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## Bulletin bibliographique

### Généralités

Martin GARDNER. – **Knots and borromean rings, rep-tiles, and eight queens: Martin Gardner's unexpected hanging.** – The new Martin Gardner mathematical library, vol. 4. – Un vol. broché, 14×22, de XI, 274 p. – ISBN 978-0-521-75871-0. – Prix: £12.99. – Cambridge University Press, Cambridge, 2014.

The hangman's paradox, cat's cradle, gambling, peg solitaire, pi and e – all these and more are back in Martin Gardner's inimitable style, with updates on new developments and discoveries. Read about how knots and molecules are related; take a trip into the fourth dimension; try out new dissections of stars, crosses and polygons; and challenge yourself with new twists on classic games. Contains extensive updated material by Gardner not found in any other editions of these books, plus new bibliographies. The first complete collection of Martin Gardner's Mathematical Library which encompasses the entire twenty-five-year run of his Scientific American columns.

Jérôme GAVIN, Alain SCHÄRLIG. – **Sur les doigts, jusqu'à 9999: la numérotation digitale, des Anciens à la Renaissance.** – Un vol. broché, 16×24, de 164 p. – ISBN 978-2-88915-090-8. – Prix: SFr. 52.00. – Presses polytechniques et universitaires romandes, Lausanne, 2014.

Qui n'a jamais montré un nombre sur ses doigts? Pour nous c'est commun. Mais notre limite, c'est 10... Les anciens, eux, montaient jusqu'à 99 sur une seule main. Et donc jusqu'à 9999 sur les deux en cas de besoin. Et ils l'ont fait pendant au moins deux mille ans. C'est ce qui est décrit dans ce livre: ses auteurs ont trouvé des traces de la numérotation digitale depuis les anciens Grecs jusqu'aux Persans du 17e siècle, en passant par des bas-reliefs romains, un docteur de l'Eglise du 8e siècle, et des icônes byzantines.

Rudolf HALLER, Friedrich BARTH. – **Berühmte Aufgaben der Stochastik: Von den Anfängen bis heute.** – De Gruyter studium. – Un vol. relié, 17,5×24,5, de XVI, 448 p. – ISBN 978-3-486-72832-3. – Prix: €79.95. – De Gruyter/Oldenbourg, München, 2014.

Over the centuries, problems were proposed in stochastics and combinatorial mathematics that prompted ingenious solutions. This book offers selected important problems in historical sequence. The methods and arithmetic competencies once used to master these problems are still remarkable, and many techniques left a major imprint on the history of stochastics. The book will be of interest to both mathematicians and an educated lay readership.

Norbert HELDERMANN. – **Höhere Mathematik 2: Lösungen der Aufgaben.** – Berliner Studienreihe zur Mathematik, Band 24. – Un vol. relié, 17,5×24,5, de VI, 290 p. – ISBN 978-3-88538-124-2. – Prix: SFr. 40.00. – Heldermann Verlag, Lemgo, 2014.

Das Buch enthält ausführliche Lösungen zu den Aufgaben des vorausgehenden Lehrbuchs gleichen Titels, BSM Band 23.

Steven G. KRANTZ, Harold R. PARKS. – **A mathematical odyssey: journey from the real to the complex.** – Un vol. relié, 18×26, de XVI, 382 p. – ISBN 978-1-4614-8938-2. – Prix: SFr. 60.00. – Springer, New York, 2014.

Mathematics is a poem. It is a lucid, sensual, precise exposition of beautiful ideas directed to specific goals. It is worthwhile to have as broad a cross-section of mankind as possible be conversant with what goes on in mathematics. Just as everyone knows that the Internet is a powerful and important tool for communication, so everyone should know that the Poincaré conjecture gives us important information about the shape of our universe. Just as every responsible citizen realizes that the mass-production automobile was pioneered by Henry Ford, just so everyone should know that the P/NP problem has implications for security and data manipulation that will affect everyone. This book endeavors to tell the story of the modern impact of mathematics, of its trials and triumphs and insights, in language that can be appreciated by a broad audience. It endeavors to show what mathematics means for our lives, how it impacts all of us, and what new thoughts it should cause us to entertain. It introduces new vistas of mathematical ideas and shares the excitement of new ideas freshly minted. It discusses the significance and impact of these ideas, and gives them meaning that will travel well and cause people to reconsider their place in the universe. Mathematics is one of mankind's oldest disciplines. Along with philosophy, it has shaped the very modus of human thought. And it continues to do so. To be unaware of modern mathematics is to be miss out on a large slice of life. It is to be left out of essential modern developments. We want to address this point, and do something about it. This is a book to make mathematics exciting for people of all interests and all walks of life. Mathematics is exhilarating, it is ennobling, it is uplifting, and it is fascinating. We want to show people this part of our world, and to get them to travel new paths.

Ahmed LESFARI. – **Notions fondamentales d'analyse mathématique: résumés de cours, exercices et problèmes corrigés.** – Un vol. broché, 19×24, de 360 p. – ISBN 978-2-7298-84918. – Prix: €32.00. – Ellipses, Paris, 2014.

Ce livre d'exercices et problèmes corrigés d'analyse mathématique, avec rappels de cours, est consacré à des parties fondamentales d'analyse mathématique. Il s'organise en neuf chapitres : généralités, fonctions de plusieurs variables, intégrales généralisées, séries numériques, suites et séries de fonctions, séries entières, séries de Fourier, intégrales généralisées dépendant d'un paramètre et problèmes de synthèse. Dans chaque chapitre, le lecteur trouvera : un résumé de cours concis et des exercices intégralement corrigés. En fin d'ouvrage le lecteur trouvera des problèmes de synthèse avec des solutions complètes et qui en outre peuvent constituer des sujets d'étude. Les corrigés sont détaillés, expliqués, justifiés et un soin tout particulier a été apporté à leur rédaction afin de les rendre clairs et complets. De nombreux exemples se trouvent disséminés dans le texte. Cet ouvrage s'adresse aux étudiants des niveaux L1 et L2, qu'ils soient à l'université ou en classes préparatoires scientifiques. Il intéressera aussi les étudiants qui préparent le CAPES ou l'agrégation, ainsi que, pour certaines parties, les étudiants de niveau L3.

Jean-Pierre LUBET, Jean-Pierre FRIEDELMEYER. – **L'analyse algébrique: un épisode clé de l'histoire des mathématiques.** – IREM - histoire des mathématiques / Comprendre les mathématiques par les textes historiques. – Un vol. broché, 16,5×24, de 253 p. – ISBN 978-2-7298-8394-2. – Prix: €28.00. – Ellipses, Paris, 2014.

D'où nous viennent les notions de fonction dérivée? de primitive? Comment s'est répandu l'usage des notations  $f'$ ,  $f''$ , ... pour représenter les dérivées successives? Quels résultats pouvait-on obtenir en manipulant des sommes infinies sans se préoccuper de leur convergence, comme c'était souvent le cas au XVIIIe siècle? De quels moyens disposait-on pour faire face aux problèmes issus de la physique mathématique naissante? À quelle occasion les termes commutatif ou distributif qui faisaient partie du vocabulaire juridique et moral ont-ils été introduits en mathématiques? Pour répondre à toutes ces questions il faut lire des auteurs illustres comme Euler ou Lagrange, mais aussi bien d'autres, souvent méconnus tels Arbogast, Brisson ou Servois. Cet ouvrage permet un contact avec les textes originaux, il s'adresse à toute personne intéressée par la culture scientifique : étudiant, enseignant, formateur, amateur curieux de comprendre le développement des idées en mathématiques. Une mise en perspective générale, des introductions et des commentaires sont là pour situer le contexte, lever les principales difficultés, signaler les enjeux. Les errements et les incertitudes

sont examinés avec précision, ils rendent manifestes quelques-uns des obstacles qu'il a fallu surmonter pour aboutir à l'analyse mathématique que nous connaissons aujourd'hui.

ROSSELLA LUPACCHINI, ANNARITA ANGELINI, (Editors). – **The art of science: from perspective drawing to quantum randomness.** – Un vol. relié, 16×24, de XIII, 210 p. – ISBN 978-3-319-02110-2. – Prix: SFr. 80.00. – Springer, Cham, 2014.

Like linear perspective, complex numbers and probability are notable discoveries of the Renaissance. History has been quick to recognize the crucial impact of linear perspective on painting, but reluctant to acknowledge the importance of complex numbers and probability. Both were treated with a great deal of suspicion by the scientific establishment and overlooked for many years. It was only in the twentieth century, when quantum theory defined the notion of “complex probability amplitude”, that complex numbers merged with probability and transformed the image of the physical world. From a theoretical point of view, however, the space opened to painting by linear perspective and the space opened to science by complex numbers are equally valuable and share significant characteristics. By exploring that common ground, *the art of science* will lead the reader to complement Leonardo's vision of painting as a science and to see science as an art. Its aim is to restore a visual dimension to mathematical sciences – an element dulled, if not obscured, by historians, philosophers, and scientists themselves.

TOM MÜLLER. – **Irrationalitätsbeweise.** – Berliner Studienreihe zur Mathematik, Band 25. – Un vol. relié, 17,5×24,5, de 209 p. – ISBN 978-3-88538-125-9. – Prix: SFr. 35.00. – Heldermann Verlag, Lemgo, 2014.

Die Untersuchung von nicht rationalen Zahlen gehört nicht nur zu den ältesten, sondern auch zu den spannendsten Forschungsgebieten der Mathematik. Bereits Euklid hat diesem Thema ein ganzes Buch seiner Elemente gewidmet und dabei eine Tiefe erzielt, die erst wieder in der Neuzeit durch Fermat, Euler und Lambert erreicht wurde. Dieses Buch bietet einen Ausflug in die Welt der Irrationalitäts- und Transzendenzbeweise. Verschiedenste Techniken werden dargestellt und historisch eingeordnet. Es kann von Studenten der Mathematik zu jeder Zeit nach dem Erwerb der mathematischen Grundlagen in den ersten beiden Semestern gelesen werden. Für arbeitende Mathematiker dürfte es aus historischen Gründen interessant sein. Studenten der Zahlentheorie sollten seinen Inhalt kennen. Es ist gleichermassen zum Selbststudium und als Textbuch geeignet.

LESZEK WROŃSKI. – **Reichenbach's paradise: constructing the realm of probabilistic common "causes".** – Un vol. relié, 17,5×24,5, de XII, 113 p. – ISBN 978-3-11-037270-0. – Prix: €69.95. – De Gruyter Open, Warsaw/Berlin, 2014.

Since its introduction by Hans Reichenbach, many philosophers have claimed to refute the idea – known as the common cause principle – that any surprising correlation between any two factors that do not directly influence one another is due to some common cause. For example, falsity of the principle is frequently inferred from falsifiability of Bell's inequalities. The author demonstrates, however, that the situation is not so straightforward. There is more than one version of the principle formulated with the use of different variants of Reichenbach-inspired notions; their falsity still remains an open question. The book traces different formulations of the principle and provides proofs of a few pertinent theorems, settling the relevant questions in various probability spaces. In exploring mathematical and philosophical issues surrounding the principle, the book offers both philosophical insight and mathematical rigor.

## ***Logique et fondements***

VASCO BRATTKA, HANNES DIENER, DIETER SPREEN, (Editors). – **Logic, computation, hierarchies.** – Ontos mathematical logic, vol. 4. – Un vol. relié, 16×23,5, de X, 413 p. – ISBN 978-1-61451-783-2. – Prix: €109.95. – De Gruyter, Berlin, 2014.

Published in honor of Victor L. Selivanov, the 17 articles collected in this volume inform on the latest developments in computability theory and its applications in computable analysis; descriptive set theory and topology; and the theory of omega-languages; as well as non-classical logics, such as temporal logic and

paraconsistent logic. This volume will be of interest to mathematicians and logicians, as well as theoretical computer scientists.

## *Analyse combinatoire*

Matthias DEHMER, Frank EMMERT-STREIB, (Editors). – **Quantitative graph theory: mathematical foundations and applications.** – Discrete mathematics and its applications. – Un vol. relié, 16×24, de XIX, 508 p. – ISBN 978-1-4665-8451-8. – Prix: US\$99.95. – CRC Press, Boca Raton, 2015.

The first book devoted exclusively to quantitative graph theory, *Quantitative graph theory: mathematical foundations and applications* presents and demonstrates existing and novel methods for analyzing graphs quantitatively. Incorporating interdisciplinary knowledge from graph theory, information theory, measurement theory, and statistical techniques, this book covers a wide range of quantitative-graph theoretical concepts and methods, including those pertaining to real and random graphs such as: Comparative approaches (graph similarity or distance). – Graph measures to characterize graphs quantitatively. – Applications of graph measures in social network analysis and other disciplines. – Metrical properties of graphs and measures. – Mathematical properties of quantitative methods or measures in graph theory. – Network complexity measures and other topological indices. – Quantitative approaches to graphs using machine learning (e.g., clustering). – Graph measures and statistics. – Information-theoretic methods to analyze graphs quantitatively (e.g., entropy). Through its broad coverage, *Quantitative graph theory: mathematical foundations and applications* fills a gap in the contemporary literature of discrete and applied mathematics, computer science, systems biology, and related disciplines. It is intended for researchers as well as graduate and advanced undergraduate students in the fields of mathematics, computer science, mathematical chemistry, cheminformatics, physics, bioinformatics, and systems biology.

Thomas LAM, Luc LAPOINTE, Jennifer MORSE, Anne SCHILLING, Mark SHIMOZONO, Mike ZABROCKI. – **K-Schur functions and affine Schubert calculus.** – Fields Institute monographs, vol. 33. – Un vol. relié, 16×24, de VIII, 219 p. – ISBN 978-1-4939-0681-9. – Prix: US\$109.00. – Springer, New York, 2014.

This book gives an introduction to the very active field of combinatorics of affine Schubert calculus, explains the current state of the art, and states the current open problems. Affine Schubert calculus lies at the crossroads of combinatorics, geometry, and representation theory. Its modern development is motivated by two seemingly unrelated directions. One is the introduction of k-Schur functions in the study of Macdonald polynomial positivity, a mostly combinatorial branch of symmetric function theory. The other direction is the study of the Schubert bases of the (co)homology of the affine Grassmannian, an algebro-topological formulation of a problem in enumerative geometry. This is the first introductory text on this subject. It contains many examples in Sage, a free open source general purpose mathematical software system, to entice the reader to investigate the open problems. This book is written for advanced undergraduate and graduate students, as well as researchers, who want to become familiar with this fascinating new field.

## *Théorie des nombres*

Peter KRITZER, Harald NIEDERREITER, Friedrich PILLICHSHAMMER, Arne WINTERHOF, (Editors). – **Uniform distribution and quasi-Monte Carlo methods: discrepancy, integration and applications.** – Radon series on computational and applied mathematics, vol. 15. – Un vol. relié, 17,5×24,5, de X, 258 p. – ISBN 978-3-11-031789-3. – Prix: €129.95. – De Gruyter, Berlin, 2014.

This book is summarizing the results of the workshop “Uniform Distribution and Quasi-Monte Carlo Methods” of the RICAM Special Semester on “Applications of algebra and number theory” in October 2013. The survey articles in this book focus on number theoretic point constructions, uniform distribution theory, and quasi-Monte Carlo methods. As deterministic versions of the Monte Carlo method, quasi-Monte Carlo rules enjoy increasing popularity, with many fruitful applications in mathematical practice, as for example in finance, computer graphics, and biology. The goal of this book is to give an overview of recent developments in uniform distribution theory, quasi-Monte Carlo methods, and their applications, presented by leading experts in these vivid fields of research.

Florian LUCA, Melvyn B. NATHANSON, Jaroslav NEŠETŘIL, Bruce LANDMAN, Richard J. NOWAKOWSKI, Aaron ROBERTSON, (Editors). – **Integers. Annual volume 2013.** – Un vol. relié, 17,5×24,5, de XII, 1079 p. – ISBN 978-3-11-029811-6. – Prix: €149.95. – De Gruyter, Berlin, 2014.

“Integers” is a refereed online journal devoted to research in the area of combinatorial number theory. It publishes original research articles in combinatorics and number theory. Topics covered by the journal include additive number theory, multiplicative number theory, sequences and sets, extremal combinatorics, Ramsey theory, elementary number theory, classical combinatorial problems, hypergraphs, and probabilistic number theory. Integers also houses a combinatorial games section. This work presents all papers of the 2013 volume in book form.

## *Géométrie algébrique*

Ivan ARZHANTSEV, Ulrich DERENTHAL, Jürgen HAUSEN, Antonio LAFACE. – **Cox rings.** – Cambridge studies in advanced mathematics, vol. 144. – Un vol. relié, 16×23,5, de VIII, 530 p. – ISBN 978-1-107-02462-5. – Prix: £50.00. – Cambridge University Press, Cambridge, 2015.

Cox rings are significant global invariants of algebraic varieties, naturally generalizing homogeneous coordinate rings of projective spaces. This book provides a largely self-contained introduction to Cox rings, with a particular focus on concrete aspects of the theory. Besides the rigorous presentation of the basic concepts, other central topics include the case of finitely generated Cox rings and its relation to toric geometry; various classes of varieties with group actions; the surface case; and applications in arithmetic problems, in particular Manin’s conjecture. The introductory chapters require only basic knowledge in algebraic geometry. The more advanced chapters also touch on algebraic groups, surface theory, and arithmetic geometry. Each chapter ends with exercises and problems. These comprise mini-tutorials and examples complementing the text, guided exercises for topics not discussed in the text, and, finally, several open problems of varying difficulty.

Susan M. COOPER, Sean SATHER-WAGSTAFF, (Editors). – **Connection between algebra, combinatorics, and geometry.** – Springer proceedings in mathematics and statistics, vol. 76. – Un vol. relié, 16×24, de XVI, 317 p. – ISBN 978-1-4939-0625-3. – Prix: US\$129.00. – Springer, New York, 2014.

Commutative algebra, combinatorics, and algebraic geometry are thriving areas of mathematical research with a rich history of interaction. *Connections Between Algebra, Combinatorics, and Geometry* contains lecture notes, along with exercises and solutions, from the Workshop on Connections Between Algebra and Geometry held at the University of Regina from May 29–June 1, 2012. It also contains research and survey papers from academics invited to participate in the companion Special Session on Interactions Between Algebraic Geometry and Commutative Algebra, which was part of the CMS Summer Meeting at the University of Regina held June 2–3, 2012, and the meeting Further Connections Between Algebra and Geometry, which was held at the North Dakota State University, February 23, 2013. This volume highlights three mini-courses in the areas of commutative algebra and algebraic geometry: differential graded commutative algebra, secant varieties, and fat points and symbolic powers. It will serve as a useful resource for graduate students and researchers who wish to expand their knowledge of commutative algebra, algebraic geometry, combinatorics, and the intricacies of their intersection.

David B. ELLIS, Roberts ELLIS. – **Automorphisms and equivalence relations in topological dynamics.** – London Mathematical Society lecture note series, vol. 412. – Un vol. broché, 15×23, de XIV, 268 p. – ISBN 978-1-107-63322-3. – Prix: £45.00. – Cambridge University Press, Cambridge, 2014.

Focusing on the role that automorphisms and equivalence relations play in the algebraic theory of minimal sets provides an original treatment of some key aspects of abstract topological dynamics. Such an approach is presented in this lucid and self-contained book, leading to simpler proofs of classical results, as well as providing motivation for further study. Minimal flows on compact Hausdorff spaces are studied as icers on the universal minimal flow  $M$ . The group of the icer representing a minimal flow is defined as a subgroup of the automorphism group  $G$  of  $M$ , and icers are constructed explicitly as relative products

using subgroups of  $G$ . Many classical results are then obtained by examining the structure of the  $\alpha$ -invariants on  $M$ , including a proof of the Furstenberg structure theorem for distal extensions. This book is designed as both a guide for graduate students, and a source of interesting new ideas for researchers.

Harald NIEDERREITER, Alina OSTAFE, Daniel PANARIO, Arne WINTERHOF, (Editors). – **Algebraic curves and finite fields: cryptography and other applications**. – Radon series on computational and applied mathematics, vol. 16. – Un vol. relié, 17,5×24,5, de XI, 240 p. – ISBN 978-3-11-031788-6. – Prix: €129.95. – De Gruyter, Berlin, 2014.

Algebra and number theory have always been counted among the most beautiful and fundamental mathematical areas with deep proofs and elegant results. However, for a long time they were not considered of any substantial importance for real-life applications. This has dramatically changed with the appearance of new topics such as modern cryptography, coding theory, and wireless communication. Nowadays we find applications of algebra and number theory frequently in our daily life. We mention security and error detection for internet banking, check digit systems and the bar code, GPS and radar systems, pricing options at a stock market, and noise suppression on mobile phones as most common examples. This book collects the results of the workshops “Applications of algebraic curves” and “Applications of finite fields” of the RICAM Special Semester 2013. These workshops brought together the most prominent researchers in the area of finite fields and their applications around the world. They address old and new problems on curves and other aspects of finite fields, with emphasis on their diverse applications to many areas of pure and applied mathematics.

Elena RUBEL. – **Algebraic geometry: a concise dictionary**. – Un vol. relié, 17,5×24,5, de IX, 230 p. – ISBN 978-3-11-031622-3. – Prix: €89.95. – De Gruyter, Berlin, 2014.

Algebraic geometry is one of the most classic subjects of university research in mathematics. It has a very complicated language that makes life very difficult for beginners. This book is a little dictionary of algebraic geometry: for every of the most common words in algebraic geometry, it contains its definition, several references and the statements of the main theorems about that term (without their proofs). Also some terms of other subjects, close to algebraic geometry, have been included. It was born to help beginners that know some basic facts of algebraic geometry, but not every basic fact, to follow seminars and to read papers, by providing them with basic definitions and statements. The form of a dictionary makes it very easy and quick to consult.

## *Anneaux et algèbres*

Mahir CAN, Zhenheng LI, Benjamin STEINBERG, Qiang WANG, (Editors). – **Algebraic monoids, group embeddings, and algebraic combinatorics**. – Fields Institute communications, vol. 71. – Un vol. relié, 16×24, de X, 354 p. – ISBN 978-1-4939-0937-7. – Prix: SFr. 126.50. – Springer, New York, 2014.

This book contains a collection of fifteen articles and is dedicated to the sixtieth birthdays of Lex Renner and Mohan Putcha, the pioneers of the field of algebraic monoids. Topics presented include: structure and representation theory of reductive algebraic monoids, monoid schemes and applications of monoids, monoids related to Lie theory, equivariant embeddings of algebraic groups, constructions and properties of monoids from algebraic combinatorics, endomorphism monoids induced from vector bundles, Hodge-Newton decompositions of reductive monoids. A portion of these articles are designed to serve as a self-contained introduction to these topics, while the remaining contributions are research articles containing previously unpublished results, which are sure to become very influential for future work. Among these, for example, the important recent work of Michel Brion and Lex Renner showing that the algebraic semigroups are strongly  $\pi$ -regular. Graduate students as well as researchers working in the fields of algebraic (semi)group theory, algebraic combinatorics, and the theory of algebraic group embeddings will benefit from this unique and broad compilation of some fundamental results in (semi)group theory, algebraic group embeddings, and algebraic combinatorics merged under the umbrella of algebraic monoids.

Andy R. MAGID. – **The separable Galois theory of commutative rings.** – Second edition. – Monographs and textbooks in pure and applied mathematics, vol. 308. – Un vol. relié, 16×24, de XV, 168 p. – ISBN 978-1-4822-0805-4. – Prix: US\$109.95. – CRC Press, Boca Raton, 2014.

*The Separable Galois Theory of Commutative Rings, Second Edition* provides a complete and self-contained account of the Galois theory of commutative rings from the viewpoint of categorical classification theorems and using solely the techniques of commutative algebra. Along with updating nearly every result and explanation, this edition contains a new chapter on the theory of separable algebras. The book develops the notion of commutative separable algebra over a given commutative ring and explains how to construct an equivalent category of profinite spaces on which a profinite groupoid acts. It explores how the connection between the categories depends on the construction of a suitable separable closure of the given ring, which in turn depends on certain notions in profinite topology. The book also discusses how to handle rings with infinitely many idempotents using profinite topological spaces and other methods.

Martin SCHLICHENMAIER. – **Krichever-Novikov type algebras: theory and applications.** – De Gruyter studies in mathematics, vol. 53. – Un vol. relié, 17,5×24,5, de XV, 360 p. – ISBN 978-3-11-026517-0. – Prix: €109.95. – De Gruyter, Berlin, 2014.

Krichever and Novikov introduced certain classes of infinite dimensional Lie algebras to extend the Virasoro algebra and its related algebras to Riemann surfaces of higher genus. The author of this book generalized and extended them to a more general setting needed by the applications. Examples of applications are conformal field theory, Wess-Zumino-Novikov-Witten models, moduli space problems, integrable systems, Lax operator algebras, and deformation theory of Lie algebra. Furthermore they constitute an important class of infinite dimensional Lie algebras which due to their geometric origin are still manageable. This book gives an introduction for the newcomer to this exciting field of ongoing research in mathematics and will be a valuable source of reference for the experienced researcher. Beside the basic constructions and results also applications are presented.

## ***Théorie des groupes et généralisations***

Benjamin FINE, Anthony GAGLIONE, Alexei MYASNIVOK, Gerhard ROSENBERGER, Dennis SPELLMAN. – **The elementary theory of groups: a guide through the proofs of the Tarski conjectures.** – De Gruyter expositions in mathematics, vol. 60. – Un vol. relié, 17,5×24,5, de XIV, 307 p. – ISBN 978-3-11-034199-7. – Prix: US\$196.00. – De Gruyter, Berlin/Boston, 2014.

After being an open question for sixty years the Tarski conjecture was answered in the affirmative by Olga Kharlampovich and Alexei Myasnikov and independently by Zlil Sela. Both proofs involve long and complicated applications of algebraic geometry over free groups as well as an extension of methods to solve equations in free groups originally developed by Razborov. This book is an examination of the material on the general elementary theory of groups that is necessary to begin to understand the proofs. This material includes a complete exposition of the theory of fully residually free groups or limit groups as well a complete description of the algebraic geometry of free groups. Also included are introductory material on combinatorial and geometric group theory and first-order logic. There is then a short outline of the proof of the Tarski conjectures in the manner of Kharlampovich and Myasnikov.

## ***Fonctions de plusieurs variables complexes***

Friedrich HASLINGER. – **The d-bar Neumann problem and Schrödinger operators.** – De Gruyter expositions in mathematics, vol. 59. – Un vol. relié, 17,5×24,5, de XI, 241 p. – ISBN 978-3-11-031530-1. – Prix: €119.95. – De Gruyter, Berlin, 2014.

The topic of this book is located at the intersection of complex analysis, operator theory and partial differential equations. First we investigate the canonical solution operator to d-bar restricted to Bergman spaces of holomorphic L<sup>2</sup> functions in one and several complex variables. These operators are Hankel



operators of special type. In the following we consider the general  $\bar{d}$ -complex and derive properties of the complex Laplacian on  $L^2$  spaces of bounded pseudoconvex domains and on weighted  $L^2$  spaces. The main part is devoted to compactness of the  $\bar{d}$ -Neumann operator. The last part will contain a detailed account of the application of the  $\bar{d}$ -methods to Schrödinger operators, Pauli and Dirac operators and to Witten-Laplacians.

## *Équations différentielles ordinaires*

Yirong LIU, Jibin LI, Wentao HUANG. – **Planar dynamical systems: selected classical problems.** – Un vol. relié, 17,5×24,5, de XVIII, 371 p. – ISBN 978-3-11-029829-1. – Prix: US\$168.00. – Science Press & De Gruyter, Beijing/Berlin, 2014.

This book presents in an elementary way the recent significant developments in the qualitative theory of planar dynamical systems. The subjects are covered as follows: the studies of center and isochronous center problems, multiple Hopf bifurcations and local and global bifurcations of the equivariant planar vector fields which concern with Hilbert's 16th problem. The book is intended for graduate students, post-doctors and researchers in dynamical systems. For all engineers who are interested in the theory of dynamical systems, it is also a reasonable reference. It requires a minimum background of a one-year course on nonlinear differential equations.

## *Équations aux dérivées partielles*

Pavel DRÁBEK, Gabriela HOLUBOVÁ. – **Elements of partial differential equations.** – Second edition. – De Gruyter textbook. – Un vol. broché, 17×24, de XIII, 277 p. – ISBN 978-3-11-031665-0. – Prix: €34.95. – De Gruyter, Berlin, 2014.

This textbook is an elementary introduction to the basic principles of partial differential equations. With many illustrations it introduces PDEs on an elementary level, enabling the reader to understand what partial differential equations are, where they come from and how they can be solved. The intention is that the reader understands the basic principles which are valid for particular types of PDEs, and to acquire some classical methods to solve them, thus the authors restrict their considerations to fundamental types of equations and basic methods. Only basic facts from calculus and linear ordinary differential equations of first and second order are needed as a prerequisite. The book is addressed to students who intend to specialize in mathematics as well as to students of physics, engineering, and economics.

## *Systèmes dynamiques et théorie ergodique*

Bodil BRANNER, Núria FAGELLA. – **Quasiconformal surgery in holomorphic dynamics.** – Cambridge studies in advanced mathematics, vol. 141. – Un vol. relié, 16×23,5, de XVII, 413 p. – ISBN 978-1-107-04291-9. – Prix: £65.00. – Cambridge University Press, Cambridge, 2014.

Since its introduction in the early 1980s quasiconformal surgery has become a major tool in the development of the theory of holomorphic dynamics, and it is essential background knowledge for any researcher in the field. In this comprehensive introduction the authors begin with the foundations and a general description of surgery techniques before turning their attention to a wide variety of applications. They demonstrate the different types of surgeries that lie behind many important results in holomorphic dynamics, dealing in particular with Julia sets and the Mandelbrot set. Two of these surgeries go beyond the classical realm of quasiconformal surgery and use trans-quasiconformal surgery. Another deals with holomorphic correspondences, a natural generalization of holomorphic maps. The book is ideal for graduate students and researchers requiring a self-contained text including a variety of applications. It particularly emphasises the geometrical ideas behind the proofs, with many helpful illustrations seldom found in the literature.

## *Analyse de Fourier, analyse harmonique abstraite*

Anton DEITMAR, Siegfried ECHTERHOFF. – **Principles of harmonic analysis.** – Second edition. – Universitext. – Un vol. broché, 16×24, de XIII, 332 p – ISBN 978-3-319-05791-0. – Prix: SFr. 80.00. – Springer, Cham, 2014.

This book offers a complete and streamlined treatment of the central principles of abelian harmonic analysis: Pontryagin duality, the Plancherel theorem and the Poisson summation formula, as well as their respective generalizations to non-abelian groups, including the Selberg trace formula. The principles are then applied to spectral analysis of Heisenberg manifolds and Riemann surfaces. This new edition contains a new chapter on p-adic and adelic groups, as well as a complementary section on direct and projective limits. Many of the supporting proofs have been revised and refined. The book is an excellent resource for graduate students who wish to learn and understand harmonic analysis and for researchers seeking to apply it.

## *Analyse fonctionnelle*

Vladimir A. MIKHAIETS, Aleksandr A. MURACH. – **Hörmander spaces, interpolation, and elliptic problems.** – De Gruyter studies in mathematics, vol. 60. – Un vol. relié, 17,5×24,5, de XII, 297 p. – ISBN 978-3-11-029685-3. – Prix: €99.95. – De Gruyter, Berlin, 2014.

The monograph gives a detailed exposition of the theory of general elliptic operators (scalar and matrix) and elliptic boundary value problems in Hilbert scales of Hörmander function spaces. This theory was constructed by the authors in a number of papers published in 2005–2009. It is distinguished by a systematic use of the method of interpolation with a functional parameter of abstract Hilbert spaces and Sobolev inner product spaces. This method, the theory and their applications are expounded for the first time in the monographic literature. The monograph is written in detail and in a reader-friendly style. The complete proofs of theorems are given. This monograph is intended for a wide range of mathematicians whose research interests concern with mathematical analysis and differential equations.

Martin R. WEBER. – **Finite elements in vector lattices.** – Un vol. relié, 17,5×24,5, de IX, 220 p. – ISBN 978-3-11-035077-7. – Prix: €129.95. – De Gruyter, Berlin, 2014.

Finite elements in Archimedean vector lattices are introduced as abstract models of finite functions, i.e. continuous functions with compact support on some topological space. This book is the first systematic treatment of the theory of finite elements, contains the results known up to the year 2013 and joins all important contributions achieved by a series of mathematicians that can only be found scattered in the literature.

## *Calcul des variations et contrôle optimal*

Saleh A. R. AL-MEZEL, Falleh R. M. AL-SOLAMY, Qamrul H. ANSARI, (Editors). – **Fixed point theory, variational analysis, and optimization.** – Un vol. relié, 16×24, de XX, 347 p. – ISBN 978-1-4822-2207-4. – Prix: US\$129.95. – CRC Press, Boca Raton, 2014.

*Fixed point theory, variational analysis, and optimization* not only covers three vital branches of nonlinear analysis – fixed point theory, variational inequalities, and vector optimization – but also explains the connections between them, enabling the study of a general form of variational inequality problems related to the optimality conditions involving differentiable or directionally differentiable functions. This essential reference supplies both an introduction to the field and a guideline to the literature, progressing from basic concepts to the latest developments. Packed with detailed proofs and bibliographies for further reading, the text: – Examines Mann-type iterations for nonlinear mappings on some classes of a metric space. – Outlines recent research in fixed point theory in modular function spaces. – Discusses key results on the existence of continuous approximations and selections for set-valued maps with an emphasis on the nonconvex case. –

Contains definitions, properties, and characterizations of convex, quasiconvex, and pseudoconvex functions, and of their strict counterparts. – Discusses variational inequalities and variational-like inequalities and their applications. – Gives an introduction to multi-objective optimization and optimality conditions. – Explores multi-objective combinatorial optimization (MOCO) problems, or integer programs with multiple objectives. *Fixed point theory, variational analysis, and optimization* is a beneficial resource for the research and study of nonlinear analysis, optimization theory, variational inequalities, and mathematical economics. It provides fundamental knowledge of directional derivatives and monotonicity required in understanding and solving variational inequality problems.

Miroslav BAČÁK. – **Convex analysis and optimization in Hadamard spaces**. – De Gruyter series in nonlinear analysis and applications, vol. 22. – Un vol. relié, 17,5×24,5, de VIII, 185 p. – ISBN 978-3-11-036103-2. – Prix: US\$140.00. – De Gruyter, Berlin/Boston, 2014.

In the past two decades, convex analysis and optimization have been developed in Hadamard spaces. This book represents a first attempt to give a systematic account on the subject. Hadamard spaces are complete geodesic spaces of nonpositive curvature. They include Hilbert spaces, Hadamard manifolds, Euclidean buildings and many other important spaces. While the role of Hadamard spaces in geometry and geometric group theory has been studied for a long time, first analytical results appeared as late as in the 1990s. Remarkably, it turns out that Hadamard spaces are appropriate for the theory of convex sets and convex functions outside of linear spaces. Since convexity underpins a large number of results in the geometry of Hadamard spaces, we believe that its systematic study is of substantial interest. Optimization methods then address various computational issues and provide us with approximation algorithms which may be useful in sciences and engineering. We present a detailed description of such an application to computational phylogenetics. The book is primarily aimed at both graduate students and researchers in analysis and optimization, but it is accessible to advanced undergraduate students as well.

## *Topologie générale*

Vladimir V. TKACHUK. – **A Cp-theory problem book: special features of function spaces**. – Problem books in mathematics. – Un vol. relié, 16×24, de XIV, 210 p. – ISBN 978-3-319-04746-1. – Prix: SFr. 93.50. – Springer, Cham, 2014.

The books in Vladimir Tkachuk's *A Cp-theory problem book series* will be the 'go to' texts for basic reference to Cp-theory. This second volume, *Special features of function spaces*, gives a reasonably complete coverage of Cp-theory, systematically introducing each of the major topics and providing 500 carefully selected problems and exercises with complete solutions. Bonus results and open problems are also given. The text is designed to bring a dedicated reader from basic topological principles to the frontiers of modern research covering a wide variety of topics in Cp-theory and general topology at the professional level. The first volume, *Topological and function spaces*, provided an introduction from scratch to Cp-theory and general topology, preparing the reader for a professional understanding of Cp-theory in the last section of its main text. This second volume continues from the first, and can be used as a textbook for courses in both Cp-theory and general topology as well as a reference guide for specialists working in Cp-theory and related topics. Additionally, the material can also be considered as an introduction to advanced set theory and descriptive set theory, presenting diverse topics of the theory of function spaces with the topology of pointwise convergence, or Cp-theory which exists at the intersection of topological algebra, functional analysis and general topology. From the reviews of *Topological and function spaces*: "... It is designed to bring a dedicated reader from the basic topological principles to the frontiers of modern research. Any reasonable course in calculus covers everything needed to understand this book. This volume can also be used as a reference for mathematicians working in or outside the field of topology (functional analysis) wanting to use results or methods of Cp-theory. On the whole, the book provides a useful addition to the literature on Cp-theory, especially at the instructional level."

## ***Topologie algébrique***

Alain JEANNERET, Daniel LINES. – **Invitation à la topologie algébrique. Tome I: homologie.** – Mathématiques. – Un vol. broché, 14,5×20,5, de 297 p. – ISBN 978-2-36493-126-8. – Prix: €25.00. – Cépaduès-Éditions, Toulouse, 2014.

Ce livre, en deux tomes, est une introduction à la topologie algébrique et plus particulièrement à la théorie de l'homologie. Celle-ci associe à chaque espace topologique un module dont les propriétés algébriques reflètent celles de l'espace considéré. Nous l'appliquons principalement à l'étude des variétés, qui interviennent de manière fondamentale tant en mathématiques qu'en physique. Nous discutons de manière détaillée les divers concepts de dimension et d'orientation des variétés et établissons les résultats fondamentaux que sont les dualités de Poincaré et de Lefschetz. Le dernier chapitre du Tome II contient un panorama des résultats spectaculaires obtenus depuis les années soixante du siècle dernier concernant les variétés. Nous donnons dans les deux premiers chapitres du Tome I des compléments aux notions de base de la topologie générale et de la théorie des modules. Nous introduisons les homologies simpliciale et singulière, déterminons les modules d'homologie de nombreux espaces tels que les sphères, les surfaces et les espaces projectifs, et démontrons quelques théorèmes classiques de topologie comme ceux de Jordan et de Brouwer. Cet ouvrage sera utile pour un cours de niveaux master et doctorat ainsi que pour une étude individuelle de ces matières, y compris par des mathématiciens plus confirmés dont la topologie algébrique n'est pas le sujet principal de recherche.

Alain JEANNERET, Daniel LINES. – **Invitation à la topologie algébrique. Tome II: cohomologie, variétés.** – Mathématiques. – Un vol. broché, 14,5×20,5, de 298 p. – ISBN 978-2-36493-127-5. – Prix: €25.00. – Cépaduès-Éditions, Toulouse, 2014.

Ce Tome II introduit la cohomologie, qui est une théorie duale de l'homologie, et examine les liens avec cette dernière ainsi que les divers produits construits sur les modules d'homologie et de cohomologie. Nous étudions en détail les variétés topologiques avec ou sans bord, définissons sur celles-ci au moyen de l'homologie une notion d'orientation et la comparons avec les définitions classiques d'orientation pour les variétés différentiables ou triangulables. Nous exposons les théorèmes de dualité de Poincaré, Alexander et Lefschetz et en déduisons les propriétés des formes d'intersection et de la signature des variétés. Le dernier chapitre du livre présente les résultats fondamentaux concernant la différentiabilité et la triangulabilité des variétés, obtenus depuis les années soixante du siècle dernier, tant en grandes dimensions qu'en dimension quatre. Nous discutons également la conjecture de Poincaré classique et ses généralisations. Bien que des démonstrations complètes de ces résultats soient hors de portée d'un ouvrage tel que le nôtre, nous sommes attachés à rendre leurs énoncés compréhensibles. Cette vue d'ensemble, et les références à la littérature qui l'accompagnent, fournissent une introduction aux développements récents dans ce riche domaine de la topologie.

## ***Probabilités et processus stochastiques***

Maryse BEGUIN. – **Théorie de la mesure et de l'intégration pour les probabilités: cours et exercices corrigés.** – Un vol. broché, 19×24, de VIII, 208 p. – ISBN 978-2-7298-8035-4. – Prix: €21.00. – Ellipses, Paris, 2013.

L'activité humaine a, depuis longtemps, nécessité de définir et de mesurer des grandeurs concrètes comme des nombres, des longueurs, des volumes. Puis l'être humain a ressenti la nécessité de mesurer des objets plus abstraits, comme des événements avec le calcul des probabilités. Abordable dès la fin d'un cursus de L1 scientifique, l'objectif de cet ouvrage est de proposer une construction de la théorie de la mesure et de l'intégrale de Lebesgue, en démontrant les principaux théorèmes, comme ceux de convergence monotone, de convergence dominée, de Fubini. Chaque chapitre est illustré par des exercices corrigés afin de permettre l'assimilation et la manipulation des notions abstraites exposées, ou de démontrer des résultats connus ou utiles dans la pratique. Les applications principales comme les intégrales dépendant d'un paramètre sont abordées et l'accent est mis sur les applications dans le calcul des probabilités. Les étudiants de cursus

scientifiques de classes préparatoires et de L3 constituent le lectorat visé en priorité. Cependant certains chapitres peuvent servir de référence en première année de Master de certains cursus. Ce livre peut aussi être utile aux professeurs qui enseignent des probabilités ou des statistiques et qui souhaitent approfondir les bases théoriques de ces calculs.

Mark BOLLMAN. – **Basic gambling mathematics: the numbers behind the neon.** – Un vol. broché, 15×23,5, de XI, 271 p. – ISBN 978-1-4822-0893-1. – Prix: US\$59.95. – CRC Press, Boca Raton, 2014.

*Basic Gambling Mathematics: The Numbers Behind the Neon* explains the mathematics involved in analyzing games of chance, including casino games, horse racing, and lotteries. The book helps readers understand the mathematical reasons why some gambling games are better for the player than others. It is also suitable as a textbook for an introductory course on probability. Along with discussing the mathematics of well-known casino games, the author examines game variations that have been proposed or used in actual casinos. Numerous examples illustrate the mathematical ideas in a range of casino games while end-of-chapter exercises go beyond routine calculations to give readers hands-on experience with casino-related computations. The book begins with a brief historical introduction and mathematical preliminaries before developing the essential results and applications of elementary probability, including the important idea of mathematical expectation. The author then addresses probability questions arising from a variety of games, including roulette, craps, baccarat, blackjack, Caribbean stud poker, Royal Roulette, and sic bo. The final chapter explores the mathematics behind “get rich quick” schemes, such as the martingale and the Iron Cross, and shows how simple mathematics uncovers the flaws in these systems.

Sourav CHATTERJEE. – **Superconcentration and related topics.** – Springer monographs in mathematics. – Un vol. broché, 16×24, de IX, 156 p. – ISBN 978-3-319-03885-8. – Prix: SFr. 113.50. – Springer, Cham, 2014.

A certain curious feature of random objects, introduced by the author as “super concentration,” and two related topics, “chaos” and “multiple valleys,” are highlighted in this book. Although super concentration has established itself as a recognized feature in a number of areas of probability theory in the last twenty years (under a variety of names), the author was the first to discover and explore its connections with chaos and multiple valleys. He achieves a substantial degree of simplification and clarity in the presentation of these findings by using the spectral approach. Understanding the fluctuations of random objects is one of the major goals of probability theory and a whole subfield of probability and analysis, called concentration of measure, is devoted to understanding these fluctuations. This subfield offers a range of tools for computing upper bounds on the orders of fluctuations of very complicated random variables. Usually, concentration of measure is useful when more direct problem-specific approaches fail; as a result, it has massively gained acceptance over the last forty years. And yet, there is a large class of problems in which classical concentration of measure produces suboptimal bounds on the order of fluctuations. Here lies the substantial contribution of this book, which developed from a set of six lectures the author first held at the Cornell Probability Summer School in July 2012. The book is interspersed with a sizable number of open problems for professional mathematicians as well as exercises for graduate students working in the fields of probability theory and mathematical physics. The material is accessible to anyone who has attended a graduate course in probability.

Pierre DEL MORAL, Christelle VERGÉ. – **Modèles et méthodes stochastiques: une introduction avec applications.** – Mathématiques et applications, vol. 75. – Un vol. relié, 15,5×23,5, de XXIV, 487 p. – ISBN 978-3-642-54615-0. – Prix: €39.99. – Springer, Berlin, 2014.

La théorie des probabilités et des processus stochastiques est sans aucun doute l’un des plus importants outils mathématiques des sciences modernes. Le théorème des probabilités s’illustre dans de nombreux domaines issus de la biologie, de la physique, et des sciences de l’ingénieur : dynamique des populations, traitement du signal et de l’image, chimie moléculaire, économétrie, sciences actuarielles, mathématiques financières, ainsi qu’en analyse de risque. Le but de cet ouvrage est de parcourir les principaux modèles et méthodes stochastiques de cette théorie en pleine expansion. Ce voyage ne nécessite aucun bagage spécifique sur la théorie des processus stochastiques. Les outils d’analyses nécessaires à une bonne compréhension sont donnés au fur et à mesure de leur construction, révélant ainsi leur nécessité. La théorie des processus stochastiques

est une extension naturelle de la théorie de systèmes dynamiques à des phénomènes aléatoires. Elle contient des formalisations d'évolutions de phénomènes aléatoires rencontrés en physique, en biologie, en économie, ou en sciences de l'ingénieur, mais aussi des algorithmes d'exploration stochastique d'espaces de solutions complexes pour résoudre des problèmes d'estimation, d'optimisation et d'apprentissage statistique. Des techniques de résolution avancées en statistique bayésienne, en traitement du signal, en analyse d'événements rares, en combinatoire énumérative, en optimisation combinatoire, ainsi qu'en physique et chimie quantique sont exposées dans cet ouvrage.

René L. SCHILLING, Lothar PARTZSCH. – **Brownian motion: an introduction to stochastic processes.** – Second edition. – De Gruyter graduate. – Un vol. broché, 17×24, de XVI, 408 p. – ISBN 978-3-11-030729-0. – Prix: €39.95. – De Gruyter, Berlin, 2014.

Brownian motion is one of the most important stochastic processes in continuous time and with continuous state space. Within the realm of stochastic processes, Brownian motion is at the intersection of Gaussian processes, martingales, Markov processes, diffusions and random fractals, and it has influenced the study of these topics. Its central position within mathematics is matched by numerous applications in science, engineering and mathematical finance. Often textbooks on probability theory cover, if at all, Brownian motion only briefly. On the other hand, there is a considerable gap to more specialized texts on Brownian motion which is not so easy to overcome for the novice. The authors' aim was to write a book which can be used as an introduction to Brownian motion and stochastic calculus, and as a first course in continuous-time and continuous-state Markov processes. They also wanted to have a text which would be both a readily accessible mathematical back-up for contemporary applications (such as mathematical finance) and a foundation to get easy access to advanced monographs. This textbook, tailored to the needs of graduate and advanced undergraduate students, covers Brownian motion, starting from its elementary properties, certain distributional aspects, path properties, and leading to stochastic calculus based on Brownian motion. It also includes numerical recipes for the simulation of Brownian motion.

## Analyse numérique

Călin-Ioan GHEORGHIU. – **Spectral methods for non-standard eigenvalue problems : fluid and structural mechanics and beyond.** – Springer briefs in mathematics. – Un vol. broché, 15,5×23,5, de XII, 120 p. – ISBN 978-3-319-06229-7. – Prix: €52.74. – Springer, Cham, 2014.

This book focuses on the constructive and practical aspects of spectral methods. It rigorously examines the most important qualities as well as drawbacks of spectral methods in the context of numerical methods devoted to solve non-standard eigenvalue problems. In addition, the book also considers some nonlinear singularly perturbed boundary value problems along with eigenproblems obtained by their linearization around constant solutions. The book is mathematical, posing problems in their proper function spaces, but its emphasis is on algorithms and practical difficulties. The range of applications is quite large. High order eigenvalue problems are frequently beset with numerical ill conditioning problems. The book describes a wide variety of successful modifications to standard algorithms that greatly mitigate these problems. In addition, the book makes heavy use of the concept of pseudospectrum, which is highly relevant to understanding when disaster is imminent in solving eigenvalue problems. It also envisions two classes of applications, the stability of some elastic structures and the hydrodynamic stability of some parallel shear flows. This book is an ideal reference text for professionals (researchers) in applied mathematics, computational physics and engineering. It will be very useful to numerically sophisticated engineers, physicists and chemists. The book can also be used as a textbook in review courses such as numerical analysis, computational methods in various engineering branches or physics and computational methods in analysis.

Constantine POZRIKIDIS. – **Introduction to finite and spectral element methods using MATLAB<sup>®</sup>.** – Second edition. – Un vol. relié, 16×24, de XXV, 804 p. – ISBN 978-1-4822-0915-0. – Prix: US\$139.95. – CRC Press, Boca Raton, 2014.

Incorporating new topics and original material, *Introduction to finite and spectral element methods using MATLAB<sup>®</sup>, second edition* enables readers to quickly understand the theoretical foundation and practical

implementation of the finite element method and its companion spectral element method. Readers gain hands-on computational experience by using the free online FSELIB library of MATLAB<sup>®</sup> functions and codes. With the book as a user guide, readers can immediately run the codes and graphically display solutions to a variety of elementary and advanced problems. New to the second edition: Two new chapters with updated material. – Updated detailed proofs and original derivations. – New schematic illustrations and graphs. – Additional solved problems. – Updated MATLAB software, including improved and new computer functions as well as complete finite element codes incorporating domain discretization modules in three dimensions. Suitable for self-study or as a textbook in various science and engineering courses, this self-contained book introduces the fundamentals on a need-to-know basis and emphasizes the development of algorithms and the computer implementation of essential procedures. The text first explains basic concepts and develops the algorithms before addressing problems in solid mechanics, fluid mechanics, and structural mechanics.

## *Mécanique des fluides, acoustique*

Kuppalapalle VAJRAVELU, Kerehalli V. PRASAD. – **Keller-box method and its application.** – De Gruyter studies in mathematical physics, vol. 8. – Un vol. relié, 17,5×24,5, de XI, 401 p. – ISBN 978-3-11-027137-9. – Prix: €119.95. – De Gruyter, Berlin, 2014.

Most of the problems arising in science and engineering are nonlinear. They are inherently difficult to solve. Traditional analytical approximations are valid only for weakly nonlinear problems, and often break down for problems with strong nonlinearity. This book presents the current theoretical developments and applications of the Keller-box method to nonlinear problems. The first half of the book addresses basic concepts to understand the theoretical framework for the method. In the second half of the book, the authors give a number of examples of coupled nonlinear problems that have been solved by means of the Keller-box method. The particular area of focus is on fluid flow problems governed by nonlinear equation.

## *Mécanique quantique*

Boris A. ARBUZOV. – **Non-perturbative effective interactions in the standard model.** – De Gruyter studies in mathematical physics, vol. 23. – Un vol. relié, 17,5×24,5, de X, 225 p. – ISBN 978-3-11-030292-9. – Prix: €129.95. – De Gruyter, Berlin, 2014.

This monograph is devoted to the non-perturbative dynamics in the Standard Model (SM), the basic theory of all fundamental interactions in nature except gravity. The Standard Model is divided into two parts: the quantum chromodynamics (QCD) and the electro-weak theory (EWT) are well-defined renormalizable theories in which the perturbation theory is valid. However, for the adequate description of the real physics non-perturbative effects are inevitable. This book describes how these non-perturbative effects may be obtained in the framework of spontaneous generation of effective interactions. The well-known example of such effective interaction is provided by the famous Nambu-Jona-Lasinio effective interaction. Also a spontaneous generation of this interaction in the framework of QCD is described and applied to the method for other effective interactions in QCD and EWT. The method is based on N.N. Bogoliubov's conception of compensation equations. As a result we then describe the principal features of the Standard Model, e.g., Higgs sector, and significant non-perturbative effects including recent results obtained at LHC and TEVATRON.

Vladislav G. BAGROV, Dmitry GITMAN. – **The Dirac equation and its solutions.** – De Gruyter studies in mathematical physics, vol. 4. – Un vol. relié, 17,5×24,5, de XI, 430 p. – ISBN 978-3-11-026292-6. – Prix: €129.95. – De Gruyter, Berlin, 2014.

Dirac equations are of fundamental importance for relativistic quantum mechanics and quantum electrodynamics. In relativistic quantum mechanics, the Dirac equation is referred to as one-particle wave equation of motion for electron in an external electromagnetic field. In quantum electrodynamics, exact solutions of this equation are needed to treat the interaction between the electron and the external field exactly. In particular, all propagators of a particle, i.e., the various Green's functions, are constructed in a certain way by using exact solutions of the Dirac equation.

Igor O. CHEREDNIKOV, Tom MERTENS, Frederik F. VAN DER VEKEN. – **Wilson lines in quantum field theory**. – De Gruyter studies in mathematical physics, vol. 24. – Un vol. relié, 17,5×24,5, de XI, 257 p. – ISBN 978-3-11-030910-2. – Prix: US\$168.00. – De Gruyter, Berlin/Boston, 2014.

Wilson lines (also known as gauge links or eikonal lines) can be introduced in any gauge field theory. Although the concept of the Wilson exponentials finds an enormously wide range of applications in a variety of branches of modern quantum field theory, from condensed matter and lattice simulations to quantum chromodynamics, high-energy effective theories and gravity, there are surprisingly few books or textbooks on the market which contain comprehensive pedagogical introduction and consecutive exposition of the subject. The objective of this book is to get the potential reader acquainted with theoretical and mathematical foundations of the concept of the Wilson loops in the context of modern quantum field theory, to teach him/her to perform independently some elementary calculations with Wilson lines, and to familiarize him/her with the recent development of the subject in different important areas of research. The target audience of the book consists of graduate and postgraduate students working in various areas of quantum field theory, as well as researchers from other fields.

## *Physique statistique, structure de la matière*

Christian HEINEMANN, Christiane KRAUS. – **Phase separation coupled with damage processes: analysis of phase field models in elastic media**. – Springer Spektrum. – Un vol. broché, 15×21, de XII, 172 p. – ISBN 978-3-658-05251-5. – Prix: €69.01. – Springer, Wiesbaden, 2014.

The authors explore a unifying model which couples phase separation and damage processes in a system of partial differential equations. The model has technological applications to solder materials where interactions of both phenomena have been observed and cannot be neglected for a realistic description. The equations are derived in a thermodynamically consistent framework and suitable weak formulations for various types of this coupled system are presented. In the main part, existence of weak solutions is proven and degenerate limits are investigated. Contents: – Modeling of phase separation and damage processes. – Notion of weak solutions. – Existence of weak solutions. – Degenerate limit. Target groups: – Researchers, academics and scholars in the field of (applied) mathematics. – Material scientists in the field of modeling damaging processes.

## *Relativité*

Sergei M. KOPEIKIN, (Editor). – **Frontiers in relativistic celestial mechanics. Volume 1: theory**. – De Gruyter studies in mathematical physics, vol. 21. – Un vol. relié, 17,5×24,5, de XVIII, 401 p. – ISBN 978-3-11-033747-1. – Prix: €139.95. – De Gruyter, Berlin, 2014.

Relativistic celestial mechanics – investigating the motion celestial bodies under the influence of general relativity – is a major tool of modern experimental gravitational physics. With a wide range of prominent authors from the field, this two-volume series consists of reviews on a multitude of advanced topics in the area of relativistic celestial mechanics – starting from more classical topics such as the regime of asymptotically-flat spacetime, light propagation and celestial ephemerides, but also including its role in cosmology and alternative theories of gravity as well as modern experiments in this area. This first volume of a two-volume series is concerned with theoretical foundations such as post-Newtonian solutions to the two-body problem, light propagation through time-dependent gravitational fields, as well as cosmological effects on the movement of bodies in the solar systems. On the occasion of his 80th birthday, these two volumes honor V. A. Brumberg – one of the pioneers in modern relativistic celestial mechanics.



## *Économie, recherche opérationnelle, jeux*

Stéphane CREPEY, TOMASZ R. BIELECKI. With an introductory dialogue by Damiano BRIGO. – **Counterparty risk and funding: a tale of two puzzles.** – Chapman & Hall/CRC financial mathematics series. – Un vol. relié, 18×26, de XXI, 365 p. – ISBN 978-1-4665-1645-8. – Prix: US\$89.95. – CRC Press, Boca Raton, 2014.

*Counterparty Risk and Funding: A Tale of Two Puzzles* explains how to study risk embedded in financial transactions between the bank and its counterparty. The authors provide an analytical basis for the quantitative methodology of dynamic valuation, mitigation, and hedging of bilateral counterparty risk on over-the-counter (OTC) derivative contracts under funding constraints. They explore credit, debt, funding, liquidity, and rating valuation adjustment (CVA, DVA, FVA, LVA, and RVA) as well as replacement cost (RC), wrong-way risk, multiple funding curves, and collateral. The first part of the book assesses today's financial landscape, including the current multi-curve reality of financial markets. In mathematical but model-free terms, the second part describes all the basic elements of the pricing and hedging framework. Taking a more practical slant, the third part introduces a reduced-form modeling approach in which the risk of default of the two parties only shows up through their default intensities. The fourth part addresses counterparty risk on credit derivatives through dynamic copula models. In the fifth part, the authors present a credit migrations model that allows you to account for rating-dependent credit support annex (CSA) clauses. They also touch on nonlinear FVA computations in credit portfolio models. The final part covers classical tools from stochastic analysis and gives a brief introduction to the theory of Markov copulas. The credit crisis and ongoing European sovereign debt crisis have shown the importance of the proper assessment and management of counterparty risk. This book focuses on the interaction and possible overlap between DVA and FVA terms. It also explores the particularly challenging issue of counterparty risk in portfolio credit modeling. Primarily for researchers and graduate students in financial mathematics, the book is also suitable for financial quants, managers in banks, CVA desks, and members of supervisory bodies.

Matt DAVISON. – **Quantitative finance: a simulation-based introduction using Excel.** – Un vol. relié, 16×24, de XIX, 511 p. – ISBN 978-1-4398-7168-3. – Prix: US\$79.95. – CRC Press, Boca Raton, 2014.

*Quantitative finance: a simulation-based introduction using Excel* provides an introduction to financial mathematics for students in applied mathematics, financial engineering, actuarial science, and business administration. The text not only enables students to practice with the basic techniques of financial mathematics, but it also helps them gain significant intuition about what the techniques mean, how they work, and what happens when they stop working. After introducing risk, return, decision making under uncertainty, and traditional discounted cash flow project analysis, the book covers mortgages, bonds, and annuities using a blend of Excel simulation and difference equation or algebraic formalism. It then looks at how interest rate markets work and how to model bond prices before addressing mean variance portfolio optimization, the capital asset pricing model, options, and value at risk (VaR). The author next focuses on binomial model tools for pricing options and the analysis of discrete random walks. He also introduces stochastic calculus in a nonrigorous way and explains how to simulate geometric Brownian motion. The text proceeds to thoroughly discuss options pricing, mostly in continuous time. It concludes with chapters on stochastic models of the yield curve and incomplete markets using simple discrete models. Accessible to students with a relatively modest level of mathematical background, this book will guide your students in becoming successful quants. It uses both hand calculations and Excel spreadsheets to analyze plenty of examples from simple bond portfolios. The spreadsheets are available on the book's CRC Press web page.

## *Systemes, contrôle*

Yann OLLIVIER, Hervé PAJOT, Cédric VILLANI, (Editors). – **Optimal transportation: theory and applications.** – London Mathematical Society lecture note series, vol. 413. – Un vol. broché, 15,5×23, de X, 306 p. – ISBN 978-1-107-68949-7. – Prix: £40.00. – Cambridge University Press, Cambridge, 2014.

The theory of optimal transportation has its origins in the eighteenth century when the problem of transporting resources at a minimal cost was first formalised. Through subsequent developments, particularly in recent decades, it has become a powerful modern theory. This book contains the proceedings of the summer school “Optimal Transportation: Theory and Applications” held at the Fourier Institute in Grenoble. The event brought together mathematicians from pure and applied mathematics, astrophysics, economics and computer science. Part I of this book is devoted to introductory lecture notes accessible to graduate students, while Part II contains research papers. Together, they represent a valuable resource on both fundamental and advanced aspects of optimal transportation, its applications, and its interactions with analysis, geometry, PDE and probability, urban planning and economics. Topics covered include Ricci flow, the Euler equations, functional inequalities, curvature-dimension conditions, and traffic congestion.