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BULLETIN BIBLIOGRAPHIQUE

Généralités

Michèle AUDIN. — **Souvenirs sur Sofia Kovalevskaya**. — Un vol. relié, 20×26, de IX, 286 p. — ISBN 978-2-91-635205-3. — Prix: •42.00. — Calvage & Mounet, Paris, 2008.

Lorsqu'elle meurt à Stockholm en 1891, Sofia Kovalevskaya n'a que 41 ans. Elle a pourtant eu une vie d'une rare intensité. Ses études, puis sa carrière scientifique, l'auront conduite, de Moscou à Berlin, Paris ou Stockholm, à travers l'Europe. Elle aura soutenu une thèse de mathématiques, été nommée professeur d'université, édité une importante revue, écrit des livres, milité pour la cause des femmes, élevé sa fille... Aujourd'hui presque classique, un tel parcours était à l'époque hors du commun. Un peu plus d'un siècle plus tard, Michèle Audin, elle-même mathématicienne, universitaire et écrivain, retrace la vie exceptionnelle de cette femme exceptionnelle, avec un respect, une admiration et une affection qui ne peuvent qu'emporter l'adhésion des lecteurs. Avec elle, ils partageront les passions et les indignations de Sophie, ils se plongeront dans le monde qui l'entourait. Ils découvriront aussi ses mathématiques. Michèle Audin n'hésite pas, en effet, à nous exposer en détail les questions que Sophie a traitées, donnant ainsi aux amateurs de mathématiques de quoi alimenter leur passion. Quant aux autres, qui omettront peut-être certains passages trop techniques, ils ne se sentiront jamais laissés à l'écart. Avec une rare exigence de rigueur, alliée à un grand talent de conteuse, Michèle Audin nous offre une authentique œuvre d'historien, un grand témoignage humain et un récit captivant.

Edward J. BARBEAU, Peter J. TAYLOR, (Editors). — **Challenging mathematics in and beyond the classroom: the 16th ICMI study**. — New ICMI Study Series, vol. 12. — Un vol. relié, 16×24,5, de XIII, 336 p. — ISBN 978-0-387-09602-5. — Prix: •93.04. — Springer, New York, 2009.

The last two decades have seen significant innovation both in classroom teaching and in the public presentation of mathematics. Much of this has centered on the use of contests, exhibitions and investigations, including the use of technology, designed to capture interest, challenge the intellect and encourage a more robust understanding of mathematical ideas and processes. ICMI Study 16 was commissioned to review these developments and describe experiences around the globe in different contexts, systematize the area, examine the effectiveness of the use of challenges

and set the stage for future study and development. A prestigious group of international researchers, with collective experience in innovative classroom practice, contests and rallies of every level and description, as well as public presentation of mathematics, contributed to this effort. The result, *Challenging Mathematics In and Beyond the Classroom*, deals with challenges for both gifted as regular students, and with building public interest in appreciation of mathematics.

Mohamed BOUCETTA. — **Dualité, formes quadratiques, formes hermitiennes.** — Bien débiter en mathématiques. — Un vol. relié, 14,5×20,5, de 150 p. — ISBN 978-2-85428-888-9. — Prix: •17.00. — Cépaduès-Editions, Toulouse, 2009.

Cet ouvrage traite de quelques grands thèmes d'algèbre linéaire et multilinéaire: dualité, formes quadratiques, espaces préhilbertiens réels et complexes, espaces euclidiens. Il s'adresse aux étudiants de premières années d'Université (L2, L3), des Classes Préparatoires aux Grandes Écoles, ainsi qu'aux étudiants qui préparent le C.A.P.E.S. de Mathématiques. Il 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. 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. Le texte est agrémenté de pages historiques, qui replacent les résultats énoncés dans leur contexte.

Jean-Jacques COLIN. — **Intégration, calcul des primitives.** — Bien débiter en mathématiques. — Un vol. relié, 14,5 x 20,5, de VI, 133 p. — ISBN 978-2-85428-892-6. — Prix: •17.00. — Cépaduès-Editions, Toulouse, 2009.

Cet ouvrage expose la théorie de l'intégration des fonctions continues par morceaux sur un segment, et se prolonge par un tour d'horizon sur les différentes méthodes élémentaires de calcul des primitives. Il s'adresse essentiellement aux étudiants de premières années d'université (L1, L2, L3), des classes préparatoires aux Grandes Écoles, ainsi qu'aux étudiants qui préparent le C.A.P.E.S. de Mathématiques. Il 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. Les rappels de cours et les exercices sont agrémentés de pages historiques, qui replacent les résultats énoncés dans leur contexte. 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.

Michele EMMER, (Editor). — **Mathematics and culture VI.** — Un vol. relié, 16×24, de IX, 299 p. — ISBN 978-3-540-87568-0. — Prix: •49.95. — Springer, Berlin, 2009.

The new volume in the series *Mathematics and Culture* continues a journey that began in 1998, a quest to describe the interplay of influences between the world of mathematics and the worlds of art, cinema, theatre and history, medicine, biology and aeronautics. The series editor, Michele Emmer, has chosen a new collection of essays that cast light on these connections in new, surprising and fascinating ways. *Mathematics and Culture VI* includes: A homage to the artist Mario Merz, some of whose work depicted numbers derived from the Fibonacci in curving neon arrays. — Essays probing the relationships of mathematics with the moving images of video and cinema; the complex connections between mathematics and psychoanalysis and new frontiers of applied mathematics. — Chapters entitled Mathematics and cartoon; Mathematics and art; Mathematics and cinema, and Mathematics and wine, offering the observations of an international group of thinkers, writers and researchers across a broad spectrum of disciplines. — A stimulating section following the journeys of Marco Polo, and exploring the Venice that both

set him on his travels and welcomed him back, traverses not just miles but culture and science. — Written for both mathematicians, for teachers, students and researchers, and a broad audience of readers with an interest in the history of ideas, this book offers an excellent starting point for research into the tightly woven bonds between scientific and cultural endeavour.

Roland GROUX, Philippe SOULAT. — **Les fonctions spéciales vues par les problèmes.** — Pratiques mathématiques. — Un vol. relié, 14,5×20,5, de 325 p. — ISBN 978-2-85428-898-8. — Prix: •26.00. — Cépaduès- Editions, Toulouse, 2009.

Ce manuel présente, sous forme de problèmes entièrement corrigés, les fonctions spéciales les plus courantes de l'Analyse Mathématique. Pour chacune d'elles l'étude débute en général par une approche élémentaire, dans le domaine réel. Puis on dégage les formules clefs et les différentes représentations avant d'aborder les prolongements analytiques classiques sur le domaine complexe. Enfin des compléments précisent les applications diverses. Pour faciliter cette étude, une première partie du livre expose les outils indispensables pour une bonne compréhension des sujets: séries de Fourier, séries entières, problèmes de Cauchy Lipschitz et de Sturm Liouville, transformée de Laplace, fonctions holomorphes et intégrales sur un chemin complexe. Cette partie théorique, conformément à l'esprit de la collection Pratiques mathématiques, est aussi présentée sous forme de problèmes détaillés allant droit à l'essentiel en éclairant les démonstrations des théorèmes clefs. Après cette présentation des pré requis nécessaires, la seconde partie du manuel développe les différents problèmes. Un regroupement par familles permet de dégager les unités structurelles: solutions des équations de type hypergéométrique (Bessel, Hankel, Kummer, Airy); fonctions d'Euler (Gamma, digamma, Bêta, Zêta); polylogarithmes et fonctions usuelles intégrales, fonctions elliptiques. Le tout donne un ouvrage synthétique, ouvrant des fenêtres sur des domaines divers, idéal pour une initiation aux techniques essentielles de l'Analyse et un entraînement en vue de concours tels que CAPES, Agrégation de Mathématiques ou admissions en écoles d'Ingénieurs.

Daniel GUIN, Thomas HAUSBERGER. — **Algèbre, tome 1: groupes, corps et théorie de Galois.** — Collection enseignement SUP. — Un vol. relié, 17×24, de XX, 457 p. — ISBN 978-2-86883-974-9. — Prix: •37.00. — EDP Sciences, Les Ulis, 2008.

Ce livre s'adresse aux étudiants de licence ou master de mathématiques (L3–M1) et à ceux qui préparent le Capes ou l'agrégation. Il traite de la théorie des groupes, de la théorie des corps et d'un de leurs points communs essentiels, la théorie de Galois des extensions finies. Chacune de ces théories est présentée en détails, depuis les définitions de base jusqu'à des résultats très élaborés. On y présente de nombreuses applications comme, par exemple, les problèmes de constructions à la règle et au compas (quadrature du cercle, trisection de l'angle, duplication du cube), polygones réguliers, ainsi que la résolution par radicaux des équations polynomiales. Les chapitres sont, pour la plupart, suivis de thèmes de réflexion (TR) et de travaux pratiques de "mathématiques assistées par ordinateurs" (TP). Ces TR et TP permettent d'étudier en profondeur des notions qui illustrent ou complètent le cours.

Gilbert MONNA. — **Problèmes corrigés et commentés de mathématiques, algèbre linéaire et euclidienne.** — Bien débiter en mathématiques. — Un vol. relié, 14,5×20,5, de 151 p. — ISBN 978-2-85428-882-7. — Prix: •17.00. — Cépaduès-Editions, Toulouse, 2009.

Cet ouvrage est un recueil de problèmes d'algèbre linéaire et euclidienne qui s'adresse aux étudiants de deuxième et troisième année d'Université, des classes préparatoires aux Grandes Écoles, ainsi qu'aux étudiants qui préparent le C.A.P.E.S. de Mathématiques. L'auteur y aborde la réduction des endomorphismes, l'étude des formes multilinéaires, et celle des espaces euclidiens. Chaque problème est soigneusement corrigé, commenté, et se trouve précédé de rappels de cours indispensables à sa résolution. Certains problèmes sont relativement simples, d'autres sont plus

déliçats, et offrent au lecteur la possibilité de faire une synthèse des connaissances qu'il a acquises au cours de ses études. Il pourra ainsi tester son niveau et constater ses progrès. Le texte est agrémenté de pages historiques, qui replacent les résultats énoncés dans leur contexte.

Hermann WEYL. — **Mind and nature: selected writings on philosophy, mathematics and physics.** — Edited and with an introduction by Peter PESIC. — Un vol. relié, 16,5×24, de 261 p. — ISBN 978-0-691-13545-8. — Prix: £24.95. — Princeton University Press, Princeton, 2009.

Hermann Weyl (1885–1955) was one of the twentieth century's most important mathematicians, as well a seminal figure in the development of quantum physics and general relativity. He was also an eloquent writer with a lifelong interest in the philosophical implications of the startling new scientific developments with which he was so involved. *Mind and Nature* is a collection of Weyl's most important general writings on philosophy, mathematics and physics, including pieces that have never before been published in any language or translated into English, or that have long been out of print. Complete with Peter Pesic's introduction, notes and bibliography, these writings reveal an unjustly neglected dimension of a complex and fascinating thinker. In addition, the book includes more than twenty photographs of Weyl and his family and colleagues, many of which are previously unpublished. Included here are Weyl's exposition of his important synthesis of electromagnetism and gravitation, which Einstein at first hailed as "a first-class stroke of genius"; two little-known letters by Weyl and Einstein from 1922 that give their contrasting views on the philosophical implications of modern physics; and an essay on time that contains Weyl's argument that the past is never completed and the present is not a point. Also included are two book-length series of lectures, *The Open World* (1932) and *Mind and Nature* (1934), each a masterly exposition of Weyl's views on a range of topics from modern physics and mathematics. Finally, four retrospective essays from Weyl's last decade give his final thoughts on the interrelations among mathematics, philosophy, and physics, intertwined with reflections on the course of his rich life.

Analyse combinatoire

Jorgen BANG-JENSEN, Gregory GUTIN. — **Digraphs: theory, algorithms and applications.** — Second edition. — Springer monographs in mathematics. — Un vol. relié, 16,5×24, de XXII, 795 p. — ISBN 978-1-84800-997-4. — Prix: •99.95. — Springer, London, 2009.

The theory of directed graphs has developed enormously over recent decades, yet this book (first published in 2000) remains the only book to cover more than a small fraction of the results. New research in the field has made a second edition a necessity. Substantially revised, reorganised and updated, the book now comprises eighteen chapters, carefully arranged in a straightforward and logical manner, with many new results and open problems. As well as covering the theoretical aspects of the subject, with detailed proofs of many important results, the authors present a number of algorithms, and whole chapters are devoted to topics such as branchings, feedback arc and vertex sets, connectivity augmentations, sparse subdigraphs with prescribed connectivity, and also packing, covering and decompositions of digraphs. Throughout the book, there is a strong focus on applications which include quantum mechanics, bioinformatics, embedded computing, and the travelling salesman problem. Detailed indices and topic-oriented chapters ease navigation, and more than 650 exercises, 170 figures and 150 open problems are included to help immerse the reader in all aspects of the subject. *Digraphs* is an essential, comprehensive reference for undergraduate and graduate students, and researchers in mathematics, operations research and computer science. It will also prove invaluable to specialists in related areas, such as meteorology, physics and computational biology.

Jack KOOLEN, Jin Ho KWAK, Ming-Yao XU, (Editors). — **Applications of group theory to combinatorics: selected papers from the Com²MaC Conference on Applications of Group Theory to Combinatorics, Pohang, Korea, 9–12 July 2007.** — Un vol. relié, 18×25,5, de X, 181 p. — ISBN 978-0-415-47184-8. — Prix: US\$144.95. — CRC Press, Boca Raton, Florida, 2008.

Applications of Group Theory to Combinatorics contains 11 survey papers from international experts in combinatorics, group theory and combinatorial topology. The contributions cover topics from quite a diverse spectrum, such as design theory, Belyi functions, group theory, transitive graphs, regular maps, and Hurwitz problems, and present the state-of-the-art in these areas. *Applications of Group Theory to Combinatorics* will be useful in the study of graphs, maps and polytopes having maximal symmetry, and is aimed at researchers in the areas of group theory and combinatorics, graduate students in mathematics, and other specialists who use group theory and combinatorics.

Théorie des nombres

B. LANDMAN, M.B. NATHANSON, J. NEŠETŘIL, R.J. NOWAKOWSKI, C. POMERANCE, A. ROBERTSON, (Editors). — **Combinatorial number theory: proceedings of the ‘Integers Conference 2007’, Carrollton, Georgia, USA, October 24–27, 2007.** — Un vol. relié, 18×24,5 de VIII, 204 p. — ISBN 978-3-11-020221-2. — Prix: •130.79. — Walter de Gruyter, Berlin, 2009.

George E. Andrews: The finite Heine transformation. — Tsz Ho Chan: Finding almost squares III. — Dennis Eichhorn, Mizan R. Khan, Alan H. Stein, Christian L. Yankov: Sums and differences of the coordinates of points on modular hyperbolas. — David Garth, Joseph Palmer, Ha Ta: Self generating sets and numeration systems. — Neil Hindman: Small sets satisfying the central sets theorem. — Brian Hopkins: Column-to-row operations on partitions: the envelopes. — Xian-Jin Li: On the Euler product of some zeta functions. — Florian Luca, Carl Pomerance: On the range of the iterated Euler function. — Gretchen L. Matthews: Frobenius numbers of generalized Fibonacci semigroups. — James McLaughlin, Andrew V. Sills: Combinatorics of Ramanujan-Slater type identities. — Ken Ono: A mock theta function for the delta-function. — Ram Krishna Pandey, Amitabha Tripathi: On the density of integral sets with missing differences. — Carl Pomerance, Igor E. Shparlinski: On pseudosquares and pseudopowers. — Frank Thorne: Maier matrices beyond \mathbf{Z} . — Tomohiro Yamada: Linear equations involving iterates of $\sigma(N)$. — Paul Yiu, K.R.S. Sastry, Shanzhen Gao: Heron sequences and their modifications.

Géométrie algébrique

Ilya ITENBERG, Grigory MIKHALKIN, Eugenii SHUSTIN. — **Tropical algebraic geometry.** — Second edition. — Oberwolfach Seminars, vol. 35. — Un vol. broché, 17×24, de VIII, 104 p. — ISBN 978-3-0346-0047-7. — Prix: SFr. 34.90. — Birkhäuser, Basel, 2009.

Tropical geometry is algebraic geometry over the semifield of tropical numbers, i.e., the real numbers and negative infinity enhanced with the $(\max, +)$ -arithmetics. Geometrically, tropical varieties are much simpler than their classical counterparts. Yet they carry information about complex and real varieties. These notes present an introduction to tropical geometry and contain some applications of this rapidly developing and attractive subject. The book consists of three chapters which complete each other and give a possibility for non-specialists to take the

first steps in the subject which is not yet well represented in the literature. The intended audience is graduate, post-graduate, and Ph.D. students as well as established researchers in mathematics.

Algèbre linéaire et multilinéaire, théorie des matrices

Henri ROUDIER. — **Algèbre linéaire: cours & exercices, CAPES & agrégations, internes & externes.** — Troisième édition revue et augmentée. — Un vol. broché, 17×24, de XVII, 750 p. — ISBN 978-2-7117-2485-7. — Prix: •55.00. — Vuibert, Paris, 2008.

Ce manuel devenu classique s'adresse aux étudiants de Licence et de Master comme aux élèves des classes préparatoires aux grandes écoles, ainsi qu'aux candidats qui préparent le CAPES ou l'agrégation. On verra que le calcul et les applications sont exposés le plus tôt possible puis, lorsque la pratique montre qu'il n'est plus possible de faire autrement, on aborde les concepts. Les onze premiers chapitres guideront le lecteur jusqu'au théorème du rang et aux changements de base. Opérations élémentaires, matrices échelonnées, algorithme du pivot, calcul dans une algèbre, résolution des systèmes linéaires y jouent un rôle essentiel. Viennent ensuite des chapitres plus abstraits où l'on reprend les concepts précédents dans un cadre théorique. Les chapitres consacrés à la théorie de la réduction sont centrés sur le concept de polynôme minimal, la théorie des facteurs invariants et la réduction de Jordan. Enfin, les derniers chapitres — consacrés à la théorie élémentaire des espaces vectoriels euclidiens — fournissent une petite introduction à la théorie des formes bilinéaires symétriques. L'ouvrage est complété par une série d'études portant sur des notions qui interviennent dans plusieurs chapitres. Tous les exercices sont corrigés et les algorithmes sont décrits dans un "langage universel" qu'il est facile d'adapter aux langages conventionnels.

Anneaux et algèbres

Mike PREST. — **Purity, spectra and localisation.** — Encyclopedia of mathematics and its applications, vol. 121. — Un vol. relié, 16,5×24, de XXVIII, 769 p. — ISBN 978-0-521-87308-6. — Prix: £85.00. — Cambridge University Press, Cambridge, 2009.

This book is an account of a fruitful interaction between algebra, mathematical logic, and category theory. It is possible to associate a topological space to the category of modules over any ring. This space, the Ziegler spectrum, is based on the indecomposable pure-injective modules. Although the Ziegler spectrum arose within the model theory of modules and plays a central role in that subject, this book concentrates on its algebraic aspects and uses. The central aim is to understand modules and the categories they form through associated structures and dimensions which reflect the complexity of these, and similar, categories. The structures and dimensions considered arise through the application of ideas and methods from model theory and functor category theory. Purity and associated notions are central, localisation is an ever-present theme and various types of spectrum play organising roles. This book presents a unified account of material which is often presented from very different viewpoints and it clarifies the relationship between these various approaches. It may be used as an introductory graduate-level text, since it provides relevant background material and a wealth of illustrative examples. An extensive index and thorough referencing also make this book an ideal, comprehensive reference.

Théorie des groupes et généralisations

John RHODES, Benjamin STEINBERG. — **The q -theory of finite semigroups.** — Springer monographs in mathematics. — Un vol. relié, 16,5×24,5, de XVIII, 666 p. — ISBN 978-0-387-09780-0. — Prix: •66.95. — Springer, New York, 2009.

Discoveries in finite semigroups have influenced several mathematical fields, including theoretical computer science, tropical algebra via matrix theory with coefficients in semirings, and other areas of modern algebra. This comprehensive, encyclopedic text will provide the reader — from the graduate student to the researcher/practitioner — with a detailed understanding of modern finite semigroup theory, focusing in particular on advanced topics on the cutting edge of research. — *Key features*: Develops q -theory, a new theory that provides a unifying approach to finite semigroup theory via quantization; contains the only contemporary exposition of the complete theory of the complexity of finite semigroups; introduces spectral theory into finite semigroup theory; develops the theory of profinite semigroups from first principles, making connections with spectra of Boolean algebras of regular languages; presents over 70 research problems, most new, and hundreds of exercises. — *Additional features*: For newcomers, an appendix on elementary finite semigroup theory; extensive bibliography and index. *The q -Theory of Finite Semigroups* presents important techniques and results, many for the first time in book form, and thereby updates and modernizes the literature of semigroup theory.

Sándor SZABÓ, Arthur D. SANDS. — **Factoring groups into subsets.** — Lecture notes in pure and applied mathematics, vol. 257. — Un vol. broché, 16×23,5, de XV, 269 p. — ISBN 978-1-4200-9046-8. — Prix: US\$179.95. — CRC Press, Boca Raton, Florida, 2009.

Decomposing an Abelian group into a direct sum of its subsets leads to results that can be applied to a variety of areas, such as number theory, geometry of tilings, coding theory, cryptography, graph theory, and Fourier analysis. Focusing mainly on cyclic groups, *Factoring Groups into Subsets* explores the factorization theory of Abelian groups. The book first shows how to construct new factorizations from old ones. The authors then discuss nonperiodic and periodic factorizations, quasiperiodicity, and the factoring of periodic subsets. They also examine how tiling plays an important role in number theory. The next several chapters cover factorizations of infinite Abelian groups; combinatorics, such as Ramsey numbers, Latin squares, and complex Hadamard matrices; and connections with codes, including variable length codes, error correcting codes, and integer codes. The final chapter deals with several classical problems of Fuchs. Encompassing many of the main areas of factorization theory, this book explores problems in which the underlying factored group is cyclic. — *Features*: Discusses the classification of cyclic groups with periodic factorizations and non-full-rank factorizations; covers quasiperiodicity and the factoring of the group of integers; provides a self-contained treatment of the more general theory of factorization so practitioners do not have to immerse themselves in the details of the full generality; presents applications to variable length codes and integer codes.

Fonctions de variables réelles

George A. ANASTASSIOU. — **Fractional differentiation inequalities.** — Un vol. relié, 16,5×24, de XIV, 675 p. — ISBN 978-0-387-98127-7. — Prix: •106.95. — Springer, New York, 2009.

Fractional differentiation inequalities are by themselves an important area of research. They have many applications in pure and applied mathematics and many other applied sciences. One of the most important applications is in establishing the uniqueness of a solution in fractional differential equations and systems and in fractional partial differential equations. They also provide

upper bounds to the solutions of the above equations. In this book the author presents the Opial, Poincaré, Sobolev, Hilbert, and Ostrowski fractional differentiation inequalities. Results for the above are derived using three different types of fractional derivatives, namely by Canavati, Riemann-Liouville and Caputo. The univariate and multivariate cases are both examined. Each chapter is self-contained. The theory is presented systematically along with the applications. The application to information theory is also examined. This monograph is suitable for researchers and graduate students in pure mathematics. Applied mathematicians, engineers, and other applied scientists will also find this book useful.

Asen L. DONTCHEV, R. Tyrrell ROCKAFELLAR. — **Implicit functions and solution mappings: a view from variational analysis.** — Springer monographs in mathematics. — Un vol. relié, 16,5×24, de XII, 375 p. — ISBN 978-0-387-87820-1. — Prix: •64.15. — Springer, New York, 2009.

The implicit function theorem is one of the most important theorems in analysis and its many variants are basic tools in partial differential equations and numerical analysis. This book treats the implicit function paradigm in the classical framework and beyond, focusing largely on properties of solution mappings of variational problems. The purpose of this self-contained work is to provide a reference on the topic and to present a unified collection of a number of results which are currently scattered throughout the literature. The first chapter of the book treats the classical implicit function theorem in a way that will be useful for students and teachers of undergraduate calculus. The remaining part becomes gradually more advanced, and considers implicit mappings defined by relations other than equations, e.g., variational problems. Applications to numerical analysis and optimization are also provided. This valuable book is a major achievement and is sure to become a standard reference on the topic.

Teodira-Liliana T. RĂDULESCU, Vicențiu D. RĂDULESCU, Titu ANDREESCU. — **Problems in analysis: advanced calculus on the real axis.** — Un vol. broché, 15,5×23,5, de XX, 452 p. — ISBN 978-0-387-77378-0. — Prix: •59.95. — Springer, New York, 2009.

Problems in Real Analysis: Advanced Calculus on the Real Axis features a comprehensive collection of challenging problems in mathematical analysis that aim to promote creative, non-standard techniques for solving problems. This self-contained text offers a host of new mathematical tools and strategies which develop a connection between analysis and other mathematical disciplines, such as physics and engineering. A broad view of mathematics is presented throughout; the text is excellent for the classroom or self-study. It is intended for undergraduate and graduate students in mathematics, as well as for researchers engaged in the interplay between applied analysis, mathematical physics, and numerical analysis. — *Key features:* Uses competition-inspired problems as a platform for training typical inventive skills; develops basic valuable techniques for solving problems in mathematical analysis on the real axis and provides solid preparation for deeper study of real analysis; includes numerous examples and interesting, valuable historical accounts of ideas and methods in analysis; offers a systematic path to organizing a natural transition that bridges elementary problem-solving activity to independent exploration of new results and properties.

Fonctions d'une variable complexe

Eberhard FREITAG, Rolf BUSAM. — **Complex analysis.** — Second edition. — Universitext. — Un vol. broché, 15,5×23,5, de X, 532 p. — ISBN 978-3-540-93982-5. — Prix: •44.95. — Springer, Berlin, 2009.

The idea of this book is to give an extensive description of the classical complex analysis; here “classical” means roughly that sheaf theoretical and cohomological methods are omitted. The first four chapters cover the essential core of complex analysis presenting their fundamental results. After this standard material, the authors step forward to elliptic functions and to elliptic modular functions including a taste of all most beautiful results of this field. The book is rounded by applications to analytic number theory including distinguished pearls of this fascinating subject as for instance the prime number theorem. Great importance is attached to completeness, all needed notions are developed, only minimal prerequisites (elementary facts of calculus and algebra) are required. More than 400 exercises including hints for solutions and many figures make this an attractive, indispensable book for students who would like to have a sound introduction to classical complex analysis. For the second edition the authors have revised the text carefully.

Théorie du potentiel

Lester L. HELMS. — **Potential theory.** — Universitext. — Un vol. broché, 15,5×23,5, de XI, 441 p. — ISBN 978-1-84882-318-1. — Prix: •59.95. — Springer, London, 2009.

Aimed at graduate students and researchers in mathematics, physics, and engineering, this book presents a clear path from calculus to classical potential theory and beyond with the aim of moving the reader into a fertile area of mathematical research as quickly as possible. The author revises and updates material from his classic work, *Introduction to Potential Theory* (1969), to provide a modern text that introduces all the important concepts of classical potential theory. In the first half of the book, the subject matter is developed meticulously from first principles using only calculus. Commencing with the inverse square law for gravitational and electromagnetic forces and the divergence theorem of the calculus, the author develops methods for constructing solutions of Laplace’s equation on a region with prescribed values on the boundary of the region. The second half addresses more advanced material aimed at those with a background of a senior undergraduate or beginning graduate course in real analysis. For specialized regions, namely spherical caps, solutions of Laplace’s equation are constructed having prescribed normal derivatives on the flat portion of the boundary and prescribed values on the remaining portion of the boundary. By means of transformations known as diffeomorphisms, these solutions are morphed into local solutions on regions with curved boundaries. The Perron-Wiener-Brelot method is then used to construct global solutions for elliptic partial differential equations involving a mixture of prescribed values of a boundary differential operator on part of the boundary and prescribed values on the remainder of the boundary.

Équations aux dérivées partielles

Serge ALINHAC. — **Hyperbolic partial differential equations.** — Universitext. — Un vol. broché, 16×23,5, de XI, 150 p. — ISBN 978-0-387-87822-5. — Prix: •53.45. — Springer, New York, 2009.

This excellent introduction to hyperbolic partial differential equations is devoted to linear equations and symmetric systems, as well as conservation laws. The book is divided into two parts. The first, which is intuitive and easy to visualize, includes all aspects of the theory involving vector fields and integral curves; the second describes the wave equation and its perturbations for two or three-space dimensions. Over 100 exercises are included, as well as “do it yourself” instructions for the proofs of many theorems. Only an understanding of differential calculus is required. Notes at the end of the self-contained chapters, as well as references at the end of the book, enable ease-of-use for both the student and the independent researcher.

Systèmes dynamiques et théorie ergodique

Vladimir ANASHIN, Andrei KHRENNIKOV. — **Applied algebraic dynamics**. — De Gruyter expositions in mathematics, vol. 49. — Un vol. relié, 18×24,5, de XXIV, 533 p. — ISBN 978-3-11-020300-4. — Prix: •93.41. — Walter de Gruyter, Berlin, 2009.

This monograph presents recent developments in the theory of algebraic dynamical systems and their applications to computer science, cryptography, psychology, quantum theory, genetics and numerical simulations. The most important mathematical results presented in this book are in the fields of p -adic ergodic theory and of ergodic theory on groups, providing the basis for the considered applications. This book is of interest to graduate students and researchers working in one of the areas above. — *From the contents*: Algebraic and number-theoretic background. — Dynamics on algebraic structures. — p -adic analysis. — p -adic ergodic theory. — Asymptotic distribution of cycles. — Basics of polynomial dynamics on groups. — Ergodic polynomials over groups with operators. — Automata, computers, combinatorics. — Pseudorandom numbers. — Stream ciphers. — Structure of trajectories. — p -adic probability theory. — p -adic valued quantization. — m -adic modeling in cognitive science and psychology. — Neuronal hierarchy behind the ultrametric mental space. — Gene expression from dynamics in the 2-adic space. — Genetic code on the dyadic plane.

Luis BARREIRA. — **Dimension and recurrence in hyperbolic dynamics**. — Progress in mathematics, vol. 272. — Un vol. relié, 16,5×24, de XIV, 300 p. — ISBN 978-3-7643-8881-2. — Prix: SFr. 89.90. — Birkhäuser, Basel, 2008.

The main objective of this book is to give a broad unified introduction to the study of dimension and recurrence in hyperbolic dynamics. It includes the discussion of the foundations, main results, and main techniques in the rich interplay of four main areas of research: hyperbolic dynamics, dimension theory, multifractal analysis, and quantitative recurrence. It also gives a panorama of several selected topics of current research interest. More than half of the material appears here for the first time in book form, describing many recent developments in the area such as topics on irregular sets, variational principles, applications to number theory, measures of maximal dimension, multifractal nonrigidity, and quantitative recurrence. All the results are included with detailed proofs, many of them simplified or rewritten on purpose for the book. The text is self-contained and is directed to researchers as well as graduate students who wish to have a global view of the theory together with a working knowledge of its main techniques. It should also be useful as a basis for graduate courses in dimension theory of dynamical systems, multifractal analysis, and quantitative recurrence in hyperbolic dynamics.

Stephen L. CAMPBELL, Richard HABERMAN. — **Introduction to differential equations with dynamical systems**. — Un vol. relié, 18,5×26,5, de XIII, 430 p. — ISBN 978-0-691-12474-2. — Prix: £68.00. — Princeton University Press, Princeton, 2008.

Many textbooks on differential equations are written to be interesting to the teacher rather than the student. *Introduction to Differential Equations With Dynamical Systems* is directed toward students. This concise and up-to-date textbook addresses the challenges that undergraduate mathematics, engineering, and science students experience during a first course on differential equations. And, while covering all the standard parts of the subject, the book emphasizes linear constant coefficient equations and applications, including the topics essential to engineering students. Stephen Campbell and Richard Haberman — using carefully worded derivations, elementary explanations, and examples, exercises, and figures rather than theorems and proofs — have written a book that makes learning and teaching differential equations easier and more relevant. The book also presents elementary dynamical systems in a unique and flexible way that is suitable for all courses, regardless of length. A student solutions manual is available at press.princeton.edu.

Jean-Marc GINOUX. — **Differential geometry applied to dynamical systems.** — World Scientific series on nonlinear science. Series A, vol. 66. — Un vol. relié, 16×23,5, de XXVII, 312 p., 1 CD-ROM. — ISBN 978-981-4277-14-3. — Prix: £64.00. — World Scientific, Singapore, 2009.

This book aims to present a new approach called flow curvature method that applies differential geometry to dynamical systems. Hence, for a trajectory curve, an integral of any n -dimensional dynamical system as a curve in Euclidean n -space, the curvature of the trajectory – or the flow – may be analytically computed. Then, the location of the points where the curvature of the flow vanishes defines a manifold called flow curvature manifold. Such a manifold being defined from the time derivatives of the velocity vector field, contains information about the dynamics of the system, hence identifying the main features of the system such as fixed points and their stability, local bifurcations of codimension one, center manifold equation, normal forms, linear invariant manifolds (straight lines, planes, hyperplanes). In the case of singularly perturbed systems or slow-fast dynamical systems, the flow curvature manifold directly provides the slow invariant manifold analytical equation associated with such systems. Also, starting from the flow curvature manifold, it will be demonstrated how to find again the corresponding dynamical system, thus solving the inverse problem.

Équations aux différences finies, équations fonctionnelles

Pl. KANNAPPAN. — **Functional equations and inequalities with applications.** — Springer monographs in mathematics. — Un vol. relié, 16×24, de XXIII, 810 p. — ISBN 978-0-387-89491-1. — Prix: •129.95. — Springer, Dordrecht, 2009.

Functional Equations and Inequalities With Applications presents a comprehensive, nearly encyclopedic, study of the classical topic of functional equations. Nowadays, the field of functional equations is an ever-growing branch of mathematics with far-reaching applications; it is increasingly used to investigate problems in mathematical analysis, combinatorics, biology, information theory, statistics, physics, the behavioral sciences, and engineering. This self-contained monograph explores all aspects of functional equations and their applications to related topics, such as differential equations, integral equations, the Laplace transformation, the calculus of finite differences, and many other basic tools in analysis. Each chapter examines a particular family of equations and gives an in-depth study of its applications as well as examples and exercises to support the material. The book is intended as a reference tool for any student, professional (researcher), or mathematician studying in a field where functional equations can be applied. It can also be used as a primary text in a classroom setting or for self-study. Finally, it could be an inspiring entrée into an active area of mathematical exploration for engineers and other scientists who would benefit from this careful, rigorous exposition.

Analyse de Fourier, analyse harmonique abstraite

Valery V. VOLCHKOV, Vitaly V. VOLCHKOV. — **Harmonic analysis of mean periodic functions on symmetric spaces and the Heisenberg group.** — Springer monographs in mathematics. — Un vol. relié, 16,5×24, de XI, 671 p. — ISBN 978-1-84882-532-1. — Prix: •106.95. — Springer, London, 2009.

This book presents the first systematic and unified treatment of the theory of mean periodic functions on homogeneous spaces. This area has its classical roots in the beginning of the twentieth century and is now a very active research area, having close connections to harmonic analysis, complex analysis, integral geometry, and analysis on symmetric spaces. The main

purpose of this book is the study of local aspects of spectral analysis and spectral synthesis on Euclidean spaces, Riemannian symmetric spaces of an arbitrary rank and Heisenberg groups. The subject can be viewed as arising from three classical topics: John's support theorem, Schwartz's fundamental principle, and Delsarte's two-radii theorem. Highly topical, the book contains most of the significant recent results in this area with complete and detailed proofs. In order to make this book accessible to a wide audience, the authors have included an introductory section that develops analysis on symmetric spaces without the use of Lie theory. Challenging open problems are described and explained, and promising new research directions are indicated. Designed for both experts and beginners in the field, the book is rich in methods for a wide variety of problems in many areas of mathematics.

Géométrie

John H. CONWAY, Heidi BURGIEL, Chaim GOODMAN-STRAUSS. — **The symmetries of things.** — Un vol. relié, 20×24,5, de XV, 426 p. — ISBN 978-1-56881-220-5. — Prix: US\$75.00. — A. K. Peters, Wellesley, Massachusetts, 2008.

Start with a single shape. Repeat it in some way – translation, reflection over a line, rotation around a point – and you have created symmetry. Symmetry is a fundamental phenomenon in art, science, and nature that has been captured, described, and analyzed using mathematical concepts for a long time. Inspired by the geometric intuition of Bill Thurston and empowered by his own analytical skills, John Conway, together with his coauthors, has developed a comprehensive mathematical theory of symmetry that allows the description and classification of symmetries in numerous geometric environments. This richly and compellingly illustrated book addresses the phenomenological, analytical, and mathematical aspects of symmetry on three levels that build on one another and will speak to interested lay people, artists, working mathematicians, and researchers.

Stanley E. PAYNE, Joseph A. THAS. — **Finite generalized quadrangles.** — Second edition. — EMS series of lectures in mathematics. — Un vol. broché, 17×24, de XI, 287 p. — ISBN 978-3-03719-066-1. — Prix: •44.00. — European Mathematical Society, Zürich, 2009.

Generalized quadrangles (GQ) were formally introduced by J. Tits in 1959 in order to describe geometric properties of simple groups of Lie type of rank 2. Since its appearance in 1984, *Finite Generalized Quadrangles* (FGQ) quickly became the standard reference for finite GQ. It presents the whole story of the subject from the very beginning in a book of modest length. This second edition is essentially a reprint of the first edition. It is a careful rendering into \LaTeX of the original, along with an appendix that brings to the attention of the reader those major new results pertaining to GQ, especially in those areas to which the authors of this work have made a contribution. The first edition being out of print for many years, the new edition makes again available this classical reference in the rapidly increasing field of finite geometries.

Géométrie différentielle

Jesús A. ÁLVAREZ LÓPEZ, Eduardo GARCÍA-RÍO, (Editors). — **Differential geometry: proceedings of the VIII International Colloquium, Santiago de Compostela, Spain, 7–11 July 2008.** — Un vol. relié, 16×23,5, de XII, 330 p. — ISBN 978-981-4261-16-6. — Prix: £79.00. — World Scientific, Singapore, 2009.

This volume contains research and expository papers on recent advances in foliations and Riemannian geometry. Some of the topics covered in this volume include topology, geometry, dynamics and analysis of foliations, curvature, submanifold theory, Lie groups, and harmonic maps. Among the contributions, readers may find an extensive survey on characteristic classes of Riemannian foliations offering also new results, an article showing the uniform simplicity of certain diffeomorphism groups, an exposition of convergences of contact structures to foliations from the point of view of Thurston's and Thurston-Bennequin's inequalities, a discussion about Fatou-Julia decompositions for foliations and a description of singular Riemannian foliations on spaces without conjugate points. Papers on submanifold theory focus on the existence of graphs with prescribed mean curvature and mean curvature flow for spacelike graphs, isometric and conformal deformations and detailed surveys on totally geodesic submanifolds in symmetric spaces, cohomogeneity one actions on hyperbolic spaces and rigidity of geodesic spheres in space forms. Geometric realizability of curvature tensors and curvature operators are also treated in this volume with special attention to the affine and the pseudo-Riemannian settings. Also, some contributions on biharmonic maps and submanifolds enrich the scope of this volume in providing an overview of different topics of current interest in differential geometry.

Alessandro DE PARIS, Alexandre VINIGRADOV. — **Fat manifolds and linear connections.** — Un vol. relié, 16,5×23,5, de XII, 297 p. — ISBN 13978-981-281-904-8. — Prix: £41.00. — World Scientific, Singapore, 2009.

The theory of connections is central not only in pure mathematics (differential and algebraic geometry), but also in mathematical and theoretical physics (general relativity, gauge fields, mechanics of continuum media). The now-standard approach to this subject was proposed by Ch. Ehresmann 60 years ago, attracting first mathematicians and later physicists by its transparent geometrical simplicity. Unfortunately, it does not extend well to a number of recently emerged situations of significant importance (singularities, supermanifolds, infinite jets and secondary calculus, etc.). Moreover, it does not help in understanding the structure of calculus naturally related with a connection. In this unique book, written in a reasonably self-contained manner, the theory of linear connections is systematically presented as a natural part of differential calculus over commutative algebras. This not only makes easy and natural numerous generalizations of the classical theory and reveals various new aspects of it, but also shows in a clear and transparent manner the intrinsic structure of the associated differential calculus. The notion of a "fat manifold" introduced here then allows the reader to build a well-working analogy of this "connections calculus" with the usual one.

Khaled SADALLAH, Abdelghani ZEGHIB, (Éditeurs). — **Géométries et dynamiques: École CIMPA – UNESCO – El-Oued, Algérie: géométries et dynamiques riemanniennes et pseudo-riemanniennes, et applications.** — Travaux en cours, n° 70. — Un vol. broché, 17×24, de IX, 351 p. — ISBN 978-2-7056-6772-6. — Prix: •64.00. — Hermann, Paris, 2008.

Cet ouvrage explore en profondeur et propose des revues détaillées des avancées les plus récentes, de quelques questions de géométries et de dynamiques comme les surfaces de Riemann, la géométrie riemannienne, les espaces homogènes, la géométrie lorentzienne et la relativité générale, les systèmes dynamiques et la cosmologie, les invariants de nœuds, les champs de vecteurs sur la sphère, les groupes d'homéomorphismes. Ce livre s'adresse aux étudiants en formation de master mathématiques, physiques ou physique mathématiques, ainsi qu'à tout chercheur et enseignant voulant approfondir ses connaissances dans ces domaines. — Les auteurs: E. Ghys, D. Smai, R. Souam, B. Kloeckner, C. Frances, T. Barbot, D. Dou, F. Béguin, T. Sari, A. Zeghib, A. Abchir, M. Belkhalifa, V. Borelli, O. Gil-Medrano et H. Hattab.

Topologie générale

Stephen HUGGETT, David JORDAN. — **A topological aperitif**. — Revised edition. — Un vol. broché, 18×23,5, de IX, 152 p. — ISBN 978-1-84800-912-7. — Prix: •26.95. — Springer, London, 2009.

This is a book of elementary geometric topology, in which geometry, frequently illustrated, guides calculation. The book starts with a wealth of examples, often subtle, of how to be mathematically certain whether two objects are the same from the point of view of topology. After introducing surfaces, such as the Klein bottle, the book explores the properties of polyhedra drawn on these surfaces. More refined tools are developed in a chapter on winding number, and an appendix gives a glimpse of knot theory. Moreover, in this revised edition, a new section gives a geometrical description of part of the classification theorem for surfaces. Several striking new pictures show how given a sphere with any number of ordinary handles and at least one Klein handle, all the ordinary handles can be converted into Klein handles. Numerous examples and exercises make this a useful textbook for a first undergraduate course in topology, providing a firm geometrical foundation for further study. For much of the book the prerequisites are slight, though, so anyone with curiosity and tenacity will be able to enjoy the *Aperitif*.

Topologie algébrique

Victor P. SNAITH. — **Stable homotopy around the Arf-Kervaire invariant**. — Progress in mathematics, vol. 273. — Un vol. relié, 16,5×24, de XIV, 239 p. — ISBN 978-3-7643-9903-0. — Prix: SFr. 105.00. — Birkhäuser, Basel, 2009.

This monograph describes important techniques of stable homotopy theory, both classical and brand new, applying them to the long-standing unsolved problem of the existence of framed manifolds with odd Arf-Kervaire invariant. Opening with an account of the necessary algebraic topology background, it proceeds in a quasi-historical manner to draw from the author's contributions over several decades. A new technique entitled "upper triangular technology" is introduced which enables the author to relate Adams operations to Steenrod operations and thereby to recover most of the important classical Arf-Kervaire invariant results quite simply. The final chapter briefly relates the book to the contemporary motivic stable homotopy theory of Morel-Voevodsky.

Tammo TOM DIECK. — **Algebraic topology**. — EMS textbooks in mathematics. — Un vol. relié, 18×24, de XI, 567 p. — ISBN 978-3-03719-048-7. — Prix: •58.00. — European Mathematical Society, Zürich, 2008.

This book is written as a textbook on algebraic topology. The first part covers the material for two introductory courses about homotopy and homology. The second part presents more advanced applications and concepts (duality, characteristic classes, homotopy groups of spheres, bordism). The author recommends starting an introductory course with homotopy theory. For this purpose, classical results are presented with new elementary proofs. Alternatively, one could start more traditionally with singular and axiomatic homology. Additional chapters are devoted to the geometry of manifolds, cell complexes and fibre bundles. A special feature is the rich supply of nearly 500 exercises and problems. Several sections include topics which have not appeared before in textbooks as well as simplified proofs for some important results. Prerequisites are standard point set topology (as recalled in the first chapter), elementary algebraic notions (modules, tensor product), and some terminology from category theory. The aim of the book is to introduce advanced undergraduate and graduate (masters) students to basic tools, concepts

and results of algebraic topology. Sufficient background material from geometry and algebra is included.

Topologie des variétés, analyse globale et analyse des variétés

Michael FARBER. — **Invitation to topological robotics.** — Zürich lectures in advanced mathematics. — Un vol. broché, 17×24, de X, 132 p. — ISBN 978-3-03719-054-8. — •32.00. — European Mathematical Society, Zürich, 2008.

The book discusses several selected topics of a new emerging area of research lying on the interface between topology and engineering. The first main topic of the book is topology of configuration spaces of mechanical linkages. These manifolds arise in various fields of mathematics and in other sciences, e.g. engineering, statistics, molecular biology. To compute Betti numbers of these configuration spaces we apply a new technique of Morse theory in the presence of an involution. A significant result of topology of linkages presented in the book is a solution of a conjecture of Kevin Walker which states that the relative sizes of bars of a linkage are determined, up to certain equivalence, by the cohomology algebra of the linkage configuration space. The book also describes a new probabilistic approach to topology of linkages which treats the bar lengths as random variables and studies mathematical expectations of Betti numbers. The second main topic of the book is topology of configuration spaces associated to polyhedra. The book gives an account of a beautiful work of S. R. Gal suggesting an explicit formula for the generating function encoding Euler characteristics of these spaces. Next we study the knot theory of a robot arm focusing on a recent important result of R. Connelly, E. Demain and G. Rote. Finally, the book investigates topological problems arising in the theory of robot motion planning algorithms and studies the homotopy invariant $TC(X)$ measuring navigational complexity of configuration spaces. The book is intended as an appetizer and will introduce the reader to many fascinating topological problems motivated by engineering.

Krzysztof GALICKI, Santiago R. SIMANCA, (Editors). — **Riemannian topology and geometric structures on manifolds.** — Progress in mathematics, vol. 271. — Un vol. relié, 16,5×24, de XVII, 290 p. — ISBN 978-0-8176-4742-1. — Prix: SFr. 175.00. — Birkhäuser, Boston, 2009.

Riemannian Topology and Geometric Structures on Manifolds results from a similarly entitled conference held at the University of New Mexico in Albuquerque. The various contributions to this volume discuss recent advances in the areas of positive sectional curvature, Kähler and Sasaki geometry, and their interrelation to mathematical physics, notably M and superstring theory. Focusing on these fundamental ideas, this collection presents articles with original results, and plausible problems of interest for future research. *Contributors*: C.P. Boyer, J. Cheeger, X. Dai, K. Galicki, P. Gauduchon, N. Hitchin, L. Katzarkov, J. Kollár, C. LeBrun, P. Rukimbira, S. R. Simanca, J. Sparks, C. van Coevering, W. Ziller.

Jean-Yves LE DIMET. — **Géométrie et topologie différentielles: cours et exercices d'application, master, CAPES & agrégation.** — Un vol. broché, 17×24, de VIII, 182 p. — ISBN 978-2-7117-2067-5. — Prix: •25.00. — Vuibert, Paris, 2008.

Illustré d'une centaine d'exercices, ce cours contient toutes les connaissances classiques portant sur les courbes et les surfaces: repère de Frénet, courbure et torsion des courbes, application de Gauss pour les surfaces et les hypersurfaces, courbure de Gauss, etc. Volontairement rédigé dans l'esprit actuel de la Licence et du Master, il offre une initiation à la géométrie et à la topologie des variétés, ces dernières étant présentées comme des parties des espaces numériques. Il pourra également servir d'introduction aux traités spécialisés. Dans cet esprit, on remarquera

que le dernier chapitre constitue une introduction aux variétés abstraites. Pour que ce manuel soit réellement autosuffisant, il s'ouvre sur un important chapitre de rappels portant sur la topologie générale et le calcul différentiel. Les étudiants en Licence y trouveront notamment un résumé de leur programme d'analyse. Enfin, chaque section est suivie d'une abondante série d'exercices d'application directe du cours.

Probabilités et processus stochastiques

David APPLEBAUM. — **Lévy processes and stochastic calculus**. — Second edition. — Cambridge studies in advanced mathematics, vol. 116. — Un vol. broché, 15,5×23, de XXX, 460 p. — ISBN 978-0-521-73865-1. — Prix: £35.00. — Cambridge University Press, Cambridge, 2009.

Lévy processes form a wide and rich class of random process, and have many applications ranging from physics to finance. Stochastic calculus is the mathematics of systems interacting with random noise. Here, the author ties these two subjects together, beginning with an introduction to the general theory of Lévy processes, then leading on to develop the stochastic calculus for Lévy processes in a direct and accessible way. En route, the reader is introduced to important concepts in modern probability theory, such as martingales, semi-martingales, Markov and Feller processes, semigroups and generators, and the theory of Dirichlet forms. There is a self-contained treatment of the pseudo-differential operator representation of generators of Lévy processes and their generalisations, and a careful development of stochastic integrals and stochastic differential equations driven by Lévy processes. The book introduces all the tools that are needed for the stochastic approach to option pricing, including Itô's formula, Girsanov's theorem and the martingale representation theorem. This fully revised edition features a number of new topics. These include: Regular variation and subexponential distributions. — Necessary and sufficient conditions for Lévy processes to have finite moments. — Characterisation of Lévy processes with finite variation. — Kunita's estimates for moments of Lévy type stochastic integrals. — New proofs of Itô representation and martingale representation theorems for general Lévy processes. — Multiple Wiener-Lévy integrals and chaos decomposition. — An introduction to Malliavin calculus. — An introduction to stability theory for Lévy-driven SDEs.

S.R. ATHREYA, V.S. SUNDER. — **Measure and probability**. — Un vol. relié, 16,5×24,5, de X, 221 p. — ISBN 978-1-4398-0126-0. — Prix: US\$69.95. — Universities Press, Hyderabad, CRC Press, Boca Raton, Florida, 2009.

This book has been designed primarily for students at the masters and doctoral levels. It covers the fundamentals of measure theory and probability theory. It begins with the construction of Lebesgue measure via Carathéodory's outer measure approach and goes on to discuss integration and standard convergence theorems (monotone and dominated, as well as Fatou's lemma). An entire chapter is devoted to complex measures, L_p spaces, the Radon-Nikodym theorem and the Riesz representation theorem. The elements of probability theory (random variables, distributions, independence, product measures spaces) as also the law of large numbers and the central limit theorem are presented. Discrete time Markov chains, stationary distributions and limit theorems are then discussed. Among the highlights are alternative proofs of the Riesz representation theorem and of the law of large numbers. Finally, the appendix treats many basic topics such as metric spaces, topological spaces and the Stone-Weierstrass theorem.

Léonard GALLARDO. — **Mouvement brownien et calcul d'Itô: avec exercices corrigés**. — Collection Méthodes. — Un vol. broché, 15×22, de XII, 239 p. — ISBN 978-2-7056-6797-9. — Prix: •34.00. — Hermann, Paris, 2008.

Le mouvement désordonné de particules de pollen en suspension dans un liquide en équilibre fut observé et rigoureusement rapporté par le botaniste écossais Robert Brown en 1827. Ce phénomène aléatoire lié à l'agitation moléculaire reçut par la suite le nom de mouvement brownien. Sa description mathématique comme un processus stochastique a captivé l'attention des physiciens et mathématiciens depuis plus d'un siècle. Il intervient dans de très nombreux modèles en physique, chimie, biologie, sciences économiques et mathématiques financières. Le mouvement brownien est l'objet central du calcul des probabilités moderne : il est tout à la fois une martingale, un processus gaussien, un processus à accroissements indépendants et un processus de Markov. Ces diverses propriétés qui en font le processus stochastique par excellence, sont présentées dans cet ouvrage avec les deux outils qu'il permet de développer : l'intégrale d'Itô et la notion d'équation différentielle stochastique. Ce livre s'adresse à tous ceux et celles qui recherchent une introduction rapide et rigoureuse aux méthodes du calcul stochastique, en particulier aux étudiants des masters de mathématiques, aux élèves des grandes écoles scientifiques ainsi qu'aux candidats à l'agrégation. Nous y avons inclus des exercices de difficulté variée, corrigés en fin de volume, pour en faciliter la lecture et l'utilisation comme outil pédagogique.

Piotr GRACZYK, Margit RÖSLER, Marc YOR, (Editors). — **Harmonic and stochastic analysis of Dunkl processes.** — Travaux en cours. Mathématiques, vol. 71. — Un vol. broché, 16×24, de 228 p. — ISBN 978-27056-6810-5. — Prix : •42.00. — Hermann, Paris, 2008.

Le livre présente un thème important, qui se développe actuellement de façon intense, de l'analyse et la théorie stochastique contemporaines : les opérateurs, les semi-groupes et les processus stochastiques de Dunkl. Les motivations et les applications de ces sujets, à l'origine en provenance de la physique (Modèles quantiques intégrables), s'étendent aujourd'hui à de vastes domaines de l'analyse harmonique et du calcul stochastique, y compris les espaces symétriques, et les processus de diffusion à valeurs dans ces espaces. Les auteurs du livre ont obtenu des résultats importants de la théorie de Dunkl. Le livre est écrit de façon accessible à des chercheurs ayant des connaissances standard en analyse harmonique et calcul stochastique. — *Contributeurs* : Olesksandr Chybyryakov, Nizar Demni, Léonard Gallardo, Margit Rösler, Mickael Voit, Marc Yor.

Carl GRAHAM. — **Chaînes de Markov : cours et exercices corrigés.** — Sciences SUP. — Un vol. relié, 17×24, de X, 274 p. — ISBN 978-2-10-052083-1. — Prix : •30.00. — Dunod, Paris, 2008.

Cet ouvrage est destiné aux étudiants en Master de mathématiques appliquées, aux élèves ingénieurs, ainsi qu'aux candidats au CAPES ou à l'Agrégation. Le cours présente de façon progressive, détaillée et rigoureuse, la théorie des chaînes de Markov à temps et espace d'états discrets. Les notions fondamentales sont illustrées par des exemples qui apportent de nombreuses applications concrètes actuelles. Le cours est complété par des exercices corrigés.

Allan GUT. — **Stopped random walks : limit theorems and applications.** — Second edition. — Springer series in operations research and financial engineering. — Un vol. relié, 18,5×24,5, de XI, 263 p. — ISBN 978-0-387-87834-8. — Prix : •34.95. — Springer, New York, 2009.

Classical probability theory provides information about random walks after a fixed number of steps. For applications, however, it is more natural to consider random walks evaluated after a random number of steps. *Stopped Random Walks : Limit Theorems and Applications* shows how this theory can be used to prove limit theorems for renewal counting processes, first passage time processes, and certain two-dimensional random walks, as well as how these results may be used in a variety of applications. The present second edition offers updated content and an outlook on further results, extensions and generalizations. A new chapter introduces nonlinear renewal processes and the theory of perturbed random walks, which are modelled as random

walks plus “noise”. This self-contained research monograph is motivated by numerous examples and problems. With its concise blend of material and over 300 bibliographic references, the book provides a unified and fairly complete treatment of the area. The book may be used in the classroom as part of a course on “probability theory”, “random walks” or “random walks and renewal processes”, as well as for self-study.

Étienne PARDOUX. — **Markov processes and applications: algorithms, networks, genome and finance.** — Wiley series in probability and statistics. — Un vol. relié, 16×23,5, de IX, 296 p. — ISBN 978-0-470-77271-3. — Prix: £45.00. — John Wiley, Chichester, West Sussex, 2009.

Markov processes are the class of stochastic processes in which past and future are conditionally independent, given their present state. They constitute important models in many applied fields. After an introduction to the Monte Carlo method, this book describes discrete time Markov chains, the Poisson process and continuous time Markov chains. It also presents numerous applications including Markov chain Monte Carlo, simulated annealing, hidden Markov models, annotation and alignment of genomic sequences, control and filtering, phylogenetic tree reconstruction and queuing networks. The last chapter is an introduction to stochastic calculus and mathematical finance. — *Features include:* The Monte Carlo method, discrete time Markov chains, the Poisson process and continuous time jump Markov processes. — An introduction to diffusion processes, mathematical finance and stochastic calculus. — Applications of Markov processes to various fields, ranging from mathematical biology, to financial engineering and computer science. — Numerous exercises and problems with solutions to most of them.

Olivier RIOUL. — **Théorie des probabilités** — Un vol. broché, 15,5×23,5, de 364 p. — ISBN 978-2-7462-1720-1. — Prix: •84.00. — Editions Hermès-Lavoisier, Paris, 2008.

Cet ouvrage propose une approche non dogmatique de la théorie des probabilités, qui combine la description mathématique à une compréhension intuitive des idées sous-jacentes. De la définition de la probabilité jusqu’aux processus ergodiques, en passant par le conditionnement et les lois des grands nombres, les concepts exposés, même les plus abstraits, sont traités avec rigueur dans un langage accessible et illustrés par de nombreux exemples. Les variables et vecteurs aléatoires sont définis directement par des distributions de probabilité, sans faire appel, au préalable, à la théorie abstraite de la mesure. Les cas discret et continu sont traités ensemble, par une notation unifiée qui simplifie les calculs. Les notions les plus avancées, comme les définitions de convergence et la construction de processus, sont exposées en détail en fin d’ouvrage. Par son approche originale, *Théorie des probabilités* permet une appréhension rapide des outils de calcul pour les besoins pratiques dans les différents domaines des sciences physiques et de l’ingénieur, sans pour autant abandonner l’intérêt d’une étude suffisamment rigoureuse des concepts.

Statistique

Brigitte ESCOPIER, Jérôme PAGÈS. — **Analyses factorielles simples et multiples: objectifs, méthodes et interprétation.** — Quatrième édition. — Sciences SUP. — Un vol. relié, 17×24, de VIII, 318 p. — ISBN 978-2-10-051932-3. — Prix: •29.00. — Dunod, Paris, 2008.

Cet ouvrage est destiné aux étudiants en Masters de mathématiques appliquées, d’économie ou d’économétrie, ainsi qu’aux élèves ingénieurs. Il aborde les méthodes d’analyse des données qui ont démontré leur efficacité dans l’étude des grandes masses complexes d’informations. Ces méthodes sont maintenant appliquées dans tous les domaines où l’on accumule d’importants fichiers de données, et sont largement utilisées hors de leurs champs traditionnels. Pour cette quatrième

édition, le texte a été révisé et augmenté notamment sur deux points qui correspondent à une demande croissante des utilisateurs : une présentation de l'Analyse Factorielle sur Données Mixtes (AFDM); une présentation de l'Analyse Factorielle Multiple Hiérarchique (AFMH), prolongement naturel de l'AFM. Le cours est illustré par de nombreuses études de cas.

Wiebe R. PESTMAN. — **Mathematical statistics**. — Second edition. — De Gruyter textbook. — Un vol. relié, 18×24,5, de IX, 597 p. — ISBN 978-3-11-020852-8. — Prix : •56.03. — Walter de Gruyter, Berlin, 2009.

This book provides a first introduction to mathematical statistics. The text covers compulsory fundamental topics, see the list below for a table of contents. As a rule, theorems are proved in a mathematically rigorous way, and many examples and exercises are included. There is an accompanying volume, in which completely worked-through solutions to all exercises can be found. Both books are very suitable for self-study. The text arose from a series of lectures given at the University of Nijmegen (Holland) and is intended for students who already have some basic mathematical background. *From the contents*: Probability theory. — Statistics and their probability distributions, estimation theory. — Hypothesis tests. — Simple regression analysis. — Normal analysis of variance. — Non-parametric methods. — Stochastic analysis and its applications in statistics. — Vectorial statistics. — Appendix.

Analyse numérique

Luca AMODEI, Jean-Pierre DEDIEU. — **Analyse numérique matricielle : cours et exercices corrigés**. — Sciences SUP. — Un vol. relié, 17×24, de XII, 316 p. — ISBN 978-2-10-052085-5. — Prix : •32.00. — Dunod, Paris, 2008.

Cet ouvrage est destiné aux étudiants en Master de mathématiques appliquées, aux élèves ingénieurs, ainsi qu'aux candidats au CAPES ou à l'Agrégation. Il propose un panorama des problèmes abordés en analyse numérique matricielle : normes sur les espaces de matrices, décompositions matricielles, méthodes directes ou itératives de résolution des systèmes linéaires, problèmes des valeurs propres. On y aborde les aspects théoriques de ces questions, l'algorithmique qui y est associée ainsi que les problèmes de complexité, de sensibilité aux erreurs et de stabilité. Le cours est illustré par des exercices corrigés qui mettent en oeuvre les techniques introduites dans chaque chapitre.

Kendall E. ATKINSON, Weimin HAN, David STEWART. — **Numerical solution of ordinary differential equations**. — Pure and applied mathematics. — Un vol. relié, 16,5×24,5, de XII, 252 p. — ISBN 978-0-470-04294-6. — Prix : £60.50. — John Wiley & Sons, Hoboken, N.J., 2009.

Numerical Solution of Ordinary Differential Equations presents a complete and easy-to-follow introduction to classical topics in the numerical solution of ordinary differential equations. The book's approach not only explains the presented mathematics, but also helps readers understand how these numerical methods are used to solve real-world problems. Unifying perspectives are provided throughout the text, bringing together and categorizing different types of problems in order to help readers comprehend the applications of ordinary differential equations. In addition, the authors' collective academic experience ensures a coherent and accessible discussion of key topics, including: Euler's method, Taylor and Runge-Kutta methods, general error analysis for multi-step methods, stiff differential equations, differential algebraic equations, two-point boundary value problems, Volterra integral equations. Each chapter features problem sets that enable readers to test and build their knowledge of the presented methods, and a related web

site features MATLAB[®] programs that facilitate the exploration of numerical methods in greater depth. Detailed references outline additional literature on both analytical and numerical aspects of ordinary differential equations for further exploration of individual topics. *Numerical Solution of Ordinary Differential Equations* is an excellent textbook for courses on the numerical solution of differential equations at the upper-undergraduate and beginning graduate levels. It also serves as a valuable reference for researchers in the fields of mathematics and engineering.

Silvia BERTOLUZZA, Silvia FALLETTA, Giovanni RUSSO, Chi-Wang SHU. — **Numerical solutions of partial differential equations.** — Advanced courses in mathematics CRM Barcelona. — Un vol. broché, 17×24, de VIII, 201 p. — ISBN 978-3-7643-8939-0. — Prix: SFr. 49.90. — Birkhäuser, Basel, 2009.

This volume offers researchers the opportunity to catch up with important developments in the field of numerical analysis and scientific computing and to get in touch with state-of-the-art numerical techniques. The book has three parts. The first one is devoted to the use of wavelets to derive some new approaches in the numerical solution of PDEs, showing in particular how the possibility of writing equivalent norms for the scale of Besov spaces allows to develop some new methods. The second part provides an overview of the modern finite-volume and finite-difference shock-capturing schemes for systems of conservation and balance laws, with emphasis on providing a unified view of such schemes by identifying the essential aspects of their construction. In the last part a general introduction is given to the discontinuous Galerkin methods for solving some classes of PDEs, discussing cell entropy inequalities, nonlinear stability and error estimates.

Stig LARSSON, Vidar THOMÉE. — **Partial differential equations with numerical methods.** — Texts in applied mathematics, vol. 45. — Un vol. broché, 23,5×16, de IX, 260 p. — ISBN 978-3-540-88705-8. — Prix: •32.05. — Springer, Berlin, 2009.

The book is suitable for advanced undergraduate and beginning graduate students of applied mathematics and engineering. The main theme is the integration of the theory of linear PDEs and the numerical solution of such equations. For each type of PDE, elliptic, parabolic, and hyperbolic, the text contains one chapter on the mathematical theory of the differential equation, followed by one chapter on finite-difference methods and one on finite element methods. As preparation, the two-point boundary value problem and the initial-value problem for ODEs are discussed in separate chapters. There is also one chapter on the elliptic eigenvalue problem and eigenfunction expansion. The presentation does not presume a deep knowledge of mathematical and functional analysis. Some background on linear functional analysis and Sobolev spaces, and also on numerical linear algebra, is reviewed in two appendices.

Aslak TVEITO, Ragnar WINTHER. — **Introduction to partial differential equations: a computational approach.** — Texts in applied mathematics, vol. 29. — Un vol. broché, 15,5×23,5, de XV, 392 p. — ISBN 978-3-540-88704-1. — Prix: •32.05. — Springer, Berlin, 2009.

This is the softcover reprint of a popular book teaching the basic analytical and computational methods of partial differential equations. Standard topics such as separation of variables, Fourier analysis, maximum principles, and energy estimates are included. Prerequisites for this text are the very basics of calculus, linear algebra and ordinary differential equations. Numerical methods are included in the book to show the significance of computations in partial differential equations, and to illustrate the strong interaction between mathematical theory and numerical methods. Great care has been taken throughout the book to seek a sound balance between the analytical and numerical techniques. The authors present the material at an easy pace with exercises and projects ranging from the straightforward to the challenging. The text would be suitable for advanced

undergraduate and graduate courses in mathematics and engineering, and it develops basic tools of computational science.

Vladimir V. VASIN, Ivan I. EREMIN. — **Operators and iterative processes of Fejér type: theory and applications.** — Inverse and ill-posed problems series. — Un vol. relié, 18×24,5, de XIV, 155 p. — ISBN 978-3-11-021818-3. — Prix: •93.41. — Walter de Gruyter, Berlin, 2009.

This book deals with the iterative approximation of fixed points of operators satisfying a special quasi-contractivity condition, the Fejér property. General convergence results and many iterative schemes are presented, with a special focus on the latter topic. The presented theory has a wide range of applications, such as systems of convex inequalities, problems of convex programming as well as well-posed and ill-posed problems, all of them with possibly a priori constraints on the solution. Apart from using some basic methods from functional analysis, this book is self-contained. — *From the contents*: General properties of nonlinear operators of Fejér type. — Applications of iterative processes to nonlinear equations. — Fejér methods for linear and convex inequalities. — Some topics of Fejér mappings and processes.

Informatique

Hans-Christian HEGE, Konrad POLTHIER, Gerik SCHEUERMANN, (Editors). — **Topology-based methods in visualization II.** — Mathematics and visualization. — Un vol. relié, 16,5×24, de VIII, 190 p. — ISBN 978-3-540-88605-1. — Prix: •69.95. — Springer, Berlin, 2009.

Visualization research aims at providing insight into large, complicated data. Topological methods stand out by their solid mathematical ground guiding the algorithmic analysis and its presentation among the various visualization techniques. This book contains thirteen peer-reviewed papers resulting from the second workshop on *Topology-Based Methods in Visualization*, held 2007 in Grimma near Leipzig, Germany. All articles present new original work from leading experts that has not been published before. Together, these articles present the state of the art of topology-based visualization research.

Mécanique quantique

Domenico D'ALESSANDRO. — **Introduction to quantum control and dynamics.** — Chapman & Hall/CRC applied mathematics and nonlinear science series. — Un vol. relié, 16,5×24, de XIV, 343 p. — ISBN 978-1-58488-884-0. — Prix: US\$93.95. — Chapman & Hall/CRC, Boca Raton, Florida, 2008.

The introduction of control theory in quantum mechanics has created a rich, new interdisciplinary scientific field that is producing novel insight into important theoretical questions at the heart of quantum physics. Exploring this emerging subject, *Introduction to Quantum Control and Dynamics* presents the mathematical concepts and fundamental physics behind the analysis and control of quantum dynamics, emphasizing the application of Lie algebra and Lie group theory. After introducing the basics of quantum mechanics, the book derives a class of models for quantum control systems from fundamental physics. It examines the controllability and observability of quantum systems and the related problem of quantum state determination and measurement. The author also uses Lie group decompositions as tools to analyze dynamics and to design control algorithms. In addition, he describes various other control methods and discusses topics in quantum information theory that include entanglement and entanglement dynamics. The final chapter covers the implementation of quantum control and dynamics in several fields. Armed

with basics of quantum control and dynamics, readers will invariably use this interdisciplinary knowledge in their mathematical, physics, and engineering work. — *Features*: Provides an introductory chapter on the fundamentals of quantum mechanics; uses a class of quantum control models to describe experimental situations; explains the concepts of Lie algebra, Lie group theory, and Lie transformation groups; explores numerous control design strategies, such as optimal and adiabatic control and STIRAP and Lyapunov methods; presents several applications of quantum control and dynamics, including nuclear magnetic resonance experiments and implementations of quantum information; supplies introductory notions in several related fields, including optimal control, Lagrangian and Hamiltonian mechanics, and quantum information theory.

Physique statistique, structure de la matière

Reinhard MAHNKE, Jevgenijs KAUPUŽS, Ihor LUBASHEVSKY. — **Physics of stochastic processes: how randomness acts in time.** — Physics textbook. — Un vol. broché, 17×24, de XVII, 430 p. — ISBN 978-3-527-40840-5. — Prix: £55.00. — Wiley-VCH, Weinheim, 2009.

Based on lectures given by one of the authors with many years of experience in teaching stochastic processes, this textbook is unique in combining basic mathematical and physical theory with numerous simple and sophisticated examples as well as detailed calculations. In addition, applications from different fields are included so as to strengthen the background learned in the first part of the book. With its exercises at the end of each chapter (and solutions only available to lecturers) this book will benefit students and researchers at different educational levels.

Économie, recherche opérationnelle, jeux

Robert A. HEARN, Erik D. DEMAINÉ. — **Games, puzzles, and computation.** — Un vol. relié, 15,5×23,5, de IX, 237 p. — ISBN 978-1-56881-322-6. — Prix: US\$45.00. — A. K. Peters, Wellesley, Massachusetts, 2009.

The authors show that there are underlying mathematical reasons that games and puzzles are challenging (which perhaps explains why they are so much fun). Complementarily, they also show that games and puzzles can serve as powerful models of computation — quite different from the usual models of automata and circuits — offering a new way of thinking about computation. The first part of the book describes a simple, yet powerful, framework that the authors have developed for studying the connections between games, puzzles, and computation, called *constraint logic*. This framework is then applied to several real games and puzzles that people play, showing in each case that the game is computationally as difficult as any other game in its category. Finally, the appendices provide a substantial survey of all known results in the field of game complexity, serving as a reference guide for readers interested in the computational complexity of particular games, or interested in open problems about such complexities.