-ils entiers? naturels? réels? irrationnels?... Ne peut-on dire plutôt qu'ils sont déraisonnablement efficaces? — *Les auteurs:* Dirigé par Laurent Mayet, Rédacteur en chef des Hors Séries de *Sciences et Avenir*, cet ouvrage est rédigé par les plus grands spécialistes du domaine: Bruno Aubusson, Bernard Barsotti, Georges Barthélemy, Jean-Michel Besnier, Luc Brisson, Claude-Paul Bruter, Jean-Paul Delahaye, Jacques Dubucs, Pascal Encel, Miguel Espinoza, Dominique Flament, Denis Guedj, Olivier Houdé, Christian Houzel, Jean-Marc Lévy-Leblond, Jean Mosconi, Philippe Pinel, François Schmitz, Ivahn Smadja, Jean-Jacques Szczeciniarz, Jacques Vauclair, Stéphane Verhelst.

Jean-Jacques RISLER, Pascal BOYER. — **Algèbre pour la licence 3: groupes, anneaux, corps.** — Sciences Sup. — Un vol. broché, 17×24, de VI, 210 p. — ISBN 2-10-049498-8. — Prix: €23.00. — Dunod, Paris, 2006.

Cet ouvrage propose toute l'algèbre fondamentale indispensable aux étudiants de Licence 3 de mathématiques et aux candidats au CAPES et à l'agrégation de mathématiques. Dans un souci pédagogique, les principaux concepts sont introduits par le biais d'exemples significatifs, du particulier au général, et de nombreux résultats sont présentés sous forme d'algorithme. Des exercices et des problèmes corrigés classés par thème complètent chaque chapitre. — *Table des matières:* L'anneau **Z**. — Modules de type fini. — Réduction des endomorphismes. — Groupes. — Racines des polynômes. — Théorie des corps. — Solutions des exercices et des problèmes.

Christopher G. SMALL. — **Functional equations and how to solve them.** — Problem books in mathematics. — Un vol. relié, 16×24,5, de XII, 129 p. — ISBN 0-387-34534-5. — Prix: €54.95. — Springer, New York, 2007.

This book covers topics in the theory and practice of functional equations. Special emphasis is given to methods for solving functional equations that appear in mathematics contests, such as the Putnam competition and the International Mathematical Olympiad. This book will be of particular interest to university students studying for the Putnam competition, and to high school students working to improve their skills on mathematics competitions at the national and international level. Mathematics educators who train students for these competitions will find a wealth of material for training on functional equations problems. The book also provides a number of brief biographical sketches of some of the mathematicians who pioneered the theory of functional equations. The work of Oresme, Cauchy, Babagge, and others, is explained within the context of the mathematical problems of interest at the time.

Nicholas YOUNG, (Editor). — **Surveys in geometry and number theory: reports on contemporary Russian mathematics.** — London Mathematical Society lecture note series, vol. 338. — Un vol. broché, 15,5×23, de VII, 318 p. — ISBN 0-521-69182-6. — Prix: £38.00. — Cambridge University Press, Cambridge, 2007.

The focus of this book is the continuing strength of pure mathematics in Russia after the post-Soviet diaspora. The authors are eight young specialists who are associated with strong

research groups in Moscow and St. Petersburg in the fields of algebraic geometry and number theory. Their articles are based on lecture courses given at British universities. The articles are mainly surveys of the recent work of the research groups and contain a substantial number of original results. Topics covered are embeddings and projective duals of homogeneous spaces, formal groups, mirror duality, del Pezzo fibrations, Diophantine approximation and geometric quantization. The authors are I. Arzhantsev, M. Bondarko, V. Golyshev, M. Grinenko, N. Moshchevitin, E. Tevelev, D. Timashev and N. Tyurin. Mathematical researchers and graduate students in algebraic geometry and number theory worldwide will find this book of great interest.

Histoire

Gilles DOWEK. — **Les métamorphoses du calcul: une étonnante histoire des mathématiques.** — Un vol. broché, 13,5 × 20, de 223 p. — ISBN 2-7465-0324-3. — Prix: €22.00. — Le Pommier, Paris, 2007.

Socle même de la méthode mathématique depuis l'Antiquité grecque, la notion de démonstration s'est profondément transformée, depuis le début des années soixante-dix. Plusieurs avancées mathématiques importantes, non toujours connectées les unes aux autres, remettent ainsi progressivement en cause la prééminence du raisonnement sur le calcul, pour proposer une vision plus équilibrée, dans laquelle l'un et l'autre jouent des rôles complémentaires. Cette véritable révolution nous amène à repenser le dialogue des mathématiques avec les sciences de la nature. Elle éclaire d'une lumière nouvelle certains concepts philosophiques, comme ceux de jugement analytique et synthétique. Elle nous amène aussi à nous interroger sur les liens entre les mathématiques et l'informatique, et sur la singularité des mathématiques qui est longtemps restée l'unique science à ne pas utiliser d'instruments. Enfin, et c'est certainement le plus prometteur, elle nous laisse entrevoir de nouvelles manières de résoudre des problèmes mathématiques, qui s'affranchissent de certaines limites arbitraires que la technologie du passé a imposées à la taille des démonstrations: les mathématiques sont peut-être en train de partir à la conquête d'espaces jusqu'alors inaccessibles. Mathématicien, logicien et informaticien, Gilles Dowek est chercheur et professeur à l'École polytechnique. Auteur de plusieurs ouvrages de vulgarisation, il a obtenu en 2000 le Prix d'Alembert des lycéens de la Société mathématique de France.

Jeremy GRAY. — **Worlds out of nothing: a course in the history of geometry in the 19th century.** — Springer undergraduate mathematics series. — Un vol. broché, 18 × 24, de XXIII, 376 p. — ISBN 1-84628-632-8. — Prix: €32.95. — Springer, London, 2007.

Worlds Out of Nothing is the first book to provide a course on the history of geometry in the 19th century. Based on the latest historical research, the book is aimed primarily at undergraduate and graduate students in mathematics but will also appeal to the reader with a general interest in the history of mathematics. Emphasis is placed on understanding the historical significance of the new mathematics: Why was it done? How – if at all – was it appreciated? What new questions did it generate? Topics covered in the first part of the book are projective geometry, especially the concept of duality, and non-Euclidean geometry. The book then moves on to the study of the singular points of algebraic curves (Plücker's equations) and their role in resolving a paradox in the theory of duality; to Riemann's work on differential geometry; and to Beltrami's role in successfully establishing non-Euclidean geometry as a rigorous mathematical subject. The final part of the book considers how projective geometry, as exemplified by Klein's Erlangen Program, rose to prominence, and looks at Poincaré's ideas about non-Euclidean geometry and their physical and philosophical significance. It then concludes with discussions

on geometry and formalism, examining the Italian contribution and Hilbert's *Foundations of Geometry*; geometry and physics, with a look at some of Einstein's ideas; and geometry and truth. Three chapters are devoted to writing and assessing work in the history of mathematics, with examples of sample questions in the subject, advice on how to write essays, and comments on what instructors should be looking for.

Calvin C. MOORE. — **Mathematics at Berkeley: a history.** — Un vol. relié, 16×24, de XVIII, 341 p. — ISBN 1-56881-302-3. — Prix: US$39.00. — A.K. Peters, Wellesley, Massachusetts, 2007.

In this fascinating history of the Mathematics Department at the University of California, Berkeley, Moore describes how this institution evolved from a single faculty member at a financially-troubled private college into a major research center that is ranked among the very best in the USA and in the world. Moore's account spans from its origins in the 1850s to the establishment and early years of the Mathematical Sciences Research Institute (MSRI) in the early to mid 1980s.

Analyse combinatoire

Charles J. COLBOURN, Jeffrey H. DINITZ, (Editors). — **Handbook of combinatorial designs.** — Second edition. — Discrete mathematics and its applications. — Un vol. relié, 18,5×26,5, de 984 p. — ISBN 1-58488-506-8. — Prix: US$129.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007.

Continuing in the bestselling, informative tradition of the first edition, the *Handbook of Combinatorial Designs, second edition,* remains the only resource to contain all of the most important results and tables in the field of combinatorial design. More than 30% longer than the first edition, the handbook covers the constructions, properties, and applications of designs as well as existence results. — *New to the second edition:* An introductory part that provides a general overview and a historical perspective of combinatorial designs. — Numerous chapters concerning the combinatorics of designs, such as triple systems, group divisible designs, block-transitive designs, factorial designs, lotto designs, and nested designs. — Applications in cryptography, communications, networking, statistics, and testing. — Various codes for nontraditional applications, including superimposed, optical orthogonal, and powerline. — Fully updated tables, including BIBDs, MOLS, PBDs, and Hadamard matrices. — Over 2200 references in a single bibliographic section. Meeting the need for up-to-date and accessible tabular and reference information, this handbook provides the tools to understand combinatorial design theories and applications that span the entire discipline. *Features:* Presents the latest as well as basic information pertaining to the construction, existence, and uses of combinatorial designs. — Supplies extensive tables and examples of Latin squares, orthogonal arrays, balanced incomplete block designs, t-designs, pairwise balanced designs, and Hadamard matrices. — Includes many applications used in statistics, cryptography, coding theory, graph theory, computer science, information theory, and mathematical finance. — Contains a state-of-the-art description of the computational methods used to construct and classify combinatorial designs.

Geoffrey GRIMMETT, Colin MCDIARMID, (Editors). — **Combinatorics, complexity, and chance: a tribute to Dominic Welsh.** — Oxford lecture series in mathematics and its applications, vol. 34. — Un vol. relié, 16×24, de X, 310 p. — ISBN 0-19-857127-5. — Prix: £39.50. — Oxford University Press, Oxford, 2007.

Dominic Welsh has made major contributions to the fields of combinatorics and discrete probability, including matroids, complexity, and percolation, and has taught, influenced and

inspired generations of students and researchers in mathematics. This volume summarises and reviews the consistent themes from his work through a series of articles written by renowned experts. These articles contain original research work, set in a broader context by the inclusion of review material. As a reference text in its own right, this book will be valuable to academic researchers, research students, and others seeking an introduction to the relevant contemporary aspects of these fields.

Théorie des nombres

Pei-Chu HU, Chung-Chun YANG. — **Value distribution theory related to number theory.** — Un vol. relié, 17,5×24, de XI, 543 p. — ISBN 3-7643-7568-X. — Prix: SFr. 158.00. — Birkhäuser, Basel, 2006.

The subject of the book is Diophantine approximation and Nevanlinna theory. Not only does the text provide new results and directions, it also challenges open problems and collects latest research activities on these subjects made by the authors over the past eight years. Some of the significant findings are the proof of the Green-Griffiths conjecture by using meromorphic connections and Jacobian sections, and a generalized abc-conjecture. The book also presents the state of the art in the studies of the analogues between Diophantine approximation (in number theory) and value distribution theory (in complex analysis), with a method based on Vojta's dictionary for the terms of these two fields. The approaches are relatively natural and more effective than existing methods. The book is self-contained and appended with a comprehensive and up-to-date list of references. It is of interest to a broad audience of graduate students and researchers specialized in pure mathematics.

B. LANDMAN, M. NATHANSON, J. NEŠETŘIL, R. NOWAKOWSKI, C. POMERANCE, (Editors). — **Combinatorial number theory: proceedings of the "Integers Conference 2005" in celebration of the 70th birthday of Ronald Graham, Carrollton, Georgia, USA, October 27-30, 2005.** — Un vol. relié, 18×25, de IX, 489 p. — ISBN 978-3-11-019029-8. — Prix: €157.01. — Walter de Gruyter, Berlin, 2007.

This volume contains selected refereed papers based on lectures presented at the "Integers Conference 2005", an international conference in combinatorial number theory that was held in Carrollton, Georgia in October 2005 in celebration of the 70th birthday of Ronald Graham. Widely recognized in mathematics, Dr. Graham is a leader in combinatorial number theory, theoretical computer science, graph theory, and other disciplines. The proceedings include contributions from many distinguished speakers, including Fan Chung, Ronald Graham, Neil Hindman, Florian Luca, Melvyn Nathanson, Jaroslav Nešetřil, Carl Pomerance, and Doron Zeilberger. Among the topics considered in these papers are Ramsey theory, additive number theory, multiplicative number theory, combinatorial games, sequences, elementary number theory, and graph theory.

Gabriel Daniel VILLA SALVADOR. — **Topics in the theory of algebraic function fields.** — Mathematics: theory and applications. — Un vol. relié, 16×24, de XVI, 652 p. — ISBN 0-8176-4480-6. — Prix: SFr. 128.00. — Birkhäuser, Boston, 2006.

The fields of algebraic functions of one variable appear in several areas of mathematics: complex analysis, algebraic geometry, and number theory. This text adopts the latter perspective by applying an arithmetic-algebraic viewpoint to the study of function fields as part of the

algebraic theory of numbers. The examination explains both the similarities and fundamental differences between function fields and number fields, including many exercises and examples to enhance understanding and motivate further study. The only prerequisites are a basic knowledge of field theory, complex analysis, and some commutative algebra. The book can serve as a text for a graduate course in number theory or an advanced graduate topics course. Alternatively, chapters 1-4 can serve as the base of an introductory undergraduate course for mathematics majors, while chapters 5-9 can support a second course for advanced undergraduates. Researchers interested in number theory, field theory, and their interactions will also find the work an excellent reference.

Géométrie algébrique

J.B. CONREY, D.W. FARMER, F. MEZZADRI, and N.C. SNAITH, (Editors). — **Ranks of elliptic curves and random matrix theory.** — London Mathematical Society lecture note series, vol. 341. — Un vol. broché, 15,5 × 23, de VI, 361 p. — ISBN 0-521-69964-9. — Prix : £40.00. — Cambridge University Press, Cambridge, 2007.

Random matrix theory, an area of mathematics first developed by physicists interested in the energy levels of atomic nuclei, can be used to describe some exotic phenomena in the number theory of elliptic curves. This comprehensive book begins with an introduction to elliptic curves and the fundamentals of modeling by a family of random matrices, and moves on to the latest research. The volume highlights some of the current results about ranks of elliptic curves, statistical properties of families of elliptic curves and their associated L-functions, and the emerging uses of random matrix theory in this field. This is the only book to give an in-depth treatment of this subject and is ideal for someone wishing to begin work in this area. A workshop on this topic at the Newton Institute in Cambridge was the origin of many contributions to this volume, and these describe contemporary research in the subject.

G.-M. GREUEL, C. LOSSEN, E. SHUSTIN. — **Introduction to singularities and deformations.** — Un vol. relié, 16,5 × 24, de XII, 471 p. — ISBN 3-540-28380-3. — Prix : €69.95. — Springer, Berlin, 2007.

This book presents the basic singularity theory of analytic spaces, including local deformation theory, and the theory of plane curve singularities. Plane curve singularities are a classical object of study, rich in ideas and applications, which still is in the center of current research and as such provides an ideal introduction to the general theory. Deformation theory is an important technique in many branches of contemporary algebraic geometry and complex analysis. This introductory text provides the general framework of the theory while still remaining concrete. In the first part of the book the authors develop the relevant techniques, including the Weierstraß preparation theorem, the finite coherence theorem etc., and then treat isolated hypersurface singularities, notably the finite determinacy, classification of simple singularities and topological and analytic invariants. In local deformation theory, emphasis is laid on the issues of versality, obstructions, and equisingular deformations. The book moreover contains a new treatment of equisingular deformations of plane curve singularities including a proof for the smoothness of the μ-constant stratum which is based on deformations of the parameterization. Computational aspects of the theory are discussed as well. Three appendices, including basic facts from sheaf theory, commutative algebra, and formal deformation theory, make the reading self-contained.

Brendan HASSETT. — **Introduction to algebraic geometry.** — Un vol. relié, 18×25,5, de XII, 252 p. — ISBN 0-521-87094-1 (broché : 0-521-69141-9) . — Prix : £55.00 (broché : £19.99). — Cambridge University Press, Cambridge, 2007.

Algebraic geometry has a reputation for being difficult and inaccessible, even among mathematicians! This must be overcome. The subject is central to pure mathematics, and applications in fields like physics, computer science, statistics, engineering, and computational biology are increasingly important. This book is based on courses given at Rice University and the Chinese University of Hong Kong, introducing algebraic geometry to a diverse audience consisting of advanced undergraduate and beginning graduate students in mathematics, as well as researchers in related fields. For readers with a grasp of linear algebra and elementary abstract algebra, the book covers the fundamental ideas and techniques of the subject and places these in a wider mathematical context. However, a full understanding of algebraic geometry requires a good knowledge of guiding classical examples, and this book offers numerous exercises fleshing out the theory. It introduces Gröbner bases early on and offers algorithms for almost every technique described. Both students of mathematics and researchers in related areas benefit from the emphasis on computational methods and concrete examples.

Joachim KOCK, Israel VAINSENCHER. — **An invitation to quantum cohomology : Kontsevich's formula for rational plane curves.** — Progress in mathematics, vol. 249. — Un vol. relié, 16×24,5, de XII, 159 p. — ISBN 0-8176-4456-3. — Prix : SFr. 68.00. — Birkhäuser, Boston, 2007.

This book is an elementary introduction to stable maps and quantum cohomology, starting with an introduction to stable pointed curves, and culminating with a proof of the associativity of the quantum product. The viewpoint is mostly that of enumerative geometry, and the red thread of the exposition is the problem of counting rational plane curves. Kontsevich's formula is initially established in the framework of classical enumerative geometry, then as a statement about reconstruction for Gromov-Witten invariants, and finally, using generating functions, as a special case of the associativity of the quantum product. Emphasis is given throughout the exposition to examples, heuristic discussions, and simple applications of the basic tools to best convey the intuition behind the subject. The book demystifies these new quantum techniques by showing how they fit into classical algebraic geometry. Some familiarity with basic algebraic geometry and elementary intersection theory is assumed. Each chapter concludes with some historical comments and an outline of key topics and themes as a guide for further study, followed by a collection of exercises that complement the material covered and reinforce computational skills. As such, the book is ideal for self-study, as a text for a mini-course in quantum cohomology, or as a special topics text in a standard course in intersection theory. The book will prove equally useful to graduate students in the classroom setting as to researchers in geometry and physics who wish to learn about the subject.

Marc LEVINE, Fabien MOREL. — **Algebraic cobordism.** — Springer monographs in mathematics. — Un vol. relié, 16,5×24, de XII, 244 p. — ISBN 3-540-36822-1. — Prix : €79.95. — Springer, Berlin, 2007.

Following Quillen's approach to complex cobordism, the authors introduce the notion of oriented cohomology theory on the category of smooth varieties over a fixed field. They prove the existence of a universal such theory (in characteristic 0) called algebraic cobordism. Surprisingly, this theory satisfies the analogues of Quillen's theorems : the cobordism of the base field is the Lazard ring and the cobordism of a smooth variety is generated over the Lazard ring

by the elements of positive degrees. This implies in particular the generalized degree formula conjectured by Rost. The book also contains some examples of computations and applications.

Jan NAGEL, Chris PETERS, (Editors). — **Algebraic cycles and motives, vol. 1.** — London Mathematical Society lecture note series, vol. 343. — Un vol. broché, 15,5×23, de XIV, 292 p. — ISBN 0-521-70174-0. — Prix : £40.00. — Cambridge University Press, Cambridge, 2007.

Algebraic geometry is a central subfield of mathematics in which the study of cycles is an important theme. Alexander Grothendieck taught that algebraic cycles should be considered from a motivic point of view and in recent years this topic has spurred a lot of activity. This book is one of two volumes that provide a self-contained account of the subject as it stands today. Together, the two books contain 22 contributions from leading figures in the field, which survey the key research strands and present interesting new results. Topics discussed include : the study of algebraic cycles using Abel-Jacobi/regulator maps and normal functions ; motives (Voevodsky's triangulated category of mixed motives, finite-dimensional motives) ; the conjectures of Bloch-Beilinson and Murre on filtrations on Chow groups and Bloch's conjecture. Researchers and students in complex algebraic geometry and arithmetic geometry will find much of interest here.

Mihai TIBĂR. — **Polynomials and vanishing cycles.** — Cambridge tracts in mathematics, vol. 170. — Un vol. relié, 16×23,5, de XII, 253 p. — ISBN 0-521-82920-8. — Prix: £45.00. — Cambridge University Press, Cambridge, 2007.

The behavior of vanishing cycles is the cornerstone for understanding the geometry and topology of families of hypersurfaces, usually regarded as singular fibrations. This self-contained Tract proposes a systematic geometro-topological approach to vanishing cycles, especially those appearing in non-proper fibrations, such as the fibration defined by a polynomial function. Topics which have been the object of active research especially over the 15 past years, such as holomorphic and mesomorphic germs, polynomial functions, and Lefschetz pencils on quasi-projective spaces, are here shown in a new light : conceived as aspects of a single theory with vanishing cycles at its core. Throughout the book the author presents the current state of the art. Transparent proofs are provided so that non-specialists can use this book as an introduction, but all researchers and graduate students working in differential and algebraic topology, algebraic geometry, and singularity theory will find this book of great use.

Algèbre linéaire et multilinéaire, théorie des matrices

Leslie HOGBEN, (Editor). — **Handbook of linear algebra.** — Richard BRUALDI, Anne GREENBAUM, Roy MATHIAS, (Associate editors). — Discrete mathematics and its applications. — Un vol. relié, 18,5×26, 1400 p. — ISBN 1-58488-510-6. — Prix : US$119.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007.

The *Handbook of Linear Algebra* provides comprehensive coverage of linear algebra concepts, applications, and computational software packages in an easy-to-use handbook format. The esteemed international contributors guide you from the very elementary aspects of the subject to the frontiers of current research. The book features an accessible layout of parts, chapters, and sections, with each section containing definition, fact, and example segments. The five main parts of the book encompass the fundamentals of linear algebra ; combinatorial and numerical linear algebra ; applications of linear algebra to various mathematical and nonmathematical disciplines such as quantum computing, control theory, signal processing, and computational biology ; and software packages for linear algebra computations, including

MATLAB®, Maple™, and Mathematica®. Within each section, the facts (or theorems) are presented in a list format and include references for each fact to encourage further reading, while the examples illustrate both the definitions and the facts. Linearization often enables difficult problems to be estimated by more manageable linear ones, making the *Handbook of Linear Algebra* essential reading for professionals in diverse disciplines who deal with an assortment of mathematical problems.

Robert PIZIAK, P.L. ODELL. — **Matrix theory: from generalized inverses to Jordan form.** — Pure and applied mathematics, vol. 288. — Un vol. relié, 16×23,5, de XIX, 548 p. — ISBN 1-58488-625-0. — Prix: US$89.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007

Highlighting the generalized inverse of a matrix and the method of fullrank factorization, *Matrix Theory: From Generalized Inverses to Jordan Form* probes introductory as well as more sophisticated linear algebra concepts. This presentation helps connect linear algebra to more advanced abstract algebra and matrix theory. The book first focuses on the central problem of linear algebra: solving systems of linear equations. It then discusses LU factorization, derives Sylvester's rank formula, introduces full-rank factorization, and describes generalized inverses, including the Moore-Penrose inverse. After discussions on norms, QR factorization, and orthogonality, the authors prove the important spectral theorem. They also highlight the primary decomposition theorem, Schur's triangularization theorem, singular value decomposition, and the Jordan canonical form theorem. The book concludes with a chapter on multilinear algebra. Always mathematically constructive, this book helps readers delve into elementary linear algebra ideas at a deeper level and prepare for further study in matrix theory and abstract algebra. — *Features:* Focuses on the development of the Moore-Penrose inverse, offering excellent preparation for work on advanced treatises. — Uses concrete examples to make arguments more clear. — Presents MATLAB® examples and exercises throughout since it is often used when dealing with matrices. — Includes appendices that review basic linear algebra and related prerequisites. — Provides numerous homework problems and suggestions for further reading.

Anneaux et algèbres

John CLARK, Christian LOMP, Narayanaswami VANAJA, Robert WISBAUER. — **Lifting modules: supplements and projectivity in module theory.** — Frontiers in mathematics. — Un vol. broché, 17×24, de XII, 394 p. — ISBN 3-7643-7572-8. — Prix: SFr. 78.00. — Birkhäuser, Basel, 2006.

Extending modules are generalizations of injective modules and, dually, lifting modules generalize projective supplemented modules. There is a certain asymmetry in this duality. While the theory of extending modules is well documented in monographs and textbooks, the purpose of our monograph is to provide a thorough study of supplements and projectivity conditions needed to investigate classes of modules related to lifting modules. The text begins with an introduction to small submodules, the radical, variations on projectivity, and hollow dimension. The subsequent chapters consider preradicals and torsion theories (in particular related to small modules), decompositions of modules (including the exchange property and local semi-T-nilpotency), supplements in modules (with specific emphasis on semilocal endomorphism rings), finishing with a long chapter on lifting modules, leading up their use in the theory of perfect rings, Harada rings, and quasi-Frobenius rings. Most of the material in the monograph appears in book form for the first time. The main text is augmented by a plentiful supply of exercises together with comments on further related material and on how the theory has evolved.

Craig HUNEKE, Irena SWANSON. — **Integral closure of ideals, rings, and modules.** — London Mathematical Society lecture note series, vol. 336. — Un vol. broché, 15,5×23, de XIV, 431 p. — ISBN 0-521-68860-4. — Prix: £38.00. — Cambridge University Press, Cambridge, 2006.

Integral closure has played a role in number theory and algebraic geometry since the nineteenth century, but a modern formulation of the concept for ideals perhaps began with the work of Krull and Zariski in the 1930s. It has developed into a tool for the analysis of many algebraic and geometric problems. This book collects together the central notions of integral closure and presents a unified treatment. Techniques and topics covered include: behaviour of the Noetherian property under integral closure; analytically unramified rings; the conductor; field separability; valuations; Rees algebras; Rees valuations; reductions; multiplicity; mixed multiplicity; joint reductions; the Briançon-Skoda theorem; Zariski's theory of integrally closed ideals in two-dimensional regular local rings; computational aspects; adjoints of ideals; and normal homomorphisms. With many worked examples and exercises, this book will provide graduate students and researchers in commutative algebra or ring theory with an approachable introduction leading into the current literature.

T.Y. LAM. — **Exercises in modules and rings.** — Problem books in mathematics. — Un vol. relié, 16,5×24, de XVIII, 412 p. — ISBN 0-387-98850-5. — Prix: €46.95. — Springer, New York, 2007.

Exercises in Modules and Rings offers a compendium of 639 exercises of varying degrees of difficulty in the subject of modules and rings at the graduate level. The material covered includes projective, injective, and flat modules, homological and uniform dimensions, noncommutative localizations and Goldie's theorems, maximal rings of quotients, Frobenius and quasi-Frobenius rings, as well as Morita's classical theory of category dualities and equivalences. Each of the nineteen sections begins with an introduction giving the general background and the theoretical basis for the problems that follow. All exercises are solved in full detail; many are accompanied by pertinent historical and bibliographical information, or a commentary on possible improvements, generalizations, and latent connections to other problems. This volume is designed as a problem book for the author's *Lectures on Modules and Rings* (Springer GTM, Vol. 189), from which the majority of the exercises were taken. Some forty new exercises have been added to further broaden the coverage. As a result, this book is ideal both as a companion volume to *Lectures*, and as a source for independent study. For students and researchers alike, this book will also serve as a handy reference for a copious amount of information in algebra and ring theory otherwise unavailable from textbooks.

Ross STREET. — **Quantum groups: a path to current algebra.** — Technical Editor, Ross MOORE. — Australian Mathematical Society lecture series, vol. 19. — Un vol. broché, 15,5×23, de XVIII, 141 p. — ISBN 0-521-69524-4. — Prix: £27.99. — Cambridge University Press, Cambridge, 2007.

Algebra has moved well beyond the topics discussed in standard undergraduate texts on "modern algebra". Those books typically dealt with algebraic structures such as groups, rings, and fields: still very important concepts! However, *Quantum Groups: a Path to Current Algebra* is written for the reader who is at ease with at least one such structure and keen to learn the latest algebraic concepts and techniques. A key to understanding these new developments is categorical duality. A quantum group is a vector space with structure. Part of the structure is standard: a multiplication making it an "algebra". Another part is not in those standard books at all: a comultiplication, which is dual to multiplication in the precise sense of category theory, making it a "coalgebra". While coalgebras, bialgebras, and Hopf algebras have been around

for half a century, the term "quantum group", along with revolutionary new examples, was launched by Drinfel'd in 1986.

Théorie des groupes et généralisations

Noel BRADY, Tim RILEY, Hamish SHORT. — **The geometry of the word problem for finitely generated groups.** — Advanced courses in mathematics CRM Barcelona. — Un vol. broché, 17×24, de VII, 206 p. — ISBN 3-7643-7949-9. — Prix: SFr. 44.00. — Birkhäuser, Basel, 2007.

The origins of the word problem are in group theory, decidability and complexity, but, through the vision of M. Gromov and the language of filling functions, the topic now impacts the world of large-scale geometry, including topics such as soap films, isoperimetry, coarse invariants and curvature. The first part introduces van Kampen diagrams in Cayley graphs of finitely generated, infinite groups; it discusses the van Kampen lemma, the isoperimetric functions or Dehn functions, the theory of small cancellation groups and an introduction to hyperbolic groups. One of the main tools in geometric group theory is the study of spaces, in particular geodesic spaces and manifolds, such that the groups act upon. The second part is thus dedicated to Dehn functions, negatively curved groups, in particular, CAT(0) groups, cubings and cubical complexes. In the last part, filling functions are presented from geometric, algebraic and algorithmic points of view; it is discussed how filling functions interact, and applications to nilpotent groups, hyperbolic groups and asymptotic cones are given. Many examples and open problems are included.

C.M. CAMPBELL, M.R. QUICK, E.F. ROBERTSON, G.C. SMITH, (Editors). — **Groups St Andrews 2005**. — London Mathematical Society lecture note series, vol. 339, 340. — Deux vol. brochés, 15,5×23, de X, 701 p. (pour l'ensemble des deux vol.). — ISBN 0-521-69469-8 (vol. 1), ISBN 0-521-69470-1 (vol. 2). — Prix: £40.00, chaque vol. — Cambridge University Press, Cambridge, 2007.

"Groups St Andrews 2005" was held in the University of St Andrews in August 2005 and this two-volume book contains selected papers from the international conference. Four main lecture courses were given at the conference, and articles based on their lectures form a substantial part of the proceedings. These volumes contain the contributions by Peter Cameron (Queen Mary, London), Rostislav Grigorchuk (Texas A&M, USA), John Meakin (Lincoln, Nebraska) and Akos Seress (Ohio State). Apart from the main speakers, refereed survey and research articles were contributed by other conference participants. Arranged in alphabetical order, these articles cover a wide spectrum of modern group theory. The regular proceedings of Groups St Andrews conferences have provided snapshots of the state of research in group theory throughout the past 25 years. Earlier volumes have had a major impact on the development of group theory and it is anticipated that these volumes will be equally important.

Meinolf GECK, Donna TESTERMAN, Jacques THÉVENAZ, (Editors). — **Group representation theory.** — Un vol. relié, 17,5×24,5, de X, 454 p. — ISBN 978-2-940222-12-4. — Prix: SFr. 129.00. — EPFL Press, Lausanne, 2007.

Subsequent to the pioneering work of Brauer in the middle of the 20th century, the representation theory of groups has grown into a very active area of study. The techniques and applications which have arisen during the development of the field have formed numerous connections with diverse areas of mathematics. This volume gives a general view of the main activities which took place during a research program hosted by the Bernoulli Centre of

the Ecole polytechnique fédérale de Lausanne in the spring of 2005. The book consists of a collection of independent contributions. The level of exposition is intended for graduate students and researchers in representation theory. The first part is concerned with the interplay between the representation theory of finite groups, cohomology, and topology; the second is dedicated to algebraic groups and finite reductive groups.

Jonathan D.H. SMITH. — **An introduction to quasigroups and their representations.** — Studies in advanced mathematics. — Un vol. relié, 16,5×24,5, de XII, 340 p. — ISBN 1-58488-537-8. — Prix: US$99.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007.

Collecting results scattered throughout the literature into one source, *An Introduction to Quasigroups and Their Representations* shows how representation theories for groups are capable of extending to general quasigroups and illustrates the added depth and richness that result from this extension. To fully understand representation theory, the first three chapters provide a foundation in the theory of quasigroups and loops, covering special classes, the combinatorial multiplication group, universal stabilizers, and quasigroup analogues of Abelian groups. Subsequent chapters deal with the three main branches of representation theory – permutation representations of quasigroups, combinatorial character theory, and quasigroup module theory. Each chapter includes exercises and examples to demonstrate how the theories discussed relate to practical applications. The book concludes with appendices that summarize some essential topics from category theory, universal algebra, and coalgebras. Long overshadowed by general group theory, quasigroups have become increasingly important in combinatorics, cryptography, algebra, and physics. Covering key research problems, this book proves that you can apply group representation theories to quasigroups as well.

Groupes topologiques ; groupes et algèbres de Lie

Dominique Paul CHEVALLIER. — **Introduction à la théorie des groupes de Lie réels: niveau M1-M2.** — Mathématiques à l'Université. — Un vol. broché, 17,5×26, de X, 370 p. — ISBN 978-2-7298-3068-7. — Prix: €39.50. — Ellipses, Paris, 2006.

Les groupes de Lie s'introduisent naturellement dans de nombreuses questions de mathématiques pures et appliquées. Créée à l'origine au XIX^{e} siècle par le mathématicien norvégien Sophus Lie, la théorie a été développée tout au long du XX^{e} siècle en parallèle avec les progrès de l'algèbre, de la topologie et de la géométrie différentielle et aussi sous l'impulsion des recherches en physique et en mécanique théorique. Ce livre s'adresse principalement aux étudiants de master de mathématiques de physique ou de mécanique. S'agissant d'un sujet réclamant inévitablement un certain nombre de connaissances préalables nous avons rendu l'ouvrage plus accessible en y incluant des annexes décrivant de façon synthétique le cadre général des théories auxquelles il est indispensable de se référer ainsi que les résultats préliminaires étrangers à la théorie des groupes de Lie proprement dite mais intervenant dans son développement.

Jing-Song HUANG, Pavle PANDŽIĆ. — **Dirac operators in representation theory.** — Mathematics: theory and applications. — Un vol. relié, 16×24, de X, 199 p. — ISBN 0-8176-3218-2. — Prix: SFr. 82.00. — Birkhäuser, Boston, 2006.

This monograph presents a comprehensive treatment of important new ideas on Dirac operators and Dirac cohomology. Dirac operators are widely used in physics, differential geometry, and group-theoretic settings (particularly, the geometric construction of discrete series representations). The related concept of Dirac cohomology, which is defined using Dirac

operators, is a far-reaching generalization that connects index theory in differential geometry to representation theory. Using Dirac operators as a unifying theme, the authors demonstrate how some of the most important results in representation theory fit together when viewed from this perspective. An excellent contribution to the mathematical literature of representation theory, this self-contained exposition offers a systematic examination and panoramic view of the subject. The material will be of interest to researchers and graduate students in representation theory, differential geometry, and physics.

Claudio PROCESI. — **Lie groups: an approach through invariants and representations.** — Universitext. — Un vol. broché, 15,5×23,5, de XXII, 596 p. — ISBN 0-387-26040-4. — Prix: €49.95. — Springer, New York, 2007.

Since their creation in the second half of the 19th century by the Norwegian mathematician Sophus Lie, Lie groups has been an increasing area of focus and rich research. Procesi's masterful approach to Lie groups through invariants and representations gives the reader a comprehensive treatment of the classical groups along with an extensive introduction to a wide range of topics associated with Lie groups: symmetric functions, theory of algebraic forms, Lie algebras, tensor algebra and symmetry, semi-simple Lie algebras, algebraic groups, group representations, invariants, Hilbert theory, and binary forms with fields ranging from pure algebra to functional analysis. Key to this unique exposition is the large amount of background material presented so the book is accessible to a reader with a relatively modest mathematical background. Historical information, examples, exercises are all woven into the text. *Lie Groups: An Approach through Invariants and Representations* will engage a broad audience, including advanced undergraduates, graduates, and mathematicians in a variety of areas from pure algebra to functional analysis and mathematical physics.

Urmie RAY. — **Automorphic forms and Lie superalgebras.** — Algebra and applications, vol. 5. — Un vol. relié, 16,5×24,5, de IX, 285 p. — ISBN 1-4020-5009-7. — Prix: €59.95. — Springer, Dordrecht, 2006.

A principal ingredient in the proof of the Moonshine Theorem, connecting the Monster group to modular forms, is the infinite dimensional Lie algebra of physical states of a chiral string on an orbifold of a 26 dimensional torus, called the Monster Lie algebra. It is a Borcherds-Kac-Moody Lie algebra with Lorentzian root lattice; and has an associated automorphic form having a product expansion describing its structure. Lie superalgebras are generalizations of Lie algebras, useful for depicting supersymmetry – the symmetry relating fermions and bosons. Most known examples of Lie superalgebras with a related automorphic form such as the Fake Monster Lie algebra whose reflection group is given by the Leech lattice arise from (super)string theory and can be derived from lattice vertex algebras. The No-Ghost Theorem from dual resonance theory and a conjecture of Berger-Li-Samak on the eigenvalues of the hyperbolic Laplacian provide strong evidence that they are of rank at most 26. The aim of this book is to give the reader the tools to understand the ongoing classification and construction project of this class of Lie superalgebras and is ideal for a graduate course. The necessary background is given within chapters or in appendices.

Mark R. SEPANSKI. — **Compact Lie groups.** — Graduate texts in mathematics, vol. 235. — Un vol. relié, 16,5×24,5, de XII, 198 p. — ISBN 0-387-30263-8. — Prix: €39.95. — Springer, New York, 2007.

Blending algebra, analysis, and topology, the study of compact Lie groups is one of the most beautiful areas of mathematics and a key stepping stone to the theory of general Lie groups. Assuming no prior knowledge of Lie groups, this book covers the structure and representation

theory of compact Lie groups. Included is the construction of the Spin groups, Schur orthogonality, the Peter-Weyl theorem, the Plancherel theorem, the maximal torus theorem, the commutator theorem, the Weyl integration and character formulas, the highest weight classification, and the Borel-Weil theorem. The necessary Lie algebra theory is also developed in the text with a streamlined approach focusing on linear Lie groups. This beginning graduate-level text, aimed primarily at Lie groups courses and related topics, assumes familiarity with elementary concepts from group theory, analysis, and manifold theory. Students, research mathematicians, and physicists interested in Lie theory will find this text very useful.

Fonctions d'une variable complexe

Alastair FLETCHER, Vladimir MARKOVIC. — **Quasiconformal maps and Teichmüller theory.** — Oxford graduate texts in mathematics, vol. 11. — Un vol. relié, 16×24,5, de VIII, 189 p. — ISBN 0-19-856926-2. — Prix : £45.00. — Oxford University Press, Oxford, 2007.

Based on a series of graduate lectures given by Vladimir Markovic at the University of Warwick in spring 2003, this book is accessible to those with a grounding in complex analysis looking for an introduction to the theory of quasiconformal maps and Teichmüller theory. Assuming some familiarity with Riemann surfaces and hyperbolic geometry, topics covered include the Grötzch argument, analytical properties of quasiconformal maps, the Beltrami differential equation, holomorphic motions and Teichmüller spaces. When proofs are omitted, references to where they may be found are always given, and the text is clearly illustrated throughout with diagrams, examples, and exercises for the reader.

Linda KEEN, Nikola LAKIC. — **Hyperbolic geometry from a local viewpoint.** — London Mathematical Society student texts, vol. 68. — Un vol. broché, 15,5×23, de X, 271 p. — ISBN 0-521-68224-X (relié : 0-521-86360-0). — Prix : £23.99 (relié : £60.00). — Cambridge University Press, Cambridge, 2007.

Written for graduate students, and accessible to upper-level undergraduates, this book presents topics in two-dimensional hyperbolic geometry. The authors begin with rigid motions in the plane, which are used as motivation for a full development of hyperbolic geometry in the unit disk. The approach is to define metrics from an infinitesimal point of view : first the density is defined and then the metric via integration. The study of hyperbolic geometry in arbitrary domains requires the concepts of surfaces and covering spaces as well as uniformization and Fuchsian groups. These ideas are developed in the context of what is used later. The authors then provide a detailed discussion of hyperbolic geometry for arbitrary plane domains. New material on hyperbolic and hyperbolic-like metrics is presented. These are dynamical generalizations of the Kobayashi and Caratheodory metrics for plane domains. This book concludes with applications to holomorphic dynamics, including new results and accessible open problems.

Patrice TAUVEL. — **Analyse complexe pour la licence 3 : cours et exercices corrigés.** — Sciences Sup. — Un vol. broché, 17×24, de XIII, 201 p. — ISBN 2-10-050074-0. — Prix : €28.00. — Dunod, Paris, 2006.

Les fonctions holomorphes d'une ou plusieurs variables complexes interviennent dans plusieurs branches des mathématiques et aussi dans d'autres disciplines scientifiques, en particulier en physique. L'étude de ces fonctions est relativement ancienne et constitue toujours un domaine de recherche actif. Elles mettent en valeur la position privilégiée de l'analyse complexe, située entre la géométrie différentielle, la topologie, l'analyse fonctionnelle et

l'analyse harmonique. Cet ouvrage présente l'ensemble des notions d'analyse complexe habituellement abordées en Licence. Afin que le livre soit très autonome, les premiers chapitres reprennent, avec démonstrations, les résultats classiques concernant les séries entières. Des exercices corrigés illustrent le cours et permettent au lecteur de faire le point sur les connaissances acquises.

Équations aux dérivées partielles

Antonio AMBROSETTI, Andrea MALCHIODI. — **Nonlinear analysis and semilinear elliptic problems.** — Cambridge studies in advanced mathematics, vol. 104. — Un vol. relié, 15,5×23,5, de XI, 316 p. — ISBN 0-521-86320-1. — Prix: £40.00. — Cambridge University Press, Cambridge, 2007.

Many problems in science and engineering are described by nonlinear differential equations, which can be notoriously difficult to solve. Through the interplay of topological and variational ideas, methods of nonlinear analysis are able to tackle such fundamental problems. This graduate text explains some of the key techniques in a way that will be appreciated by mathematicians, physicists and engineers. Starting from elementary tools of bifurcation theory and analysis, the authors cover a number of more modern topics from critical point theory and elliptic partial differential equations. A series of Appendices give convenient accounts of a variety of advanced topics that will introduce the reader to areas of current research. The book is amply illustrated and many chapters are rounded off with a set of exercises.

Sylvie BENZONI-GAVAGE, Denis SERRE. — **Multidimensional hyperbolic partial differential equations: first-order systems and applications.** — Oxford mathematical monographs. — Oxford science publications. — Un vol. relié, 16,5×24,5, de XXV, 508 p. — ISBN 0-19-921123-X. — Prix: £60.00. — Clarendon Press, Oxford, 2007.

Authored by leading scholars, this comprehensive, self-contained text presents a view of the state of the art in multi-dimensional hyperbolic partial differential equations, with a particular emphasis on problems in which modern tools of analysis have proved useful. Ordered in sections of gradually increasing degrees of difficulty, the text first covers linear Cauchy problems and linear initial boundary value problems, before moving on to nonlinear problems, including shock waves. The book finishes with a discussion of the application of hyperbolic PDEs to gas dynamics, culminating with the shock wave analysis for real fluids. With an extensive bibliography including classical and recent papers both in PDE analysis and in applications (mainly to gas dynamics), this text will be valuable to graduates and researchers in both hyperbolic PDEs and compressible fluid dynamics.

Pavel DRABEK, Gabriela HOLUBOVA. — **Elements of partial differential equations.** — de Gruyter textbook. — Un vol. broché, 17×24, de IX, 245 p. — ISBN 978-3-11-019124-0. — Prix: €32.66. — Walter de Gruyter, Berlin, 2007.

This book provides, on an elementary level, a first introduction to partial differential equations, with a consideration of fundamental types of equations and classical methods. Only basic facts from calculus and linear ordinary differential equations of first and second order are needed as a prerequisite. The book addresses students of mathematics, engineering, economics and applied sciences. The well-structured text is complemented by numerous illustrations, examples and exercises. — *From the contents:* Mathematical models, conservation and constitutive laws. — Classification, types of equations, boundary and initial conditions. —

Linear partial differential equations of first order. — Wave equation in one spatial variable - Cauchy problem. — Diffusion equation in one spatial variable - Cauchy problem. — Laplace and Poisson equations in two dimensions. — Solutions of initial boundary value problems for evolution equations. — Solutions of boundary value problems for stationary equations. — Methods of integral transforms. — General principles. — Laplace and Poisson equations in higher dimensions. — Diffusion equation in higher dimensions. — Wave equation in higher dimensions.

Victor A. GALAKTIONOV, Sergey R. SVIRSHCHEVSKII. — **Exact solutions and invariant subspaces of nonlinear partial differential equations in mechanics and physics.** — Chapman & Hall/CRC applied mathematics and nonlinear science series. — Un vol. relié, 16,5 × 24,5, de XXX, 498 p. — ISBN 1-58488-663-3. — Prix: US$89.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007.

Exact Solutions and Invariant Subspaces of Nonlinear Partial Differential Equations in Mechanics and Physics is the first book to provide a systematic construction of exact solutions via linear invariant subspaces for nonlinear differential operators. Acting as a guide to nonlinear evolution equations and models from physics and mechanics, the book focuses on the existence of new exact solutions on linear invariant subspaces for nonlinear operators. This practical reference deals with various partial differential equations (PDEs) and models that exhibit some common nonlinear invariant features. It begins with classical as well as more recent examples of interesting solutions on invariant subspaces. In the remainder of the book, the authors provide coverage on several techniques for constructing exact solutions that describe singularity behaviour for various nonlinear PDEs, including reaction-diffusion and gas dynamics models, thin-film and Kuramoto-Sivashinsky equations, nonlinear dispersion (compacton) equations, KdV-type and Harry Dym models, Green-Naghdi equations, and quasilinear magma equations. The book also describes the evolution properties of blow-up or extinction phenomena, finite interface propagation and regularity, and the oscillatory, changing sign behaviour of weak solutions near interfaces for nonlinear PDEs.

Alexei KUSHNER, Valentin LYCHAGIN, Vladimir RUBTSOV. — **Contact geometry and non-linear differential equations.** — Encyclopedia of mathematics and its applications, vol. 101. — Un vol. relié, 16,5 × 24, de XXI, 496 p. — ISBN 0-521-82476-1. — Prix: £80.00. — Cambridge University Press, Cambridge, 2007.

Methods from contact and symplectic geometry can be used to solve highly non-trivial nonlinear partial and ordinary differential equations without resorting to approximate numerical methods or algebraic computing software. This book explains how it's done. It combines the clarity and accessibility of an advanced textbook with the completeness of an encyclopedia. The basic ideas that Lie and Cartan developed at the end of the nineteenth century to transform solving a differential equation into a problem in geometry or algebra are here reworked in a novel and modern way. Differential equations are considered as a part of contact and symplectic geometry, so that all the machinery of Hodge-de Rham calculus can be applied. In this way a wide class of equations can be tackled, including quasi-linear equations and Monge-Ampère equations which play an important role in mathematical physics. The main features of the book are geometric transparency, and clear and almost immediate applications to interesting problems – exact solutions as well as clarifying how approximate numerical solutions can be better obtained. The types of problem considered range from the classical (e.g. Lie's classification problem) to the analysis of laser beams or the dynamics of cyclones. The authors balance rigor with the need to solve a problem, so it will serve as a reference and as a user's guide.

Systèmes dynamiques et théorie ergodique

Rabi BHATTACHARYA, Mukul MAJUMDAR. — **Random dynamical systems: theory and applications.** — Un vol. broché, 15,5×23, de XV, 463 p. — ISBN 0-521-53272-8 (relié: 0-521-82565-2). — Prix: £22.99 (relié: £50.00). — Cambridge University Press, Cambridge, 2007.

This book provides an exposition of discrete time dynamic processes evolving over an infinite horizon. Chapter 1 reviews some mathematical results from the theory of deterministic dynamical systems, with particular emphasis on applications to economics. The theory of irreducible Markov processes, especially Markov chains, is surveyed in Chapter 2. Equilibrium and long-run stability of a dynamical system in which the law of motion is subject to random perturbations are the central theme of Chapters 3-5. A unified account of relatively recent results, exploiting splitting and contractions, that have found applications in many contexts is presented in detail. Chapter 6 explains how a random dynamical system may emerge from a class of dynamic programming problems. With examples and exercises, readers are guided from basic theory to the frontier of applied mathematical research.

Analyse fonctionnelle

Jesús M.F. CASTILLO, William B. JOHNSON, (Editors). — **Methods in Banach space theory: proceedings of the V Conference on Banach Spaces, Cáceres, Spain, 13-18 September 2004**. — London Mathematical Society lecture note series, vol. 337. — Un vol. broché, 15,5×23, de X, 357 p. — ISBN 0-521-68568-0. — Prix: £40.00. — Cambridge University Press, Cambridge, 2006.

This book presents an overview of modern Banach space theory. It contains 16 papers that reflect the wide expanse of the subject. Articles are gathered into five sections according to methodology rather than to the topics considered. The sections are: geometrical methods; homological methods; topological methods; operator theoretic methods; and also function space methods. Each section contains a survey of the state of the art as well as some of the latest and most important results. All researchers working in Banach space theory, functional analysis or operator theory will find much of interest here.

Caterina CONSANI, Matilde MARCOLLI, (Editors). — **Noncommutative geometry and number theory: where arithmetic meets geometry and physics.** — Aspects of mathematics, vol. E 37. — Un vol. relié, 17,5×24,5, de VIII, 372 p. — ISBN 3-8348-0170-4. — Prix: €68.90. — Vieweg, Wiesbaden, 2006.

In recent years, number theory and arithmetic geometry have been enriched by new techniques from noncommutative geometry, operator algebras, dynamical systems, and K-theory. This volume collects and presents up-to-date research topics in arithmetic and noncommutative geometry and ideas from physics that point to possible new connections between the fields of number theory, algebraic geometry and noncommutative geometry. The articles collected in this volume present new noncommutative geometry perspectives on classical topics of number theory and arithmetic such as modular forms, class field theory, the theory of reductive p-adic groups, Shimura varieties, the local L-factors of arithmetic varieties. They also show how arithmetic appears naturally in noncommutative geometry and in physics, in the residues of Feynman graphs, in the properties of noncommutative tori, and in the quantum Hall effect.

Hans TRIEBEL. — **Theory of function spaces III.** — Monographs in mathematics, vol. 100. — Un vol. relié, 17×24, de XII, 426 p. — ISBN 3-7643-7581-7. — Prix: SFr. 205.00. — Birkhäuser, Basel, 2006.

This book deals with the recent theory of function spaces as it now stands. Special attention is paid to some developments in the last 10-15 years which are closely related to the nowadays numerous applications of the theory of function spaces to some neighbouring areas such as numerics, signal processing and fractal analysis. In particular, typical building blocks as (non-smooth) atoms, quarks, wavelet bases and wavelet frames are discussed in detail and applied afterwards to some outstanding problems of the recent theory of function spaces such as a local smoothness theory, fractal measures, fractal analysis, spaces on Lipschitz domains and on quasi-metric spaces. The book is essentially self-contained, although it might also be considered as the continuation of the two previous books of the author with the same title which appeared as volumes 78 and 84 in this book series. It is directed to mathematicians working in analysis, numerics and fractal geometry, and to (theoretical) physicists interested in related subjects such as signal processing.

Théorie des opérateurs

Erik KOELINK, Jan van NEERVEN, Ben de PAGTER, Guido SWEERS, (Editors). — **Partial differential equations and functional analysis: the Philippe Clément Festschrift.** — Operator theory: advances and applications, vol. 168. — Un vol. relié, 17×24, de VI, 294 p. — ISBN 3-7643-7600-7. — Prix: SFr. 198.00. — Birkhäuser, Basel, 2006.

Capturing the state of the art of the interplay between partial differential equations, functional analysis, maximal regularity, and probability theory, this volume was initiated at the Delft conference on the occasion of the retirement of Philippe Clément. It will be of interest to researchers in PDEs and functional analysis. — *Contributors:* G. Caristi, C. Carstensen, S. Cerrai, G. Da Prato, A.F.M. ter Elst, O. van Gaans, M. Geissert, H. Heck, M. Hieber, F. den Hollander, T.P. Hytönen, S.-O. Londen, A. Lunardi, E. Mitidieri, N. Okazawa, J. Prüss, J. Rappaz, D.W. Robinson, A. Sikora, G. Simonett, E.G.F. Thomas, L. Weis, M. Wilke, Y. Zhu.

Géométrie

Bart de BRUYN. — **Near polygons.** — Frontiers in mathematics. — Un vol. broché, 17×24, de XI, 263 p. — ISBN 3-7643-7552-3. — Prix: SFr. 60.00. — Birkhäuser, Basel, 2006.

Near polygons were introduced about 25 years ago and studied intensively in the 1980s. In recent years the subject has regained interest. This monograph gives an extensive overview of the basic theory of general near polygons. The first part of the book includes a discussion of the classes of dense near polygons, regular near polygons, and glued near polygons. Also valuations, one of the most important tools for classifying dense near polygons, are treated in detail. The second part of the book discusses the classification of dense near polygons with three points per line. The book is self-contained and almost all theorems are accompanied with proofs. Several new results are presented. Many known results occur in a more general form and the proofs are often more streamlined than their original versions. The volume is aimed at advanced graduate students and researchers in the fields of combinatorics and finite geometry.

Norman L. JOHNSON, Vikram JHA, Mauro BILIOTTI. — **Handbook of finite translation planes.** —Pure and applied mathematics, vol. 289. — Un vol. relié, 16,5×24,5, de XIX, 861 p. — ISBN 1-58488-605-6. — Prix: US$99.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007.

The *Handbook of Finite Translation Planes* provides a comprehensive listing of all translation planes derived from a fundamental construction technique, an explanation of the classes of translation planes using both descriptions and construction methods, and thorough sketches of the major relevant theorems. From the methods of André to coordinate and linear algebra, the book unifies the numerous diverse approaches for analyzing finite translation planes. It pays particular attention to the processes that are used to study translation planes, including ovoid and Klein quadric projection, multiple derivation, hyper-regulus replacement, subregular lifting, conical distortion, and Hermitian sequences. In addition, the book demonstrates how the collineation group can affect the structure of the plane and what information can be obtained by imposing group theoretic conditions on the plane. The authors also examine semifield and division ring planes and introduce the geometries of two-dimensional translation planes. As a compendium of examples, processes, construction techniques, and models, the *Handbook of Finite Translation Planes* equips readers with precise information for finding a particular plane. It presents the classification results for translation planes and the general outlines of their proofs, offers a full review of all recognized construction techniques for translation planes, and illustrates known examples. — *Features:* Provides a complete description of all known finite translation planes. — Includes examples of translation planes and related geometries. — Connects translation planes with numerous areas of incidence geometry such as flocks of quadric sets, generalized quadrangles, and partitions. — Supplies all of the varied construction techniques of translation planes. — Shows the importance of various classes of translation planes by illustrating their place within certain fundamental classification schemes.

Géométrie différentielle

Luca CAPOGNA, Donatella DANIELLI, Scott D. PAULS, Jeremy T. TYSON. — **An introduction to the Heisenberg group and the sub-Riemannian isoperimetric problem.** — Progress in mathematics, vol. 259. — Un vol. relié, 16,5×24, de XVI, 223 p. — ISBN 3-7643-8132-9. — Prix: SFr. 75.00. — Birkhäuser, Basel, 2007.

The past decade has witnessed a dramatic and widespread expansion of interest and activity in sub-Riemannian (Carnot-Carathéodory) geometry, motivated both internally by its role as a basic model in the modern theory of analysis on metric spaces, and externally through the continuous development of applications (both classical and emerging) in areas such as control theory, robotic path planning, neurobiology and digital image reconstruction. The quintessential example of a sub-Riemannian structure is the Heisenberg group, which is a nexus for all of the aforementioned applications as well as a point of contact between CR geometry, Gromov hyperbolic geometry of complex hyperbolic space, subelliptic PDE, jet spaces, and quantum mechanics. This book provides an introduction to the basics of sub-Riemannian differential geometry and geometric analysis in the Heisenberg group, focusing primarily on the current state of knowledge regarding Pierre Pansu's celebrated 1982 conjecture regarding the sub-Riemannian isoperimetric profile. It presents a detailed description of Heisenberg submanifold geometry and geometric measure theory, which provides an opportunity to collect for the first time in one location the various known partial

results and methods of attack on Pansu's problem. As such it serves simultaneously as an introduction to the area for graduate students and beginning researchers, and as a research monograph focused on the isoperimetric problem suitable for experts in the area.

Bozhidar Z. ILIEV. — **Handbook of normal frames and coordinates.** — Progress in mathematical physics, vol. 42. — Un vol. relié, 16×24, de XV, 441 p. — ISBN 3-7643-7618-X. — Prix: SFr. 158.00. — Birkhäuser, Basel, 2006.

The main subject of the book is an up-to-date and in-depth survey of the theory of normal frames and coordinates in differential geometry. The book can be used as a reference manual, a review of the existing results and an introduction to some new ideas and developments. Practically all existing essential results and methods concerning normal frames and coordinates can be found in the book. Most of the results are presented in detail with full, in some cases new, proofs. All classical results are expanded and generalized in various directions. Theorems of existence, uniqueness and, possibly, holonomicity of the normal frames and coordinates are proved; mostly, the proofs are constructive and some of their parts can be used independently for other tasks. Numerous examples and exercises illustrate the material.

Dominic D. JOYCE. — **Riemannian holonomy groups and calibrated geometry.** — Oxford graduate texts in mathematics, vol. 12. — Un vol. broché, 16×23,5, de IX, 303 p. — ISBN 978-0-19-921559-1. — Prix: £34.50. — Oxford University Press, Oxford, 2007.

This graduate level text covers an exciting and active area of research at the crossroads of several different fields in mathematics and physics. In mathematics it involves differential geometry, complex algebraic geometry, symplectic geometry, and in physics, string theory and mirror symmetry. Drawing extensively on the author's previous work, the text explains the advanced mathematics involved simply and clearly to both mathematicians and physicists. Starting with the basic geometry of connections, curvature, complex and Kähler structures suitable for beginning graduate students, the text covers seminal results such as Yau's proof of the Calabi Conjecture, and takes the reader all the way to the frontiers of current research in calibrated geometry, giving many open problems.

Peter TOPPING. — **Lectures on the Ricci flow.** — London Mathematical Society lecture note series, vol. 325. — Un vol. broché, 15,5×23, de X, 113 p. — ISBN 0-521-68947-3. — Prix: £23.99. — Cambridge University Press, Cambridge, 2006.

Hamilton's Ricci flow has attracted considerable attention since its introduction in 1982, owing partly to its promise in addressing the Poincaré conjecture and Thurston's geometrization conjecture. This book gives a concise introduction to the subject with the hindsight of Perelman's breakthroughs from 2002/2003. After describing the basic properties of, and intuition behind, the Ricci flow, core elements of the theory are discussed such as consequences of various forms of maximum principle, issues related to existence theory, and basic properties of singularities in the flow. A detailed exposition of Perelman's entropy functionals is combined with a description of Cheeger-Gromov-Hamilton compactness of manifolds and flows to show how a "tangent" flow can be extracted from a singular Ricci flow. Finally, all these threads are pulled together to give a modern proof of Hamilton's theorem that a closed three-dimensional manifold which carries a metric of positive Ricci curvature is a spherical space form.

Topologie générale

Paul L. SHICK. — **Topology : point-set and geometric.** — Pure and applied mathematics. — Un vol. relié, 16×24,5, de XIII, 271 p. — ISBN 978-0-470-09605-5. — Prix : £55.95. — Wiley-Interscience, Hoboken, 2007.

Topology : Point-Set and Geometric presents an introduction to topology that begins with the axiomatic definition of a topology on a set, rather than starting with metric spaces or the topology of subsets of $\mathbf{R}^n$. This approach includes many more examples, allowing students to develop more sophistiated intuition and enabling them to learn how to write precise proofs in a brand-new context, which is an invaluable experience for math majors. Along with the standard point-set topology topics – connected and path-connected spaces, compact spaces, separation axioms, and metric spaces – *Topology* covers the construction of spaces from other spaces, including products and quotient spaces. This innovative text culminates with topics from geometric and algebraic topology (the Classification Theorem for Surfaces and the fundamental group), which provide instructors with the opportunity to choose which "capstone" best suits his or her students. *Topology : Point-Set and Geometric* features : A short introduction in each chapter designed to motivate the ideas and place them into an appropriate context. — Sections with exercise sets ranging in difficulty from easy to fairly challenging. — Exercises that are very creative in their approaches and work well in a classroom setting. — A supplemental Web site that contains complete and colourful illustrations of certain objects, several learning modules illustrating complicated topics, and animations of particularly complex proofs.

Topologie algébrique

B.I. DUNDAS, M. LEVINE, P.A. ØSTVÆR, O. RÖNDIGS, V. VOEVODSKY. — **Motivic homotopy theory : lectures at a Summer School in Nordfjordeid, Norway, August 2002.** — Universitext. — Un vol. broché, 15,5×23,5, de X, 220 p. — ISBN 3-540-45895-6. — Prix : €49.95. — Springer, Berlin, 2007.

This book is based on lectures given at a Summer School on Motivic Homotopy Theory at the Sophus Lie Centre in Nordfjordeid, Norway, in August 2002. Aimed at graduate students in algebraic topology and algebraic geometry, it contains background material from both of these fields, as well as the foundations of motivic homotopy theory. It will serve as a good introduction as well as a convenient reference for a broad group of mathematicians to this important and fascinating new subject.

Markus BANAGL. — **Topological invariants of stratified spaces.** — Springer monographs in mathematics. — Un vol. relié, 16,5×24, de XI, 259 p. — ISBN 3-540-38585-1. — Prix : €69.95. — Springer, Berlin, 2007.

The central theme of this book is the restoration of Poincaré duality on stratified singular spaces by using Verdier-self-dual sheaves such as the prototypical intersection chain sheaf on a complex variety. After carefully introducing sheaf theory, derived categories, Verdier duality, stratification theories, intersection homology, t-structures and perverse sheaves, the ultimate objective is to explain the construction as well as algebraic and geometric properties of invariants such as the signature and characteristic classes effectuated by self-dual sheaves. Highlights never before presented in book form include complete and very detailed proofs of decomposition theorems for self-dual sheaves, explanation of methods for computing twisted characteristic classes and an introduction to the author's theory of non-Witt spaces and Lagrangian structures.

Topologie des variétés, analyse globale et analyse des variétés

Liviu NICOLAESCU. — **An invitation to Morse theory.** — Universitext. — Un vol. broché, 15,5×23,5, de XIV, 241 p. — ISBN 0-387-49509-6. — Prix : €39.95. — Springer, New York, 2007.

This self-contained treatment of Morse theory focuses on applications and is intended for a graduate course on differential or algebraic topology. The book is divided into three conceptually distinct parts. The first part contains the foundations of Morse theory (over the reals). The second part consists of applications of Morse theory over the reals, while the last part describes the basics and some applications of complex Morse theory, a.k.a. Picard-Lefschetz theory. This is the first textbook to include topics such as Morse-Smale flows, min-max theory, moment maps and equivariant cohomology, and complex Morse theory. The exposition is enhanced with examples, problems, and illustrations, and will be of interest to graduate students as well as researchers. The reader is expected to have some familiarity with cohomology theory and with the differential and integral calculus on smooth manifolds.

Andrei V. PAJITNOV. — **Circle-valued Morse theory.** — De Gruyter studies in mathematics, vol. 32. — Un vol. relié, 17,5×25, de IX, 454 p. — ISBN 3-11-015807-8. — Prix : €91.59. — Walter de Gruyter, Berlin, 2006.

In the early 1920s M. Morse discovered that the number of critical points of a smooth function on a manifold is closely related to the topology of the manifold. This became a starting point of the Morse theory which is now one of the basic parts of differential topology. Circle-valued Morse theory originated from a problem in hydrodynamics studied by S. P. Novikov in the early 1980s. Nowadays, it is a constantly growing field of contemporary mathematics with applications and connections to many domains of geometry and topology such as Arnold's conjecture in the theory of Lagrangian intersections, fibrations of manifolds over the circle, dynamical zeta functions, and the theory of knots and links in the three-dimensional sphere. The aim of the book is to give a systematic treatment of geometric foundations of the subject and recent research results. The book is accessible to first year graduate students specializing in geometry and topology.

Probabilités et processus stochastiques

Rick DURRETT. — **Random graph dynamics.** — Cambridge series in statistical and probabilistic mathematics. — Un vol. relié, 18×26, de IX, 212 p. — ISBN 0-521-86656-1. — Prix : £35.00. — Cambridge University Press, Cambridge, 2007.

The theory of random graphs began in the late 1950s in several papers by Erdős and Rényi. In the late twentieth century, the notion of six degrees of separation, meaning that any two people on the planet can be connected by a short chain of people who know each other, inspired Strogatz and Watts to define the small world random graph in which each site is connected to k close neighbors, but also has long-range connections. At about the same time, it was observed in human social and sexual networks and on the Internet that the number of neighbors of an individual or computer has a power law distribution. This inspired Barabási and Albert to define the preferential attachment model, which has these properties. These two papers have led to an explosion of research. While this literature is extensive, many of the papers are based on simulations and nonrigorous arguments. The purpose of this book is to use a wide variety of mathematical argument to obtain insights into the properties of these graphs. A unique feature

of this book is the interest in the dynamics of process taking place on the graph in addition to their geometric properties, such as connectedness and diameter.

Yves LACROIX, Laurent MAZLIAK. — **Probabilités: variables aléatoires, convergences, conditionnement: niveau M1.** — Mathématiques à l'Université. — Un vol. broché, 17,5×26, de 182 p. — ISBN 978-2-7298-3044-1. — Prix: €18.50. — Ellipses, Paris, 2006.

Le présent livre de probabilités se situe au niveau du Mastère de mathématiques (M1 principalement, mais avec des ouvertures qui ont leur place en M2). Il est aussi adapté aux étudiants suivant la préparation à l'Agrégation de mathématiques. Il présente un panorama assez large des outils et résultats fondamentaux de la théorie des probabilités: généralités sur les espaces de probabilités et les variables aléatoires, études des différentes formes de convergence des suites de variables aléatoires, théorie du conditionnement (espérances et lois conditionnelles). Une dernière partie est consacrée à des prolongements plus spécialisés qui constituent une initiation à des applications plus récentes de la modélisation du hasard (processus de Poisson, simulation, grandes déviations, théorie ergodique, optimisation). Le cours est émaillé de nombreux exercices, dont beaucoup sont intégralement corrigés dans le dernier chapitre du livre.

Chjan LIM, Joseph NEBUS. — **Vorticity, statistical mechanics, and Monte Carlo simulation.** — Springer monographs in mathematics. — Un vol. relié, 16×24,5, de XIV, 290 p. — ISBN 0-387-35075-6. — Prix: €69.95. — Springer, New York, 2007.

This book is drawn from across many active fields of mathematics and physics, and has connections to atmospheric dynamics, spherical codes, graph theory, constrained optimization problems, Markov chains, and Monte Carlo methods. It addresses how to access interesting, original, and publishable research in statistical modelling of large-scale flows and several related fields. The authors of this book explicitly reach around the major branches of mathematics and physics, showing how the use of a few straightforward approaches can create a cornucopia of intriguing questions and provide the tools to answer them. In this book, the reader will learn how to research a topic and how to understand statistical mechanics treatments of fluid dynamics. Of particular interest should be the application of Monte Carlo methods to problems like the dispersal of points on the sphere, the phase transitions of inviscid fluid flows in models that increasingly approximate the conditions of actual planetary atmospheres, and the treatment of negative absolute temperatures and the effects these extremely high-energy states have on fluid flows. Special attention is given to spherical models as well.

Statistique

Ulf GRENANDER, Michael I. MILLER. — **Pattern theory: from representation to inference.** — Un vol. broché, 19×24,5, de XII, 596 p. — ISBN 0-19-929706-1. — Prix: £50.00. — Oxford University Press, Oxford, 2007.

Pattern Theory: From Representation to Inference provides a comprehensive and accessible overview of the modern challenges in signal, data and pattern analysis in speech recognition, computational linguistics, image analysis and computer vision. Aimed at graduate students in biomedical engineering, mathematics, computer science and electrical engineering with a good background in mathematics and probability, the text includes numerous exercises and an extensive bibliography. Additional resources including extended proofs; selected solutions and examples are available on a companion website. The book commences with a short overview of pattern theory and the basics of statistics and estimation theory. Chapters 3-6 discuss the role of

representation of patterns via conditioning structure and Chapters 7 and 8 examine the second central component of pattern theory: groups of geometric transformations applied to the representation of geometric objects. Chapter 9 moves into probabilistic structures in the continuum, studying random processes and random fields indexed over subsets of $\mathbf{R}^n$. Chapters 10 and 11 continue with transformations of the matrix groups and the infinite dimensional diffeomorphisms indexed over the continuum. Chapters 12-14 extend from the pure representations of shapes to the Bayes estimation of shapes and their parametric representation. Chapters 15 and 16 study the estimation of infinite dimensional shape in the newly emergent field of Computational Anatomy, and finally Chapters 17 and 18 look at inference, exploring random sampling approaches for estimation of model order and parametric representing of shapes.

Analyse numérique

Claude BREZINSKI, Michela REDIVO-ZAGLIA. — **Méthodes numériques itératives : algèbre linéaire et non linéaire : niveau M1.** — Mathématiques à l'Université : cours et exercices corrigés. — Un vol. broché, 17,5 × 26, de XI, 307 p. — ISBN 978-2-7298-2887-5. — Prix : €33.00. — Ellipses, Paris, 2006.

Ce livre est la suite naturelle du livre *Méthodes numériques directes de l'algèbre matricielle*. Il présente pratiquement toutes les méthodes actuellement en usage pour la résolution des grands systèmes d'équations, linéaires ou non linéaires et la détermination des valeurs propres et vecteurs propres des matrices de grande taille. Les auteurs ont pris soin d'exposer, outre les aspects théoriques des méthodes présentées, les problèmes pratiques rencontrés lors de leur mise en œuvre. Les avantages et inconvénients des diverses méthodes sont clairement présentés ; les praticiens apprécieront les comparaisons et les conseils prodigués par les auteurs. Les quatre derniers chapitres de ce livre traitent de sujets rarement abordés dans les ouvrages de ce niveau. En particulier, la géométrie fractale et l'itération des applications, les méthodes permettant le classement des pages web, devraient intéresser de nombreux lecteurs. Ce livre conviendra à des lecteurs de niveaux très divers : sa clarté le rend accessible aux étudiants qui débutent en analyse numérique ; sa très grande richesse, et sa bibliographie étendue, le feront apprécier des chercheurs et des spécialistes.

Jan S. HESTHAVEN, Sigal GOTTLIEB, David GOTTLIEB. — **Spectral methods for time-dependent problems.** — Cambridge monographs on applied and computational mathematics, vol. 21 — Un vol. relié, 16 × 23,5, de IX, 273 p. — ISBN 0-521-79211-8. — Prix : £40.00. — Cambridge University Press, Cambridge, 2007.

Spectral methods are well suited to solve problems modelled by time-dependent partial differential equations: they are fast, efficient, and accurate and are used widely by mathematicians and practitioners. This class-tested introduction is ideal for use in graduate courses, or for self-study. The authors describe the basic theory of spectral methods, allowing the reader to understand the techniques through numerous examples as well as through more rigorous developments. They provide a detailed treatment of methods based on Fourier expansions and orthogonal polynomials (including thorough discussions of stability, boundary conditions, filtering, and the extension from the linear to the nonlinear situation). Computational solution techniques for integration in time are dealt with by Runge-Kutta type methods. Several of the later chapters are devoted to material not previously covered in book form. In particular, stability theory for polynomial methods, techniques for dealing with problems with discontinuous solutions, round-off errors, and the formulation of spectral methods on general grids will be especially helpful for practitioners.

A. ISERLES, (Managing editor). — **Acta numerica, vol. 15, 2006.** — Un vol. relié, 18×25,5, de 639 p. — ISBN 0-521-86815-7. — Prix: £65.00. — Cambridge University Press, Cambridge, 2006.

Douglas N. Arnold, Richard S. Falk, Ragnar Winther: Finite element exterior calculus, homological techniques, and applications. — J.C. Butcher: General linear methods. — Emmanuel J. Candès: Modern statistical estimation via oracle inequalities. — Lars Eldén: Numerical linear algebra in data mining. — Robert L. Higdon: Numerical modelling of ocean circulation. — Gérard Meurant, Zdeněk Strakoš: The Lanczos and conjugate gradient algorithms in finite precision arithmetic. — Robert Schaback, Holger Wendland: Kernel techniques: from machine learning to meshless methods.

Ming-Jun LAI, Larry L. SCHUMAKER. — **Spline functions on triangulations.** — Encyclopedia of mathematics and its applications, vol. 110. — Un vol. relié, 16,5×24, de XV, 592 p. — ISBN 978-0-521-87592-9. — Prix: £70.00. — Cambridge University Press, Cambridge, 2007.

Spline functions are universally recognized as highly effective tools in approximation theory, computer-aided geometric design, image analysis, and numerical analysis. The theory of univariate splines is well-known but this text is the first comprehensive treatment of the analogous multivariate theory. A detailed mathematical treatment of polynomial splines on triangulations is presented, providing a basis for developing practical methods for using splines in numerous application areas. The treatment of the Bernstein-Bézier representation of polynomials will provide a valuable source for researchers and students in CAGD. Chapters on smooth macro-element spaces provide new tools to engineers and scientists for solving partial differential equations numerically. Workers in the geosciences will find the results on spherical splines on triangulations especially useful for approximation and data fitting on the sphere. The book also includes a chapter on box splines, and four chapters on the latest research on trivariate splines. This comprehensive book is ideal as a primary text for graduate courses in approximation theory, and a source book for courses in computer-aided geometric design or in finite-element methods.

Alfio QUARTERONI, Riccardo SACCO, Fausto SALERI. — **Méthodes numériques: algorithmes, analyse et applications.** — Un vol. broché, 15,5×23,5, de XVI, 537 p. — ISBN 978-88-470-0495-5. — Prix: €38.54. — Springer, Milan, 2007.

Ce livre a pour but de présenter les fondements théoriques et méthodologiques de l'analyse numérique. Une attention toute particulière est portée sur les concepts de stabilité, précision et complexité des algorithmes. Les méthodes modernes relatives aux thèmes suivants sont présentées et analysées en détail: résolution des systèmes linéaires et non linéaires, approximation polynomiale, optimisation, intégration numérique, polynômes orthogonaux, transformations rapides, équations différentielles ordinaires et aux dérivées partielles. Les techniques présentées sont illustrées par de nombreux tableaux et figures. Beaucoup d'exemples et de contre-exemples sont proposés pour permettre au lecteur de développer son sens critique. Une caractéristique principale du livre réside dans l'abondance des programmes MATLAB qui accompagnent toutes les méthodes numériques présentées et qui les illustrent par des applications concrètes. Le lecteur détient ainsi tous les outils pour acquérir de solides connaissances théoriques et les appliquer directement sur ordinateur. Cet ouvrage s'adresse aux étudiants du second cycle des universités, aux élèves des écoles d'ingénieurs et, plus généralement, à toutes les personnes qui pratiquent le calcul scientifique.

Victor S. Ryaben'kii, Semyon V. Tsynkov. — **A theoretical introduction to numerical analysis.** — Un vol. relié, 16,5×24,5, de xiii, 537 p. — ISBN 1-58488-607-2. — Prix : US$ 79.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2007.

A Theoretical Introduction to Numerical Analysis presents the general methodology and principles of numerical analysis, illustrating the key concepts using numerical methods from real analysis, linear algebra, and differential equations. The book focuses on how to efficiently represent mathematical models for computer-based study. An accessible yet rigorous mathematical introduction, this book provides a pedagogical account of the fundamentals of numerical analysis. The authors thoroughly explain basic concepts, such as discretization, error, efficiency, complexity, numerical stability, consistency, and convergence. The text also addresses more complex topics like intrinsic error limits and the effect of smoothness on the accuracy of discrete approximation. Another advanced subject discussed, the method of difference potentials, employs discrete analogues of Calderon's potentials and boundary projection operators. The authors often delineate various techniques through exercises that require further theoretical study or computer implementation. By lucidly presenting the central mathematical concepts of numerical methods, *A Theoretical Introduction to Numerical Analysis* provides a foundational link to more specialized computational work in mathematics, science, and engineering.

Mécanique quantique

Anne Boutet de Monvel, Detlev Buchholz, Daniel Iagolnitzer, Ugo Moschella, (Editors). — **Rigorous quantum field theory : a Festschrift for Jacques Bros.** — Progress in mathematics, vol. 251. — Un vol. relié, 16×24, de vi, 326 p. — ISBN 3-7643-7433-0. — Prix : SFr. 118.00. — Birkhäuser, Basel, 2007.

Jacques Bros has greatly advanced our present understanding of rigorous quantum field theory through numerous fundamental contributions. This book arose from an international symposium held in honour of Jacques Bros on the occasion of his 70th birthday, at the Department of Theoretical Physics of the CEA in Saclay, France. The impact of the work of Jacques Bros is evident in several articles in this book. Quantum fields are regarded as genuine mathematical objects, whose various properties and relevant physical interpretations must be studied in a well-defined mathematical framework. The key topics in this volume include analytic structures of quantum field theory (QFT), renormalization group methods, gauge QFT, stability properties and extension of the axiomatic framework, QFT on models of curved spacetimes, QFT on noncommutative Minkowski spacetime.

Kalyan B. Sinha, Debashish Goswami. — **Quantum stochastic processes and noncommutative geometry.** — Cambridge tracts in mathematics, vol. 169. — Un vol. relié, 16×23,5, de x, 290 p. — ISBN 0-521-83450-3. — Prix : £50.00. — Cambridge University Press, Cambridge, 2007.

The classical theory of stochastic processes has important applications arising from the need to describe irreversible evolutions in classical mechanics; analogously quantum stochastic processes can be used to model the dynamics of irreversible quantum systems. Noncommutative, i.e. quantum, geometry provides a framework in which quantum stochastic structures can be explored. This book is the first to describe how these two mathematical constructions are related. In particular, key ideas of semigroups and complete positivity are combined to yield quantum dynamical semigroups (QDS). A natural and important problem is to dilate these objects to larger ones : especially interesting is the Evans-Hudson (EH) dilation, which links the original

QDS to a quantum stochastic differential equation. Sinha and Goswami develop a general theory of EH dilation for both bounded and unbounded coefficients. Many of the semigroups associated with the unbounded generators can be considered as heat semigroups on a noncommutative manifold. An asymptotic analysis of them and their generators yields geometric information of the noncommutative manifold. The unique features of the book, including the interactions of QDS and quantum stochastic calculus with noncommutative geometry, and a thorough discussion of this calculus with unbounded coefficients, will make it of interest to graduate students and researchers in functional analysis, probability and mathematical physics.

Physique statistique, structure de la matière

Cirano de DOMINICIS, Irene GIARDINA. — **Random fields and spin glasses: a field theory approach.** — Un vol. relié, 18×25,5, de XV, 213 p. — ISBN 0-521-84783-4. — Prix: £55.00. — Cambridge University Press, Cambridge, 2006.

In this book the authors deal with the theory of magnetic systems in the presence of frozen disorder, and in particular paradigmatic and well-known spin models such as the Random Field Ising Model and the Ising Spin Glass. They describe some of the most successful approaches to the physics of disordered systems, such as the replica method and Langevin dynamics, together with lesser known results in finite dimension. This is a unified presentation using a field theory language which covers mean field theory, dynamics and perturbation expansion within the same theoretical framework. Particular emphasis is given to the connections between different approaches such as statics vs. dynamics, microscopic vs. phenomenological models. The book introduces some useful and little known techniques in statistical mechanics and field theory including multiple Legendre transforms, supersymmetry, Fourier transforms on a tree, infinitesimal permutations and Ward Takahashi identities. This book will be of great interest to graduate students and researchers in statistical physics and basic field theory.

Information, communication, circuits

Arnaldo GARCIA, Henning STICHTENOTH, (Editors). — **Topics in geometry, coding theory and cryptography.** — Algebra and applications, vol. 6. — Un vol. relié, 16,5×25, de X, 200 p. — ISBN 1-4020-5333-9. — Prix: €79.95. — Springer, Dordrecht, 2007.

The theory of algebraic function fields over finite fields has its origins in number theory. However, after Goppa's discovery of algebraic geometry codes around 1980, many applications of function fields were found in different areas of mathematics and information theory, such as coding theory, sphere packings and lattices, sequence design, and cryptography. The use of function fields often led to better results than those of classical approaches. This book presents survey articles on some of these new developments. Most of the material is directly related to the interaction between function fields and their various applications; in particular the structure and the number of rational places of function fields are of great significance. The topics focus on material which has not yet been presented in other books or survey articles. Wherever applications are pointed out, a special effort has been made to present some background concerning their use.