Bulletin bibliographique

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Généralités

Jean-Louis Brahem. — **Voyage en géométrie : la 3D sac au dos**. — Impromptus. — Un vol. broché, 17×24, de 141 p. — ISBN 978-2-7465-1248-1. — Prix : €23.00. — Le Pommier, Paris, 2017.

Pour développer notre capacité à appréhender l'espace et à s'y repérer, rien de tel qu'un voyage en Géométrie, l'un des quatre États de l'Union mathématique. Le voyage commence au poste frontière de Cubville, la ville aux mille angles droits. Les voyageurs remonteront la vallée des Formes, en passant par Oblikaiä, Aigupointu, Rond les Rouleaux, La Boule et Tordu sur Ondule, grimperont le Massif Central, survoleront les îles de la mer du Milieu pour, enfin, apercevoir les ruines d'Ombropolis. Ils se poseront alors sur le désert Infini pour visiter les Douze Cubes et la Terrasse des Reflets. Chemin faisant, ils auront rencontré parallélépipèdes, plans inclinés, cylindres, sphères, cols et vallées … les composantes de notre réalité. Et se seront familiarisés avec les outils graphiques qui permettent de comprendre et d'exprimer en deux dimensions – et à la main ! – notre réalité 3D … Amateurs de mathématiques vivantes, enseignants de collège, étudiants en architecture et en design : dépaysement garanti !

Keith Devlin. — **Finding Fibonacci: the quest to rediscover the forgotten mathematical genius who changed the world**. — Un vol. relié, 14×24, de VI, 241 p. — ISBN 978-0-691-17486-0. — Prix: £24.95. — Princeton University Press, Princeton/Oxford, 2017.

In 2000, Keith Devlin set out to research the life and legacy of the medieval mathematician Leonardo of Pisa, popularly known as Fibonacci, whose book Liber abbaci has quite literally affected the lives of everyone alive today. Although he is most famous for the Fibonacci numbers—which, it so happens, he didn't invent—Fibonacci's greatest contribution was as an expositor of mathematical ideas at a level ordinary people could understand. In 1202, Liber abbaci—the *Book of Calculation*—introduced modern arithmetic to the Western world. Yet Fibonacci was long forgotten after his death, and it was not until the 1960s that his true achievements were finally recognized. *Finding Fibonacci* is Devlin's compelling firsthand account of his ten-year quest to tell Fibonacci's story. Devlin, a math expositor himself, kept a diary of the undertaking, which he draws on here to describe the project's highs and lows, its false starts and disappointments, the tragedies and unexpected turns, some hilarious episodes, and the occasional lucky breaks. You will also meet the unique individuals Devlin encountered along the way, people who, each for their own reasons, became fascinated by Fibonacci, from the Yale professor who traced modern finance back to Fibonacci to the Italian historian who made the crucial archival discovery that brought together all the threads of Fibonacci's astonishing story. Fibonacci helped to revive the West as the cradle of science, technology, and commerce, yet he vanished from the pages of history. This is Devlin's search to find him.

Michael Esfeld. — **Philosophie des sciences : une introduction**. — Troisième édition entièrement revue. — Un vol. broché, 15×22,5, de X, 296 p. — ISBN 978-2-88915-221-6. — Prix : SFr. 31.50. — Presses polytechniques et universitaires romandes, Lausanne, 2017.

Ce livre est une introduction à la philosophie des sciences qui se veut accessible aux étudiants. Il résume l'état actuel de la connaissance en présentant les différents concepts et en proposant une évaluation des résultats fondés ainsi que des questions majeures encore ouvertes. Cette troisième édition, entièrement

revue, vise à contribuer au développement d'une philosophie de la nature qui prend en considération les théories scientifiques. La première partie de l'ouvrage dresse un bilan du débat entre l'empirisme logique et ses critiques. Elle tend à démontrer qu'il est possible de conserver une version du réalisme scientifique suffisante pour fonder le projet au sein d'une métaphysique de la nature. La deuxième partie développe cette approche en présentant les principales questions de la métaphysique de la nature que soulèvent les théories modernes de la physique fondamentale (mécanique classique, électrodynamique classique, physique relativiste et physique quantique). Chaque chapitre contient un appareil pédagogique avec résumé, questions de contrôle et propositions de travail, et l'ouvrage est complété d'un glossaire et d'une bibliographie exhaustive : il est donc particulièrement adapté à un support de cours.

Luigi Pepe. — **Insegnare matematica: storia degli insegnamenti matematici in Italia**. — Un vol. relié, 21×27, de X, 541 p. — ISBN 978-88-491-5493-1. — Prix: €75.44. — CLUEB, Bologna, 2016.

Questo ampio volume si propone di presentare la storia degli insegnamenti matematici in Italia, come sono stati concretamente impartiti, in un arco temporale assai ampio: partendo dall'antichità, si ripercorrono via via il medioevo, l'età moderna, il periodo napoleonico, fino a giungere agli anni sessanta del Novecento. In esso vengono raccolti una serie di lavori monografici, che l'autore ha redatto nell'arco di trent'anni, molti dei quali comparsi su riviste o volumi specialistici, altri appositamente elaborati come materiale didattico di supporto alle lezioni per un corso universitario della laurea magistrale in matematica dell'Università di Ferrara. L'opera consta di 544 pagine e si compone di quattro parti: I. Insegnamenti matematici nell'Antichità e nel Medioevo – II. Insegnamenti matematici in Italia nell'età moderna – III. Dal periodo napoleonico all'Unità d'Italia – IV. Nel primo secolo dell'Italia unita.

Mircea Pitici, (Editor). — **The best writing on mathematics 2016**. — Un vol. relié, 14×21,5, de XXII, 377 p. — ISBN 978-0-691-17529-4. — Prix: £27.95. — Princeton University Press, Princeton/Oxford, 2017.

This annual anthology brings together the year's finest mathematics writing from around the world. Featuring promising new voices alongside some of the foremost names in the field, *The best writing on mathematics 2016* makes available to a wide audience many articles not easily found anywhere else—and you don't need to be a mathematician to enjoy them. These writings offer surprising insights into the nature, meaning, and practice of mathematics today. They delve into the history, philosophy, teaching, and everyday occurrences of math, and take readers behind the scenes of today's hottest mathematical debates. Here Burkard Polster shows how to invent your own variants of the Spot It! card game, Steven Strogatz presents young Albert Einstein's proof of the Pythagorean Theorem, Joseph Dauben and Marjorie Senechal find a treasure trove of math in New York's Metropolitan Museum of Art, and Andrew Gelman explains why much scientific research based on statistical testing is spurious. In other essays, Brian Greene discusses the evolving assumptions of the physicists who developed the mathematical underpinnings of string theory, Jorge Almeida examines the misperceptions of people who attempt to predict lottery results, and Ian Stewart offers advice to authors who aspire to write successful math books for general readers. And there's much, much more. In addition to presenting the year's most memorable writings on mathematics, this must-have anthology includes a bibliography of other notable writings and an introduction by the editor, Mircea Pitici. This book belongs on the shelf of anyone interested in where math has taken us—and where it is headed.

Alexander Soifer. — **The Colorado mathematical Olympiad: the third decade and further explorations : from the mountains of Colorado to the peaks of mathematics**. — Un vol. broché, 15,5×23,5, de LII, 259 p. — ISBN 978-3-319-52859-5. — Prix: €47.00. — Springer, Cham, 2017.

Now in its third decade, the Colorado Mathematical Olympiad (CMO), founded by the author, has become an annual state-wide competition, hosting many hundreds of middle and high school contestants each year. This book presents a year-by-year history of the CMO from 2004–2013 with all the problems from the competitions and their solutions. Additionally, the book includes 10 further explorations, bridges from solved Olympiad problems to 'real' mathematics, bringing young readers to the forefront of various fields of mathematics. This book contains more than just problems, solutions, and event statistics—it tells a compelling story involving the lives of those who have been part of the Olympiad, their reminiscences of the past and successes of the present.

Logique et fondements

David Marker. — **Lectures on infinitary model theory**. — Lecture notes in logic, vol. 46. — Un vol. relié, 16×23,5, de VIII, 183 p. — ISBN 978-1-107-18193-9. — Prix: £79.99. — Cambridge University Press, Cambridge, 2016.

Infinitary logic, the logic of languages with infinitely long conjunctions, plays an important role in model theory, recursion theory and descriptive set theory. This book is the first modern introduction to the subject in forty years, and will bring students and researchers in all areas of mathematical logic up to the threshold of modern research. The classical topics of back-and-forth systems, model existence techniques, indiscernibles and end extensions are covered before more modern topics are surveyed. Zilber's categoricity theorem for quasiminimal excellent classes is proved and an application is given to covers of multiplicative groups. Infinitary methods are also used to study uncountable models of counterexamples to Vaught's conjecture, and effective aspects of infinitary model theory are reviewed, including an introduction to Montalbán's recent work on spectra of Vaught counterexamples. Self-contained introductions to effective descriptive set theory and hyperarithmetic theory are provided, as is an appendix on admissible model theory.

Analyse combinatoire

Reinhard Diestel. — **Graph theory**. — Fifth edition. — Graduate texts in mathematics, vol. 173. — Un vol. relié, 16×24, de XVIII, 428 p. — ISBN 978-3-662-53621-6. — Prix: SFr. 74.00. — Springer, Berlin, 2017.

This standard textbook of modern graph theory, now in its fifth edition, combines the authority of a classic with the engaging freshness of style that is the hallmark of active mathematics. It covers the core material of the subject with concise yet reliably complete proofs, while offering glimpses of more advanced methods in each field by one or two deeper results, again with proofs given in full detail. The book can be used as a reliable text for an introductory course, as a graduate text, and for self-study.

Ralucca Gera, Stephen Hedetniemi, Craig Larson, (Editors). — **Graph theory: favorite conjectures and open problems – 1**. — Problem books in mathematics. — Un vol. relié, 16×24, de XII, 291 p. — ISBN 978-3-319-31938-4. — Prix: SFr. 74.00. — Springer, Cham, 2016.

This is the first in a series of volumes, which provide an extensive overview of conjectures and open problems in graph theory. The readership of each volume is geared toward graduate students who may be searching for research ideas. However, the well-established mathematician will find the overall exposition engaging and enlightening. Each chapter, presented in a story-telling style, includes more than a simple collection of results on a particular topic. Each contribution conveys the history, evolution, and techniques used to solve the authors' favorite conjectures and open problems, enhancing the reader's overall comprehension and enthusiasm. The editors were inspired to create these volumes by the popular and well attended special sessions, entitled "My Favorite Graph Theory Conjectures," which were held at the winter AMS/MAA Joint Meeting in Boston (January, 2012), the SIAM Conference on Discrete Mathematics in Halifax (June, 2012) and the winter AMS/MAA Joint meeting in Baltimore (January, 2014). In an effort to aid in the creation and dissemination of open problems, which is crucial to the growth and development of a field, the editors requested the speakers, as well as notable experts in graph theory, to contribute to these volumes.

Yanpei Liu. — **Topological theory of graphs**. — Un vol. relié, 17,5×24,5, de XI, 357 p. — ISBN 978-3-11-047669-9. — Prix: €129.95. — De Gruyter, Berlin, 2017.

This book presents a topological approach to combinatorial configurations, in particular graphs, by introducing a new pair of homology and cohomology via polyhedra. On this basis, a number of problems are solved using a new approach, such as the embeddability of a graph on a surface (orientable and nonorientable) with given genus, the Gauss crossing conjecture, the graphicness and cographicness of a

matroid, and so forth. Notably, the specific case of embeddability on a surface of genus zero leads to a number of corollaries, including the theorems of Lefschetz (on double coverings), of MacLane (on cycle base), and of Whitney (on duality) for planarity. Relevant problems include the Jordan axiom in polyhedral forms, efficient methods for extremality and for recognizing a variety of embeddings (including rectilinear layouts in VLSI), and pan-polynomials, including those of Jones, Kauffman (on knots), and Tutte (on graphs), among others.

Carlo Mariconda, Alberto Tonolo. — **Discrete calculus: methods for counting**. — Unitext – la matematica per il 3+2, vol. 103. — Un vol. broché, 15,5×23,5, de XXI, 659 p. — ISBN 978-3-319-03037-1. — Prix: SFr. 88.00. — Springer, Cham, 2016.

This book provides an introduction to combinatorics, finite calculus, formal series, recurrences, and approximations of sums. Readers will find not only coverage of the basic elements of the subjects but also deep insights into a range of less common topics rarely considered within a single book, such as counting with occupancy constraints, a clear distinction between algebraic and analytical properties of formal power series, an introduction to discrete dynamical systems with a thorough description of Sarkovskii's theorem, symbolic calculus, and a complete description of the Euler-Maclaurin formulas and their applications. Although several books touch on one or more of these aspects, precious few cover all of them. The authors, both pure mathematicians, have attempted to develop methods that will allow the student to formulate a given problem in a precise mathematical framework. The aim is to equip readers with a sound strategy for classifying and solving problems by pursuing a mathematically rigorous yet user-friendly approach. This is particularly useful in combinatorics, a field where, all too often, exercises are solved by means of ad hoc tricks. The book contains more than 400 examples and about 300 problems, and the reader will be able to find the proof of every result. To further assist students and teachers, important matters and comments are highlighted, and parts that can be omitted, at least during a first and perhaps second reading, are identified.

Zoran Stanić. — **Regular graphs: a spectral approach**. — De Gruyter series in discrete mathematics and applications, vol. 4. — Un vol. relié, 17,5×24,5, de IX, 236 p. — ISBN 978-3-11-035128-6. — Prix: €89.95. — De Gruyter, Berlin, 2017.

Written for mathematicians working with the theory of graph spectra, this (primarily theoretical) book presents relevant results considering the spectral properties of regular graphs. The book begins with a short introduction including necessary terminology and notation. The author then proceeds with basic properties, specific subclasses of regular graphs (like distance-regular graphs, strongly regular graphs, various designs or expanders) and determining particular regular graphs. Each chapter contains detailed proofs, discussions, comparisons, examples, exercises and also indicates possible applications. Finally, the author also includes some conjectures and open problems to promote further research. Contents: Spectral properties. – Particular types of regular graph. – Determinations of regular graphs. – Expanders. – Distance matrix of regular graphs.

Théorie des nombres

Mihai Caragiu. — **Sequential experiments with primes**. — Un vol. relié, 16×24, de XI, 279 p. — ISBN 978-3-319-56761-7. — Prix: SFr. 74.00. — Springer, Cham, 2017.

With a specific focus on the mathematical life in small undergraduate colleges, this book presents a variety of elementary number theory insights involving sequences largely built from prime numbers and contingent number-theoretic functions. Chapters include new mathematical ideas and open problems, some of which are proved in the text. Vector valued MGPF sequences, extensions of Conway's Subprime Fibonacci sequences, and linear complexity of bit streams derived from GPF sequences are among the topics covered in this book. This book is perfect for the pure-mathematics-minded educator in a small undergraduate college as well as graduate students and advanced undergraduate students looking for a significant high-impact learning experience in mathematics.

Jan-Hendrik Evertse, Kálmán Győry. — **Discriminant equations in Diophantine number theory**. — New mathematical monographs, vol. 32. — Un vol. relié, 16×24, de XVIII, 457 p. — ISBN 978-1-107-09761-2. — Prix: £99.99. — Cambridge University Press, Cambridge, 2017.

Discriminant equations are an important class of Diophantine equations with close ties to algebraic number theory, Diophantine approximation and Diophantine geometry. This book is the first comprehensive account of discriminant equations and their applications. It brings together many aspects, including effective results over number fields, effective results over finitely generated domains, estimates on the number of solutions, applications to algebraic integers of given discriminant, power integral bases, canonical number systems, root separation of polynomials and reduction of hyperelliptic curves. The authors' previous title, *Unit Equations in Diophantine Number Theory*, laid the groundwork by presenting important results that are used as tools in the present book. This material is briefly summarized in the introductory chapters along with the necessary basic algebra and algebraic number theory, making the book accessible to experts and young researchers alike.

Benjamin Fine, Gerhard Rosenberger. — **Number theory: an introduction via the density of primes**. — Second edition. — Un vol. relié, 16×24, de XIII, 413 p. — ISBN 978-3-319-43873-3. — Prix: €70.67. — Birkhäuser/Springer, Cham, 2017.

Now in its second edition, this textbook provides an introduction and overview of number theory based on the density and properties of the prime numbers. This unique approach offers both a firm background in the standard material of number theory, as well as an overview of the entire discipline. All of the essential topics are covered, such as the fundamental theorem of arithmetic, theory of congruences, quadratic reciprocity, arithmetic functions, and the distribution of primes. New in this edition are coverage of *p-adic* numbers, Hensel's lemma, multiple zeta-values, and elliptic curve methods in primality testing. Key topics and features include: A solid introduction to analytic number theory, including full proofs of Dirichlet's theorem and the prime number theorem. Concise treatment of algebraic number theory, including a complete presentation of primes, prime factorizations in algebraic number fields, and unique factorization of ideals. Discussion of the AKS algorithm, which shows that primality testing is one of polynomial time, a topic not usually included in such texts. Many interesting ancillary topics, such as primality testing and cryptography, Fermat and Mersenne numbers, and Carmichael numbers. The user-friendly style, historical context, and wide range of exercises that range from simple to quite difficult (with solutions and hints provided for select exercises) make *Number theory: an introduction via the density of primes* ideal for both self-study and classroom use. Intended for upper level undergraduates and beginning graduates, the only prerequisites are a basic knowledge of calculus, multivariable calculus, and some linear algebra. All necessary concepts from abstract algebra and complex analysis are introduced where needed.

Michel L. Lapidus, Goran Radunović, Darko Žubrinić. — **Fractal zeta functions and fractal drums: higher-dimensional theory of complex dimensions**. — Springer monographs in mathematics. — Un vol. relié, 16,5×24, de XL, 655 p. — ISBN 978-3-319-44704-9. — Prix: SFr. 143.00. — Springer, Cham, 2017.

This monograph gives a state-of-the-art and accessible treatment of a new general higher-dimensional theory of complex dimensions, valid for arbitrary bounded subsets of Euclidean spaces, as well as for their natural generalization, relative fractal drums. It provides a significant extension of the existing theory of zeta functions for fractal strings to fractal sets and arbitrary bounded sets in Euclidean spaces of any dimension. Two new classes of fractal zeta functions are introduced, namely, the distance and tube zeta functions of bounded sets, and their key properties are investigated. The theory is developed step-by-step at a slow pace, and every step is well motivated by numerous examples, historical remarks and comments, relating the objects under investigation to other concepts. Special emphasis is placed on the study of complex dimensions of bounded sets and their connections with the notions of Minkowski content and Minkowski measurability, as well as on fractal tube formulas. It is shown for the first time that essential singularities of fractal zeta functions can naturally emerge for various classes of fractal sets and have a significant geometric effect. The theory developed in this book leads naturally to a new definition of fractality, expressed in terms of the existence of underlying geometric oscillations or, equivalently, in terms of the existence of nonreal complex dimensions. The connections to previous extensive work of the first author and his collaborators on geometric zeta functions of fractal strings are clearly explained. Many concepts are discussed for the

first time, making the book a rich source of new thoughts and ideas to be developed further. The book contains a large number of open problems and describes many possible directions for further research. The beginning chapters may be used as a part of a course on fractal geometry. The primary readership is aimed at graduate students and researchers working in fractal geometry and other related fields, such as complex analysis, dynamical systems, geometric measure theory, harmonic analysis, mathematical physics, analytic number theory and the spectral theory of elliptic differential operators. The book should be accessible to nonexperts and newcomers to the field.

David Loeffler, Sarah Livia Zerbes, (Editors). — **Elliptic curves, modular forms and Iwasawa theory: in honour of John H. Coates' 70th Birthday, Cambridge, UK, March 2015**. — Springer proceedings in mathematics & statistics, vol. 188. — Un vol. relié, 16×24, de VIII, 492 p. — ISBN 978-3-319-45031-5. — Prix: €126.59. — Springer, Switzerland, 2016.

Celebrating one of the leading figures in contemporary number theory—John H. Coates—on the occasion of his 70th birthday, this collection of contributions covers a range of topics in number theory, concentrating on the arithmetic of elliptic curves, modular forms, and Galois representations. Several of the contributions in this volume were presented at the conference *Elliptic Curves, Modular Forms and Iwasawa Theory*, held in honour of the 70th birthday of John Coates in Cambridge, March 25–27, 2015. The main unifying theme is Iwasawa theory, a field that John Coates himself has done much to create. This collection is indispensable reading for researchers in Iwasawa theory, and is interesting and valuable for those in many related fields.

Michael Th. Rassias ; foreword by Jörg Brüdern and Preda Mihăilescu. — **Goldbach's problem : selected topics**. — Un vol. broché, 15,5×23,5, de XV, 122 p. — ISBN 978-3-319-57912-2. — Prix: SFr. 85.00. — Springer, Cham, 2017.

Important results surrounding the proof of Goldbach's ternary conjecture are presented in this book. Beginning with an historical perspective along with an overview of essential lemmas and theorems, this monograph moves on to a detailed proof of Vinogradov's theorem. The principles of the Hardy–Littlewood circle method are outlined and applied to Goldbach's ternary conjecture. New results due to H. Maier and the author on Vinogradov's theorem are proved under the assumption of the Riemann hypothesis. The final chapter discusses an approach to Goldbach's conjecture through theorems by L. G. Schnirelmann. This book concludes with an appendix featuring a sketch of H. Helfgott's proof of Goldbach's ternary conjecture. The Appendix also presents some biographical remarks of mathematicians whose research has played a seminal role on the Goldbach ternary problem. The author's step-by-step approach makes this book accessible to those that have mastered classical number theory and fundamental notions of mathematical analysis. This book will be particularly useful to graduate students and mathematicians in analytic number theory, approximation theory as well as to researchers working on Goldbach's problem.

Géométrie algébrique

Matthew Baker, Sam Payne, (Editors). — **Nonarchimedean and tropical geometry**. — Simons Symposia. — Un vol. relié, 16×24, de XIV, 526 p. — ISBN 978-3-319-30944-6. — Prix: €144.99. — Springer, Switzerland, 2016.

This volume grew out of two Simons Symposia on "Nonarchimedean and tropical geometry" which took place on the island of St. John in April 2013 and in Puerto Rico in February 2015. Each meeting gathered a small group of experts working near the interface between tropical geometry and nonarchimedean analytic spaces for a series of inspiring and provocative lectures on cutting edge research, interspersed with lively discussions and collaborative work in small groups. The articles collected here, which include high-level surveys as well as original research, mirror the main themes of the two Symposia. Topics covered in this volume include: Differential forms and currents, and solutions of Monge-Ampere type differential equations on Berkovich spaces and their skeletons; The homotopy types of nonarchimedean analytifications; The existence of "faithful tropicalizations" which encode the topology and geometry of analytifications; Relations between nonarchimedean analytic spaces and algebraic geometry, including logarithmic schemes, birational geometry, and the geometry of algebraic curves; Extended notions of tropical varieties which relate

to Huber's theory of adic spaces analogously to the way that usual tropical varieties relate to Berkovich spaces; Relations between nonarchimedean geometry and combinatorics, including deep and fascinating connections between matroid theory, tropical geometry, and Hodge theory.

Wolfram Decker, Gerhard Pfister, Mathias Schulze, (Editors). — **Singularities and computer algebra: Festschrift for Gert-Martin Greuel on the occasion of his 70th birthday**. — Un vol. relié, 16×24, de XIV, 389 p. — ISBN 978-3-319-28828-4. — Prix: €91.62. — Springer, Switzerland, 2017.

This book arose from a conference on "Singularities and Computer Algebra" which was held at the Pfalz-Akademie Lambrecht in June 2015 in honor of Gert-Martin Greuel's 70th birthday. This unique volume presents a collection of recent original research by some of the leading figures in singularity theory on a broad range of topics including topological and algebraic aspects, classification problems, deformation theory and resolution of singularities. At the same time, the articles highlight a variety of techniques, ranging from theoretical methods to practical tools from computer algebra. Greuel himself made major contributions to the development of both singularity theory and computer algebra. With Gerhard Pfister and Hans Schönemann, he developed the computer algebra system SINGULAR, which has since become the computational tool of choice for many singularity theorists. The book addresses researchers whose work involves singularity theory and computer algebra from the PhD to expert level.

Anneaux et algèbres

Kuncham Syam Prasad, Kedukodi Babushri Srinivas, Harikrishnan Panackal, Bhavanari Satyanarayana, (Editors). — **Nearrings, nearfields and related topics**. — Un vol. relié, 18×25, de XIV, 309 p. — ISBN 978-981-3207-35-6 . — Prix: £106.00. — World Scientific, New Jersey, 2017.

Recent developments in various algebraic structures and the applications of those in different areas play an important role in science and technology. One of the best tools to study the non-linear algebraic systems is the theory of near-rings. This book contains the significant material covering the plenary and invited talks conducted at the 24th International Conference on Nearrings, Nearfields and related topics held at Manipal Institute of Technology, Manipal University, Manipal (India) in July 2015. The forward note by Günter Pilz (Johannes Kepler University, Austria) explains about past developments and future prospects in the theory of nearrings and nearfields. Certain applications of nearrings are found in a few chapters. Some of the chapters are independent; however flow is maintained in all the chapters. It also include few chapters of exploratory approach.

Catégories, algèbre homologique, cohomologie des groupes

Vladimir Turaev, Alexis Virelizier. — **Monoidal categories and topological field theory**. — Progress in mathematics, vol. 323. — Un vol. relié, 16×24, de XII, 523 p. — ISBN 978-3-319-49833-1. — Prix: SFr. 143.00. — Birkhäuser/Springer, Cham, 2017.

This monograph is devoted to monoidal categories and their connections with 3-dimensional topological field theories. Starting with basic definitions, it proceeds to the forefront of current research. Part 1 introduces monoidal categories and several of their classes, including rigid, pivotal, spherical, fusion, braided, and modular categories. It then presents deep theorems of Müger on the center of a pivotal fusion category. These theorems are proved in Part 2 using the theory of Hopf monads. In Part 3 the authors define the notion of a topological quantum field theory (TQFT) and construct a Turaev-Viro-type 3-dimensional state sum TQFT from a spherical fusion category. Lastly, in Part 4 this construction is extended to 3-manifolds with colored ribbon graphs, yielding a so-called graph TQFT (and, consequently, a 3-2-1 extended TQFT). The authors then prove the main result of the monograph: the state sum graph TQFT derived from any spherical fusion category is isomorphic to the Reshetikhin-Turaev surgery graph TQFT derived from the center of that category. The book is of interest to researchers and students studying topological field theory, monoidal categories, Hopf algebras and Hopf monads.

Théorie des groupes et généralisations

Benjamin Steinberg. — **Representation theory of finite monoids**. — Universitext. — Un vol. broché, 15,5×23,5, de XXIV, 317 p. — ISBN 978-3-319-43930-3. — Prix: €69.67. — Springer, Switzerland, 2016.

This first text on the subject provides a comprehensive introduction to the representation theory of finite monoids. Carefully worked examples and exercises provide the bells and whistles for graduate accessibility, bringing a broad range of advanced readers to the forefront of research in the area. Highlights of the text include applications to probability theory, symbolic dynamics, and automata theory. Comfort with module theory, a familiarity with ordinary group representation theory, and the basics of Wedderburn theory, are prerequisites for advanced graduate level study. Researchers in algebra, algebraic combinatorics, automata theory, and probability theory, will find this text enriching with its thorough presentation of applications of the theory to these fields. Prior knowledge of semigroup theory is not expected for the diverse readership that may benefit from this exposition. The approach taken in this book is highly module-theoretic and follows the modern flavor of the theory of finite dimensional algebras. The content is divided into 7 parts. Part I consists of 3 preliminary chapters with no prior knowledge beyond group theory assumed. Part II forms the core of the material giving a modern module-theoretic treatment of the Clifford-Munn-Ponizovskii theory of irreducible representations. Part III concerns character theory and the character table of a monoid. Part IV is devoted to the representation theory of inverse monoids and categories and Part V presents the theory of the Rhodes radical with applications to triangularizability. Part VI features 3 chapters devoted to applications to diverse areas of mathematics and forms a high point of the text. The last part, Part VII, is concerned with advanced topics. There are also 3 appendices reviewing finite dimensional algebras, group representation theory, and Möbius inversion.

Groupes topologiques, groupes et algèbres de Lie

Helmut Strade. — **Simple Lie algebras over fields of positive characteristic. Vol. 1: Structure theory**. — Second edition. — De Gruyter expositions in mathematics, vol. 38. — Un vol. relié, 17,5×24,5, de VIII, 540 p. — ISBN 978-3-11-051516-9. — Prix: SFr. 119.95. — De Gruyter, Berlin, 2017.

Helmut Strade. — **Simple Lie algebras over fields of positive characteristic. Vol. 2: Classifying the absolute toral rank two case**. — Second edition. — De Gruyter expositions in mathematics, vol. 42. — Un vol. relié, 17,5×24,5, de VIII, 382 p. — ISBN 978-3-11-051676-0. — Prix: SFr. 119.95. — De Gruyter, Berlin, 2017.

The problem of classifying the finite dimensional simple Lie algebras over fields of characteristic $p > 0$ is a long standing one. Work on this question has been directed by the Kostrikin–Shafarevich Conjecture of 1966, which states that over an algebraically closed field of characteristic $p > 5$ a finite dimensional restricted simple Lie algebra is classical or of Cartan type. This conjecture was proved for $p > 7$ by Block and Wilson in 1988. The generalization of the Kostrikin-Shafarevich Conjecture for the general case of not necessarily restricted Lie algebras and $p > 7$ was announced in 1991 by Strade and Wilson and eventually proved by Strade in 1998. The final Block–Wilson–Strade–Premet Classification Theorem is a landmark result of modern mathematics and can be formulated as follows: Every simple finite dimensional simple Lie algebra over an algebraically closed field of characteristic $p > 3$ is of classical, Cartan, or Melikian type.

Équations aux dérivées partielles

D. Cioranescu, V. Girault, K.R. Rajagopal. — **Mechanics and mathematics of fluids of the differential type**. — Advances in mechanics and mathematics, vol. 35. — Un vol. relié, 16×24, de VIII, 394 p. — ISBN 978-3-319-39329-2. — Prix: US$129.00. — Springer, Switzerland, 2016.

This text is the first of its kind to bring together both the thermomechanics and mathematical analysis of Reiner-Rivlin fluids and fluids of grades 2 and 3 in a single book. Each part of the book can be considered as being self-contained. The first part of the book is devoted to a description of the mechanics, thermodynamics, and stability of flows of fluids of grade 2 and grade 3. The second part of the book is dedicated to the development of rigorous mathematical results concerning the equations governing the motion of a family of fluids of the differential type. Finally, the proofs of a number of useful results are collected in an appendix.

Boling Guo, Lixin Tian, Zhenya Yan, Liming Lin, Yu-Feng Wang. — **Rogue waves: mathematical theory and applications in physics**. — Un vol. relié, 17,5×24,5, de VII, 204 p. — ISBN 978-3-11-046942-4. — Prix: SFr. 119.95. — De Gruyter, Berlin, 2017.

This book gives an overview of the theoretical research on rogue waves and discusses solutions to rogue wave formation via the Darboux and bilinear transformations, algebro-geometric reduction, and inverse scattering and similarity transformations. Studies on nonlinear optics are included, making the book a comprehensive reference for researchers in applied mathematics, optical physics, geophysics, and ocean engineering. Contents: The research process for rogue waves. – Construction of rogue wave solution by the generalized Darboux transformation. – Construction of rogue wave solution by Hirota bilinear method, algebro-geometric approach and inverse scattering method. – The rogue wave solution and parameters managing in nonautonomous physical model.

Systèmes dynamiques et théorie ergodique

Viacheslav Z. Grines, Timur V. Medvedev, Olga V. Pochinka. — **Dynamical systems on 2- and 3-manifolds**. — Developments in mathematics, vol. 46. — Un vol. relié, 16×24, de XXVI, 295 p. — ISBN 978-3-319-44846-6. — Prix: SFr. 129.00. — Springer, Switzerland, 2016.

This book provides an introduction to the topological classification of smooth structurally stable diffeomorphisms on closed orientable 2- and 3-manifolds. The topological classification is one of the main problems of the theory of dynamical systems and the results presented in this book are mostly for dynamical systems satisfying Smale's Axiom A. The main results on the topological classification of discrete dynamical systems are widely scattered among many papers and surveys. This book presents these results fluidly, systematically, and for the first time in one publication. Additionally, this book discusses the recent results on the topological classification of Axiom A diffeomorphisms focusing on the nontrivial effects of the dynamical systems on 2- and 3-manifolds. The classical methods and approaches which are considered to be promising for the further research are also discussed. The reader needs to be familiar with the basic concepts of the qualitative theory of dynamical systems which are presented in Part 1 for convenience. The book is accessible to ambitious undergraduates, graduates, and researchers in dynamical systems and low dimensional topology. This volume consists of 10 chapters; each chapter contains its own set of references and a section on further reading. Proofs are presented with the exact statements of the results. In Chapter 10 the authors briefly state the necessary definitions and results from algebra, geometry and topology. When stating ancillary results at the beginning of each part, the authors refer to other sources which are readily available.

Approximations et développements en série

Vijay Gupta, Gancho Tachev. — **Approximation with positive linear operators and linear combinations**. — Developments in mathematics, vol. 50. — Un vol. relié, 16×24, de XIII, 186 p. — ISBN 978-3-319-58794-3. — Prix: SFr. 104.50. — Springer, Cham, 2017.

This book presents a systematic overview of approximation by linear combinations of positive linear operators, a useful tool used to increase the order of approximation. Fundamental and recent results from the past decade are described with their corresponding proofs. The volume consists of eight chapters that provide

detailed insight into the representation of monomials of the operators Ln, direct and inverse estimates for a broad class of positive linear operators, and case studies involving finite and unbounded intervals of real and complex functions. Strong converse inequalities of Type A in terminology of Ditzian–Ivanov for linear combinations of Bernstein and Bernstein–Kantorovich operators and various Voronovskaja-type estimates for some linear combinations are analyzed and explained. Graduate students and researchers in approximation theory will find the list of open problems in approximation of linear combinations useful. The book serves as a reference for graduate and postgraduate courses as well as a basis for future study and development.

Analyse de Fourier, analyse harmonique abstraite

Emmanuel Fricain, Javad Mashreghi. — **The theory of $H(b)$ spaces**. — Volume 2. — New mathematical monographs, vol. 21. — Un vol. relié, 16×23,5, de XIX, 619 p. — ISBN 978-1-107-02778-7. — Prix: £110.00. — Cambridge University Press, Cambridge, 2016.

An $H(b)$ space is defined as a collection of analytic functions that are in the image of an operator. The theory of $H(b)$ spaces bridges two classical subjects, complex analysis and operator theory, which makes it both appealing and demanding. Volume 1 of this comprehensive treatment is devoted to the preliminary subjects required to understand the foundation of $H(b)$ spaces, such as Hardy spaces, Fourier analysis, integral representation theorems, Carleson measures, Toeplitz and Hankel operators, various types of shift operators and Clark measures. Volume 2 focuses on the central theory. Both books are accessible to graduate students as well as researchers: each volume contains numerous exercises and hints, and figures are included throughout to illustrate the theory. Together, these two volumes provide everything the reader needs to understand and appreciate this beautiful branch of mathematics.

Équations intégrales

Svetlin G. Georgiev. — **Integral equations on time scales**. — Atlantis studies in dynamical systems, vol. 5. — Un vol. relié, 16×24, de IX, 402 p. — ISBN 978-94-6239-227-4. — Prix: US$129.00. — Atlantis Press/Springer, [S. l.], 2016.

This book offers the reader an overview of recent developments of integral equations on time scales. It also contains elegant analytical and numerical methods. This book is primarily intended for senior undergraduate students and beginning graduate students of engineering and science courses. The students in mathematical and physical sciences will find many sections of direct relevance. The book contains nine chapters and each chapter is pedagogically organized. This book is specially designed for those who wish to understand integral equations on time scales without having extensive mathematical background.

Analyse fonctionnelle

Shaun Bullett, Tom Fearn, Frank Smith, (Editors). — **Analysis and mathematical physics**. — LTCC advanced mathematics series, vol. 6. — Un vol. relié, 16×23,5, de IX, 235 p. — ISBN 978-1-78634-098-6. — Prix: £81.00. — World Scientific, London, 2017.

This is a concise reference book on analysis and mathematical physics, leading readers from a foundation to advanced level understanding of the topic. This is the perfect text for graduate or PhD mathematical-science students looking for support in topics such as distributions, Fourier transforms and microlocal analysis, C* Algebras, value distribution of meromorphic functions, noncommutative differential geometry, differential geometry and mathematical physics, mathematical problems of general relativity, and special functions of mathematical physics. *Analysis and mathematical physics* is the sixth volume of the LTCC Advanced Mathematics Series. This series is the first to provide advanced introductions to mathematical science topics to advanced students of mathematics. Edited by the three joint heads of the London Taught Course Centre for PhD Students in the Mathematical Sciences (LTCC), each book supports readers in broadening their mathematical knowledge outside of their immediate research disciplines while also covering specialized key areas.

Amol Sasane. — **A friendly approach to functional analysis**. — Essential textbooks in mathematics. — Un vol. broché, 15×23, de XIV, 379 p. — ISBN 978-1-78634-334-5. — Prix: £56.00. — World Scientific, London, 2017.

This book constitutes a concise introductory course on functional analysis for students who have studied calculus and linear algebra. The topics covered are Banach spaces, continuous linear transformations, Frechet derivative, geometry of Hilbert spaces, compact operators, and distributions. In addition, the book includes selected applications of functional analysis to differential equations, optimization, physics (classical and quantum mechanics), and numerical analysis. The book contains 197 problems, meant to reinforce the fundamental concepts. The inclusion of detailed solutions to all the exercises makes the book ideal also for self-study. *A friendly approach to functional analysis* is written specifically for undergraduate students of pure mathematics and engineering, and those studying joint programmes with mathematics.

Théorie des opérateurs

Tanja Eisner, Birgit Jacob, André Ran, Hans Zwart, (Editors). — **Operator theory, function spaces, and applications: International Workshop on Operator Theory and Applications, Amsterdam, July 2014**. — Operator theory: advances and applications, vol. 255. — Un vol. relié, 16×24, de VIII, 233 p. — ISBN 978-3-319-31381-8. — Prix: US$139.00. — Springer, Switzerland, 2016.

This volume collects a selected number of papers presented at the International Workshop on Operator Theory and its Applications (IWOTA) held in July 2014 at Vrije Universiteit in Amsterdam. Main developments in the broad area of operator theory are covered, with special emphasis on applications to science and engineering. The volume also presents papers dedicated to the eightieth birthday of Damir Arov and to the sixty-fifth birthday of Leiba Rodman, both leading figures in the area of operator theory and its applications, in particular, to systems theory.

Calcul des variations et contrôle optimal

Leonid T. Aschepkov, Dmitriy V. Dolgy, Taekyun Kim, Ravi P. Agarwal. — **Optimal control**. — Un vol. relié, 16×24, de XV, 209 p. — ISBN 978-3-319-49780-8. — Prix: SFr. 50.00. — Springer, Cham, 2016.

This book is based on lectures from a one-year course at the Far Eastern Federal University (Vladivostok, Russia) as well as on workshops on optimal control offered to students at various mathematical departments at the university level. The main themes of the theory of linear and nonlinear systems are considered, including the basic problem of establishing the necessary and sufficient conditions of optimal processes. In the first part of the course, the theory of linear control systems is constructed on the basis of the separation theorem and the concept of a reachability set. The authors prove the closure of a reachability set in the class of piecewise continuous controls, and the problems of controllability, observability, identification, performance and terminal control are also considered. The second part of the course is devoted to nonlinear control systems. Using the method of variations and the Lagrange multipliers rule of nonlinear problems, the authors prove the Pontryagin maximum principle for problems with mobile ends of trajectories. Further exercises and a large number of additional tasks are provided for use as practical training in order for the reader to consolidate the theoretical material.

Géométrie différentielle

Loring W. Tu. — **Differential geometry: connections, curvature, and characteristic classes**. — Graduate texts in mathematics, vol. 275. — Un vol. relié, 16×24, de XVI, 346 p. — ISBN 978-3-319-55082-4. — Prix: SFr. 74.00. — Springer, Cham, 2017.

This text presents a graduate-level introduction to differential geometry for mathematics and physics students. The exposition follows the historical development of the concepts of connection and curvature with

the goal of explaining the Chern-Weil theory of characteristic classes on a principal bundle. Along the way we encounter some of the high points in the history of differential geometry, for example, Gauss' Theorema Egregium and the Gauss-Bonnet theorem. Exercises throughout the book test the reader's understanding of the material and sometimes illustrate extensions of the theory. Initially, the prerequisites for the reader include a passing familiarity with manifolds. After the first chapter, it becomes necessary to understand and manipulate differential forms. A knowledge of de Rham cohomology is required for the last third of the text. Prerequisite material is contained in author's text *An Introduction to Manifolds*, and can be learned in one semester. For the benefit of the reader and to establish common notations, Appendix A recalls the basics of manifold theory. Additionally, in an attempt to make the exposition more self-contained, sections on algebraic constructions such as the tensor product and the exterior power are included. Differential geometry, as its name implies, is the study of geometry using differential calculus. It dates back to Newton and Leibniz in the seventeenth century, but it was not until the nineteenth century, with the work of Gauss on surfaces and Riemann on the curvature tensor, that differential geometry flourished and its modern foundation was laid. Over the past one hundred years, differential geometry has proven indispensable to an understanding of the physical world, in Einstein's general theory of relativity, in the theory of gravitation, in gauge theory, and now in string theory. Differential geometry is also useful in topology, several complex variables, algebraic geometry, complex manifolds, and dynamical systems, among other fields. The field has even found applications to group theory as in Gromov's work and to probability theory as in Diaconis's work. It is not too far-fetched to argue that differential geometry should be in every mathematician's arsenal.

Topologie algébrique

Frédéric Chazal, Vin De Silva, Marc Glisse, Steve Oudot. — **The structure and stability of persistence modules**. — Springer briefs in mathematics. — Un vol. broché, 15,5×23,5, de X, 120 p. — ISBN 978-3-319-42543-6. — Prix: US$54.99. — Springer, Switzerland, 2016.

This book is a comprehensive treatment of the theory of persistence modules over the real line. It presents a set of mathematical tools to analyse the structure and to establish the stability of such modules, providing a sound mathematical framework for the study of persistence diagrams. Completely self-contained, this brief introduces the notion of persistence measure and makes extensive use of a new calculus of quiver representations to facilitate explicit computations. Appealing to both beginners and experts in the subject, *The structure and stability of persistence modules* provides a purely algebraic presentation of persistence, and thus complements the existing literature, which focuses mainly on topological and algorithmic aspects.

Anatoly Fomenko, Dmitry Fuchs. — **Homotopical topology**. — Second edition. — Graduate texts in mathematics, vol. 273. — Un vol. relié, 16×24, de XI, 627 p. — ISBN 978-3-319-23487-8. — Prix: SFr. 77.00. — Springer, Cham, 2016.

This textbook on algebraic topology updates a popular textbook from the golden era of the Moscow school of I. M. Gelfand. The first English translation, done many decades ago, remains very much in demand, although it has been long out-of-print and is difficult to obtain. Therefore, this updated English edition will be much welcomed by the mathematical community. Distinctive features of this book include: a concise but fully rigorous presentation, supplemented by a plethora of illustrations of a high technical and artistic caliber; a huge number of nontrivial examples and computations done in detail; a deeper and broader treatment of topics in comparison to most beginning books on algebraic topology; an extensive, and very concrete, treatment of the machinery of spectral sequences. The second edition contains an entirely new chapter on K-theory and the Riemann-Roch theorem (after Hirzebruch and Grothendieck).

Probabilités et processus stochastiques

Pierre Brémaud. — **Discrete probability models and methods: probability on graphs and trees, Markov chains and random fields, entropy and coding**. — Probability theory and stochastic modelling, vol. 78. — Un vol. relié, 16×24, de XIV, 559 p. — ISBN 978-3-319-43475-9. — Prix: €84.39. — Springer, Switzerland, 2017.

The emphasis in this book is placed on general models (Markov chains, random fields, random graphs), universal methods (the probabilistic method, the coupling method, the Stein-Chen method, martingale methods, the method of types) and versatile tools (Chernoff's bound, Hoeffding's inequality, Holley's inequality) whose domain of application extends far beyond the present text. Although the examples treated in the book relate to the possible applications, in the communication and computing sciences, in operations research and in physics, this book is in the first instance concerned with theory. The level of the book is that of a beginning graduate course. It is self-contained, the prerequisites consisting merely of basic calculus (series) and basic linear algebra (matrices). The reader is not assumed to be trained in probability since the first chapters give in considerable detail the background necessary to understand the rest of the book.

Tullio Ceccherini-Silberstein, Maura Salvatori, Ecaterina Sava-Huss, (Editors). — **Groups, graphs and random walks**. — London Mathematical Society lecture note series, vol. 436. — Un vol. broché, 15×23, de XVII, 519 p. — ISBN 978-1-316-60440-3. — Prix: £65.00. — Cambridge University Press, Cambridge, 2017.

An accessible and panoramic account of the theory of random walks on groups and graphs, stressing the strong connections of the theory with other branches of mathematics, including geometric and combinatorial group theory, potential analysis, and theoretical computer science. This volume brings together original surveys and research-expository papers from renowned and leading experts, many of whom spoke at the workshop 'Groups, Graphs and Random Walks' celebrating the sixtieth birthday of Wolfgang Woess in Cortona, Italy. Topics include: growth and amenability of groups; Schrödinger operators and symbolic dynamics; ergodic theorems; Thompson's group F; Poisson boundaries; probability theory on buildings and groups of Lie type; structure trees for edge cuts in networks; and mathematical crystallography. In what is currently a fast-growing area of mathematics, this book provides an up-to-date and valuable reference for both researchers and graduate students, from which future research activities will undoubtedly stem.

Jean-François Le Gall. — **Brownian motion, martingales, and stochastic calculus**. — Graduate texts in mathematics, vol. 274. — Un vol. relié, 16×24, de XIII, 273 p. — ISBN 978-3-319-31088-6. — Prix: SFr. 63.00. — Springer, Cham, 2016.

This book offers a rigorous and self-contained presentation of stochastic integration and stochastic calculus within the general framework of continuous semimartingales. The main tools of stochastic calculus, including Itô's formula, the optional stopping theorem and Girsanov's theorem, are treated in detail alongside many illustrative examples. The book also contains an introduction to Markov processes, with applications to solutions of stochastic differential equations and to connections between Brownian motion and partial differential equations. The theory of local times of semimartingales is discussed in the last chapter. Since its invention by Itô, stochastic calculus has proven to be one of the most important techniques of modern probability theory, and has been used in the most recent theoretical advances as well as in applications to other fields such as mathematical finance. *Brownian motion, martingales, and stochastic calculus* provides a strong theoretical background to the reader interested in such developments. Beginning graduate or advanced undergraduate students will benefit from this detailed approach to an essential area of probability theory. The emphasis is on concise and efficient presentation, without any concession to mathematical rigor. The material has been taught by the author for several years in graduate courses at two of the most prestigious French universities. The fact that proofs are given with full details makes the book particularly suitable for self-study. The numerous exercises help the reader to get acquainted with the tools of stochastic calculus.

Olav Kallenberg. — **Random measures, theory and applications**. — Probability theory and stochastic modelling, vol. 77. — Un vol. relié, 16×24, de XIII, 694 p. — ISBN 978-3-319-41596-3. — Prix: €135.19. — Springer, Cham, 2017.

Offering the first comprehensive treatment of the theory of random measures, this book has a very broad scope, ranging from basic properties of Poisson and related processes to the modern theories of convergence, stationarity, Palm measures, conditioning, and compensation. The three large final chapters focus on applications within the areas of stochastic geometry, excursion theory, and branching processes. Although this theory plays a fundamental role in most areas of modern probability, much of it, including the

most basic material, has previously been available only in scores of journal articles. The book is primarily directed towards researchers and advanced graduate students in stochastic processes and related areas.

Statistique

Benjamin Kedem, Victor De Oliveira, Michael Sverchkov. — **Statistical data fusion**. — Un vol. relié, 17,5×25, de XI, 186 p. — ISBN 978-981-3200-18-0. — Prix: £81.00. — World Scientific, New Jersey, 2017.

This book comes up with estimates or decisions based on multiple data sources as opposed to more narrowly defined estimates or decisions based on single data sources. And as the world is awash with data obtained from numerous and varied processes, there is a need for appropriate statistical methods which in general produce improved inference by multiple data sources. The book contains numerous examples useful to practitioners from genomics. Topics range from sensors (radars), to small area estimation of body mass, to the estimation of small tail probabilities, to predictive distributions in time series analysis.

Analyse numérique

Susanne C. Brenner, (Editor). — **Topics in numerical partial differential equations and scientific computing**. — The IMA volumes in mathematics and its applications, vol. 160. — Un vol. relié, 16×24, de X, 176 p. — ISBN 978-1-4939-6398-0. — Prix: US$139.00. — Springer, New York, 2016.

Numerical partial differential equations (PDEs) are an important part of numerical simulation, the third component of the modern methodology for science and engineering, besides the traditional theory and experiment. This volume contains papers that originated with the collaborative research of the teams that participated in the IMA Workshop for Women in Applied Mathematics: *Numerical Partial Differential Equations and Scientific Computing* in August 2014.

Günter Mayer. — **Interval analysis: and automatic result verification**. — De Gruyter studies in mathematics, vol. 65. — Un vol. relié, 17,5×24,5, de XIII, 516 p. — ISBN 978-3-11-050063-9. — Prix: €119.95. — De Gruyter, Berlin, 2017.

This self-contained text is a step-by-step introduction and a complete overview of interval computation and result verification, a subject whose importance has steadily increased over the past many years. The author, an expert in the field, gently presents the theory of interval analysis through many examples and exercises, and guides the reader from the basics of the theory to current research topics in the mathematics of computation. Contents: Preliminaries. – Real intervals. – Interval vectors, interval matrices. – Expressions, P-contraction, ε-inflation. – Linear systems of equations. – Nonlinear systems of equations. – Eigenvalue problems. – Automatic differentiation. – Complex intervals.

Mécanique des fluides, acoustique

Eduard Feireisl, Trygve G. Karper, Milan Pokorný. — **Mathematical theory of compressible viscous fluids: analysis and numerics**. — Lecture notes in mathematical fluid mechanics. — Un vol. broché, 15,5×23,5, de XII, 186 p. — ISBN 978-3-319-44834-3. — Prix: US$89.99. — Springer, Cham, 2016.

This book offers an essential introduction to the mathematical theory of compressible viscous fluids. The main goal is to present analytical methods from the perspective of their numerical applications. Accordingly, we introduce the principal theoretical tools needed to handle well-posedness of the underlying Navier-Stokes system, study the problems of sequential stability, and, lastly, construct solutions by means of an implicit numerical scheme. Offering a unique contribution—by exploring in detail the "synergy" of analytical and numerical methods—the book offers a valuable resource for graduate students in mathematics and researchers working in mathematical fluid mechanics. Mathematical fluid mechanics concerns problems that are closely connected to real-world applications and is also an important part of the theory of partial differential equations and numerical analysis in general. This book highlights the fact that numerical and mathematical analysis are not two separate fields of mathematics. It will help graduate students and researchers to not only better understand problems in mathematical compressible fluid mechanics but also to learn something from the field of mathematical and numerical analysis and to see the connections between the two worlds. Potential readers should possess a good command of the basic tools of functional analysis and partial differential equations including the function spaces of Sobolev type.

Yoshihiro Shibata, Yukihito Suzuki, (Editors). — **Mathematical fluid dynamics, present and future. Tokyo, Japan, November 2014**. — Springer proceedings in mathematics & statistics, vol. 183. — Un vol. relié, 16×24, de XIX, 613 p. — ISBN 978-4-431-56455-3. — Prix: US$135.19. — Springer, Japan, 2016.

This volume presents original papers ranging from an experimental study on cavitation jets to an up-to-date mathematical analysis of the Navier-Stokes equations for free boundary problems, reflecting topics featured at the International Conference on Mathematical Fluid Dynamics, Present and Future, held 11–14 November 2014 at Waseda University in Tokyo. The contributions address subjects in one- and two-phase fluid flows, including cavitation, liquid crystal flows, plasma flows, and blood flows. Written by internationally respected experts, these papers highlight the connections between mathematical, experimental, and computational fluid dynamics. The book is aimed at a wide readership in mathematics and engineering, including researchers and graduate students interested in mathematical fluid dynamics.

Mécanique quantique

Luiz C.L. Botelho. — **Lecture notes in topics in path integrals and string representations**. — Un vol. relié, 16×24, de XIII, 227 p. — ISBN 978-981-3143-46-3 . — Prix: £81.00. — World Scientific, Singapore, 2017.

Functional integrals is a well-established method in mathematical physics, especially those mathematical methods used in modern non-perturbative quantum field theory and string theory. This book presents a unique, original and modern treatment of strings representations on bosonic quantum chromodynamics and bosonization theory on 2d gauge field models, besides of rigorous mathematical studies on the analytical regularization scheme on Euclidean quantum field path integrals and stochastic quantum field theory. It follows an analytic approach based on loop space techniques, functional determinant exact evaluations and exactly solubility of four dimensional QCD loop wave equations through Elfin Botelho fermionic extrinsic self avoiding string path integrals.

Kevin Costello, Owen Gwilliam. — **Factorization algebras in quantum field theory**. — Volume 1. — New mathematical monographs, vol. 31. — Un vol. relié, 15,5×23,5, de IX, 387 p. — ISBN 978-1-107-16310-2. — Prix: £110.00. — Cambridge University Press, Cambridge, 2017.

Factorization algebras are local-to-global objects that play a role in classical and quantum field theory which is similar to the role of sheaves in geometry: they conveniently organize complicated information. Their local structure encompasses examples like associative and vertex algebras; in these examples, their global structure encompasses Hochschild homology and conformal blocks. In this first volume, the authors develop the theory of factorization algebras in depth, but with a focus upon examples exhibiting their use in field theory, such as the recovery of a vertex algebra from a chiral conformal field theory and a quantum group from Abelian Chern-Simons theory. Expositions of the relevant background in homological algebra,

sheaves and functional analysis are also included, thus making this book ideal for researchers and graduates working at the interface between mathematics and physics.

Daisuke Fujiwara. — **Rigorous time slicing approach to Feynman path integrals**. — Mathematical physics studies. — Un vol. relié, 16×24, de IX, 333 p. — ISBN 978-4-431-56551-2. — Prix: SFr. 121.00. — Springer, Tokyo, 2017.

This book proves that Feynman's original definition of the path integral actually converges to the fundamental solution of the Schrödinger equation at least in the short term if the potential is differentiable sufficiently many times and its derivatives of order equal to or higher than two are bounded. The semi-classical asymptotic formula up to the second term of the fundamental solution is also proved by a method different from that of Birkhoff. A bound of the remainder term is also proved. The Feynman path integral is a method of quantization using the Lagrangian function, whereas Schrödinger's quantization uses the Hamiltonian function. These two methods are believed to be equivalent. But equivalence is not fully proved mathematically, because, compared with Schrödinger's method, there is still much to be done concerning rigorous mathematical treatment of Feynman's method. Feynman himself defined a path integral as the limit of a sequence of integrals over finite-dimensional spaces which is obtained by dividing the time interval into small pieces. This method is called the time slicing approximation method or the time slicing method. This book consists of two parts. Part I is the main part. The time slicing method is performed step by step in detail in Part I. The time interval is divided into small pieces. Corresponding to each division a finite-dimensional integral is constructed following Feynman's famous paper. This finite-dimensional integral is not absolutely convergent. Owing to the assumption of the potential, it is an oscillatory integral. The oscillatory integral techniques developed in the theory of partial differential equations are applied to it. It turns out that the finite-dimensional integral gives a finite definite value. The stationary phase method is applied to it. Basic properties of oscillatory integrals and the stationary phase method are explained in the book in detail. Those finite-dimensional integrals form a sequence of approximation of the Feynman path integral when the division goes finer and finer. A careful discussion is required to prove the convergence of the approximate sequence as the length of each of the small subintervals tends to 0. For that purpose the book uses the stationary phase method of oscillatory integrals over a space of large dimension, of which the detailed proof is given in Part II of the book. By virtue of this method, the approximate sequence converges to the limit. This proves that the Feynman path integral converges. It turns out that the convergence occurs in a very strong topology. The fact that the limit is the fundamental solution of the Schrödinger equation is proved also by the stationary phase method. The semi-classical asymptotic formula naturally follows from the above discussion. A prerequisite for readers of this book is standard knowledge of functional analysis. Mathematical techniques required here are explained and proved from scratch in Part II, which occupies a large part of the book, because they are considerably different from techniques usually used in treating the Schrödinger equation.

Relativité

Joachim Schröter. — **Minkowski space: the spacetime of special relativity**. — De Gruyter studies in mathematics, vol. 40. — Un vol. relié, 17,5×24,5, de VI, 122 p. — ISBN 978-3-11-048457-1. — Prix: SFr. 89.95. — De Gruyter, Berlin, 2017.

In Minkowski-Space the space-time of special relativity is discussed on the basis of fundamental results of space-time theory. This idea has the consequence that the Minkowski-space can be characterized by 5 axioms, which determine its geometrical and kinematical structure completely. In this sense Minkowski-Space is a prolegomenon for the formulation of other branches of special relativity, like mechanics, electrodynamics, thermodynamics etc. But these applications are not subjects of this book. Contents: Basic properties of special relativity. – Further properties of Lorentz matrices. – Further properties of Lorentz transformations. – Decomposition of Lorentz matrices and Lorentz transformations. – Further structures on M^s. – Tangent vectors in M^s. – Orientation. – Kinematics on M^s. – Some basic notions of relativistic theories.

Économie, recherche opérationnelle, jeux

Karl Hinderer, Ulrich Rieder, Michael Stieglitz. — **Dynamic optimization: deterministic and stochastic models**. — Universitext. — Un vol. broché, 15,5×23,5, de XXII, 527 p. — ISBN 978-3-319-48813-4. — Prix: €83.19. — Springer, Cham, 2016.

This book explores discrete-time dynamic optimization and provides a detailed introduction to both deterministic and stochastic models. Covering problems with finite and infinite horizon, as well as Markov renewal programs, Bayesian control models and partially observable processes, the book focuses on the precise modelling of applications in a variety of areas, including operations research, computer science, mathematics, statistics, engineering, economics and finance. *Dynamic optimization* is a carefully presented textbook which starts with discrete-time deterministic dynamic optimization problems, providing readers with the tools for sequential decision-making, before proceeding to the more complicated stochastic models. The authors present complete and simple proofs and illustrate the main results with numerous examples and exercises (without solutions). With relevant material covered in four appendices, this book is completely self-contained.

Valery A. Kalyagin, Alexey I. Nikolaev, Panos M. Pardalos, Oleg A. Prokopyev, (Editors). — **Models, algorithms, and technologies for network analysis: NET 2016, Nizhny Novgorod, Russia, May 2016**. — Springer proceedings in mathematics & statistics, vol. 197. — Un vol. relié, 16×24, de XIII, 277 p. — ISBN 978-3-319-56828-7. — Prix: SFr. 104.50. — Springer, Cham, 2017.

This valuable source for graduate students and researchers provides a comprehensive introduction to current theories and applications in optimization methods and network models. Contributions to this book are focused on new efficient algorithms and rigorous mathematical theories, which can be used to optimize and analyze mathematical graph structures with massive size and high density induced by natural or artificial complex networks. Applications to social networks, power transmission grids, telecommunication networks, stock market networks, and human brain networks are presented. Chapters in this book cover the following topics: Linear max min fairness. – Heuristic approaches for high-quality solutions. – Efficient approaches for complex multi-criteria optimization problems. – Comparison of heuristic algorithms. – New heuristic iterative local search. – Power in network structures. – Clustering nodes in random graphs. – Power transmission grid structure. – Network decomposition problems. – Homogeneity hypothesis testing. – Network analysis of international migration. – Social networks with node attributes. – Testing hypothesis on degree distribution in the market graphs. – Machine learning applications to human brain network studies. This proceeding is a result of The 6th International Conference on Network Analysis held at the Higher School of Economics, Nizhny Novgorod in May 2016. The conference brought together scientists and engineers from industry, government, and academia to discuss the links between network analysis and a variety of fields.

Systèmes, contrôle

Giorgio Fabbri, Fausto Gozzi, Andrzej Święch; with a contribution by Marco Fuhrman and Gianmario Tessitore. — **Stochastic optimal control in infinite dimension: dynamic programming and HJB equations**. — Probability theory and stochastic modelling, vol. 82. — Un vol. relié, 16×24, de XXIII, 916 p. — ISBN 978-3-319-53066-6. — Prix: SFr. 181.50. — Springer, Cham, 2017.

Providing an introduction to stochastic optimal control in infinite dimension, this book gives a complete account of the theory of second-order HJB equations in infinite-dimensional Hilbert spaces, focusing on its applicability to associated stochastic optimal control problems. It features a general introduction to optimal stochastic control, including basic results (e.g. the dynamic programming principle) with proofs, and provides examples of applications. A complete and up-to-date exposition of the existing theory of viscosity solutions and regular solutions of second-order HJB equations in Hilbert spaces is given, together with an extensive survey of other methods, with a full bibliography. In particular, Chapter 6, written by M. Fuhrman and G. Tessitore, surveys the theory of regular solutions of HJB equations arising in infinite-dimensional stochastic control, via BSDEs. The book is of interest to both pure and applied researchers working in the control

theory of stochastic PDEs, and in PDEs in infinite dimension. Readers from other fields who want to learn the basic theory will also find it useful. The prerequisites are: standard functional analysis, the theory of semigroups of operators and its use in the study of PDEs, some knowledge of the dynamic programming approach to stochastic optimal control problems in finite dimension, and the basics of stochastic analysis and stochastic equations in infinite-dimensional spaces.

Information, communication, circuits

Joshua HOLDEN. — **The mathematics of secrets: cryptography from Caesar ciphers to digital encryption**. — Un vol. relié, 16×24, de XIV, 373 p. — ISBN 978-0-691-14175-6. — Prix: US$29.95. — Princeton University Press, Princeton/Oxford, 2017.

The mathematics of secrets takes readers on a fascinating tour of the mathematics behind cryptography — the science of sending secret messages. Most books about cryptography are organized historically, or around how codes and ciphers have been used, such as in government and military intelligence or bank transactions. Joshua Holden instead shows how mathematical principles underpin the ways that different codes and ciphers operate. Holden focuses on both code making and code breaking and he discusses the majority of ancient and modern ciphers currently known. Holden begins by looking at substitution ciphers, built by substituting one letter or block of letters for another. Explaining one of the simplest and historically well-known ciphers, the Caesar cipher, Holden establishes the key mathematical idea behind the cipher and discusses how to introduce flexibility and additional notation. Holden goes on to explore polyalphabetic substitution ciphers, transposition ciphers, including one developed by the Spartans, connections between ciphers and computer encryption, stream ciphers, and ciphers involving exponentiation. He also examines public-key ciphers, where the methods used to encrypt messages are public knowledge, and yet, intended recipients are still the only ones who are able to read the message. He concludes with a look at the future of ciphers and where cryptography might be headed. Only basic mathematics up to high school algebra is needed to understand and enjoy the book. With a plethora of historical anecdotes and real-world examples, *The mathematics of secrets* reveals the mathematics working stealthily in the science of coded messages.