2 D Quadratic Maps And 3 D Ode Systems A Rigorous Approach World Scientific Series On Nonlinear Science Series A World Scientific Series On Nonlinear Science Series A

This book is essentially devoted to complex properties (Phase plane structure and bifurcations) of two-dimensional noninvertible maps, i.e. maps having either a non-unique inverse, or no real inverse, according to the plane point. They constitute models of sets of discrete dynamical systems encountered in Engineering (Control, Signal Processing, Electronics), Physics, Economics, Life Sciences. Compared to the studies made in the one-dimensional case, the two-dimensional situation remained a long time in an underdeveloped state. It is only since these last years that the interest for this research has increased. Therefore the book purpose is to give a global presentation of a matter, available till now only in a partial form. Fundamental notions and tools (such as “critical manifolds”), as the most part of results, are accompanied by many examples and figures.

The monograph is devoted to the study of functional equations with the transformed argument on the real line and on the unit circle. Such equations systematically arise in dynamical systems, differential equations, probabilities, singularities of smooth mappings, and other areas. The purpose of the book is to present modern methods and new results in the subject, with an emphasis on a connection between local and global solvability. The general concepts developed in the book are applicable to multidimensional functional equations. Some of the methods are presented for the first time in the monograph literature. The book is addressed to graduates and researchers interested in dynamical systems, differential equations, operator theory, or the theory of functions and their applications.

This reader-friendly textbook presents a comprehensive review of the essentials of image data mining, and the latest cutting-edge techniques used in the field. The coverage spans all aspects of image analysis and understanding, offering deep insights into areas of feature extraction, machine learning, and image retrieval. The theoretical coverage is supported by practical mathematical models and algorithms, utilizing data from real-world examples and experiments. Topics and features: describes the essential tools for image mining, covering Fourier transforms, Gabor filters, and contemporary wavelet transforms; reviews a varied range of state-of-the-art models, algorithms, and procedures for image mining; emphasizes how to deal with real image data for practical image mining; highlights how such features as color, texture, and shape can be mined or extracted from images for image representation; presents four powerful approaches for classifying image data, namely, Bayesian classification, Support Vector Machines, Neural Networks, and Decision Trees; discusses techniques

for indexing, image ranking, and image presentation, along with image database visualization methods; provides self-test exercises with instructions or Matlab code, as well as review summaries at the end of each chapter. This easy-to-follow work illuminates how concepts from fundamental and advanced mathematics can be applied to solve a broad range of image data mining problems encountered by students and researchers of computer science. Students of mathematics and other scientific disciplines will also benefit from the applications and solutions described in the text, together with the hands-on exercises that enable the reader to gain first-hand experience of computing.
From its birth (in Babylon?) till 1936 the theory of quadratic forms dealt almost exclusively with forms over the real field, the complex field or the ring of integers. Only as late as 1937 were the foundations of a theory over an arbitrary field laid. This was in a famous paper by Ernst Witt. Still too early, apparently, because it took another 25 years for the ideas of Witt to be pursued, notably by Albrecht Pfister, and expanded into a full branch of algebra. Around 1960 the development of algebraic topology and algebraic K-theory led to the study of quadratic forms over commutative rings and hermitian forms over rings with involutions. Not surprisingly, in this more general setting, algebraic K-theory plays the role that linear algebra plays in the case of fields. This book exposes the theory of quadratic and hermitian forms over rings in a very general setting. It avoids, as far as possible, any restriction on the characteristic and takes full advantage of the functorial aspects of the theory. The advantage of doing so is not only aesthetical: on the one hand, some classical proofs gain in simplicity and transparency, the most notable examples being the results on low-dimensional spinor groups; on the other hand new results are obtained, which went unnoticed even for fields, as in the case of involutions on 16-dimensional central simple algebras. The first chapter gives an introduction to the basic definitions and properties of hermitian forms which are used throughout the book.
This proceedings volume contains papers presented at the International Conference on the algebraic and arithmetic theory of quadratic forms held in Talca (Chile). The modern theory of quadratic forms has connections with a broad spectrum of mathematical areas including number theory, geometry, and K-theory. This volume contains survey and research articles covering the range of connections among these topics.
This multi-volume handbook is the most up-to-date and comprehensive reference work in the field of fractional calculus and its numerous applications. This fourth volume collects authoritative chapters covering several applications of fractional calculus in physics, including classical and continuum mechanics.
Advanced differential equations appear in several applications especially as mathematical models in economics, an advanced term may for example reflect the dependency on anticipated capital stock. This book also deals with nonoscillation properties of scalar advanced differential equations. Some new oscillation and nonoscillation criteria are given for linear delay or advanced

differential equations with variable coefficients and not necessarily constant delays or advanced arguments. The present book has been written in the light of the latest syllabi of several Universities. The subject matter has been presented in such a way that it is easily accessible to students. The method of presentation is very clear and lucid which can be easily followed by the students. The contents conform to the specified syllabi and are so structured as to enable the student to move easily from the fundamental to the complex. It is our earnest hope that this book will be of great value to all our students.

The aim of the Expositions is to present new and important developments in pure and applied mathematics. Well established in the community over more than two decades, the series offers a large library of mathematical works, including several important classics. The volumes supply thorough and detailed expositions of the methods and ideas essential to the topics in question. In addition, they convey their relationships to other parts of mathematics. The series is addressed to advanced readers interested in a thorough study of the subject. Editorial Board Lev Birbrair, Universidade Federal do Cear , Fortaleza, Brasil Walter D. Neumann, Columbia University, New York, USA Markus J. Pflaum, University of Colorado, Boulder, USA Dierk Schleicher, Jacobs University, Bremen, Germany Katrin Wendland, University of Freiburg, Germany Honorary Editor Victor P. Maslov, Russian Academy of Sciences, Moscow, Russia Titles in planning include Yuri A. Bahturin, Identical Relations in Lie Algebras (2019) Yakov G. Berkovich, Lev G. Kazarin, and Emmanuel M. Zhmud', Characters of Finite Groups, Volume 2 (2019) Jorge Herbert Soares de Lira, Variational Problems for Hypersurfaces in Riemannian Manifolds (2019) Volker Mayer, Mariusz Urba?ski, and Anna Zdunik, Random and Conformal Dynamical Systems (2021) Ioannis Diamantis, Bostjan Gabrovsek, Sofia Lambropoulou, and Maciej Mroczkowski, Knot Theory of Lens Spaces (2021)

This collection of review articles is devoted to new developments in the study of chaotic dynamical systems with some open problems and challenges. The papers, written by many of the leading experts in the field, cover both the experimental and theoretical aspects of the subject. This edited volume presents a variety of fascinating topics of current interest and problems arising in the study of both discrete and continuous time chaotic dynamical systems. Exciting new techniques stemming from the area of nonlinear dynamical systems theory are currently being developed to meet these challenges. Presenting the state-of-the-art of the more advanced studies of chaotic dynamical systems, Frontiers in the Study of Chaotic Dynamical Systems with Open Problems is devoted to setting an agenda for future research in this exciting and challenging field.

This unprecedented book offers all the details of the mathematical mechanics underlying state-of-the-art modeling of skeletal muscle contraction. The aim is to provide an integrated vision of mathematics, physics, chemistry and biology for this one understanding. The method is to take advantage of modern mathematical technology — Eilenberg-Mac Lane category theory, Robinson infinitesimal calculus and Kolmogorov probability theory — to examine a succession of distinguishable universes of particles, and continuous, thermodynamic, chemical, and molecular bodies, all with a focus on proofs by algebraic calculation without set theory. Also provided are metaphors and analogies, and careful distinction between representational

pictures, mental model drawings, and mathematical diagrams.High school mathematics teachers, undergraduate and graduate college students, and researchers in mathematics, physics, chemistry, and biology may use this integrated publication to broaden their perspective on science, and to experience the precision that mathematical mechanics brings to understanding the muscular mechanism of nearly all animal behavior.

There is an explosion of interest in dynamical systems in the mathematical community as well as in many areas of science. The results have been truly exciting: systems which once seemed completely intractable from an analytic point of view can now be understood in a geometric or qualitative sense rather easily. Scientists and engineers realize the power and the beauty of the geometric and qualitative techniques. These techniques apply to a number of important nonlinear problems ranging from physics and chemistry to ecology and economics. Computer graphics have allowed us to view the dynamical behavior geometrically. The appearance of incredibly beautiful and intricate objects such as the Mandelbrot set, the Julia set, and other fractals have really piqued interest in the field. This is text is aimed primarily at advanced undergraduate and beginning graduate students. Throughout, the author emphasizes the mathematical aspects of the theory of discrete dynamical systems, not the many and diverse applications of this theory. The field of dynamical systems and especially the study of chaotic systems has been hailed as one of the important breakthroughs in science in the past century and its importance continues to expand. There is no question that the field is becoming more and more important in a variety of scientific disciplines. New to this edition: •Greatly expanded coverage complex dynamics now in Chapter 2 •The third chapter is now devoted to higher dimensional dynamical systems. •Chapters 2 and 3 are independent of one another. •New exercises have been added throughout.

Philosophy of the Text This text has been designed to be an introductory survey of the basic concepts and applied mathematical methods of nonlinear science. Students in engineer ing, physics, chemistry, mathematics, computing science, and biology should be able to successfully use this text. In an effort to provide the students with a cutting edge approach to one of the most dynamic, often subtle, complex, and still rapidly evolving, areas of modern research-nonlinear physics-we have made extensive use of the symbolic, numeric, and plotting capabilities of Maple V Release 4 applied to examples from these disciplines. No prior knowledge of Maple or computer programming is assumed, the reader being gently introduced to Maple as an auxiliary tool as the concepts of nonlinear science are developed. The diskette which accompanies the text gives a wide variety of illustrative nonlinear examples solved with Maple. An accompanying laboratory manual of experimental activities keyed to the text allows the student the option of "hands on" experience in exploring nonlinear phenomena in the REAL world. Although the experiments are easy to perform, they give rise to experimental and theoretical complexities which are not to be underestimated. The Level of the Text The essential prerequisites for the first eight chapters of this text would nor mally be one semester of ordinary differential equations and an intermediate course in classical mechanics.

A gem of a book bringing together 30 years worth of results that are certain to interest anyone whose research touches on quadratic forms.

This book constitutes the thoroughly refereed post-conference proceedings of the 4th International Conference on Mobile, Secure, and Programmable Networking, held in Paris, France, in June 2018. The 27 papers presented in this volume were carefully reviewed and selected from 52 submissions. They discuss new trends in networking infrastructures, security, services and applications while focusing on virtualization and cloud computing for networks, network programming, software defined networks (SDN) and their security.

After general properties of quadratic mappings over rings, the authors more intensely study quadratic forms, and especially their Clifford algebras. To this purpose they review the required part of commutative algebra, and they present a significant part of the theory of graded

Azumaya algebras. Interior multiplications and deformations of Clifford algebras are treated with the most efficient methods.

Part I of this volume surveys the developments in the analysis of nonlinear phenomena in Japan during the past decade, while Part II consists of up-to-date original papers concerning qualitative theories and their applications. Dealt with here are nonlinear problems related to general analysis, fluid dynamics, mathematical biology and computer sciences, and their underlying mathematical structures, e.g. nonlinear waves and propagations, bifurcation phenomena, chaotic phenomena, and fractals. The volume is dedicated to Professor Masaya Yamaguti in celebration of his 60th birthday.

Robust chaos is defined by the absence of periodic windows and coexisting attractors in some neighborhoods in the parameter space of a dynamical system. This unique book explores the definition, sources, and roles of robust chaos. The book is written in a reasonably self-contained manner and aims to provide students and researchers with the necessary understanding of the subject. Most of the known results, experiments, and conjectures about chaos in general and about robust chaos in particular are collected here in a pedagogical form. Many examples of dynamical systems, ranging from purely mathematical to natural and social processes displaying robust chaos, are discussed in detail. At the end of each chapter is a set of exercises and open problems (more than 260 in the whole book) intended to reinforce the ideas and provide additional experiences for both readers and researchers in nonlinear science in general, and chaos theory in particular. Contents: Poincaré Map Technique, Smale Horseshoe, and Symbolic DynamicsRobustness of ChaosStatistical Properties of Chaotic AttractorsStructural StabilityTransversality, Invariant Foliation, and the Shadowing LemmaChaotic Attractors with Hyperbolic StructureRobust Chaos in Hyperbolic SystemsLorenz-Type SystemsRobust Chaos in the Lorenz-Type SystemsNo Robust Chaos in Quasi-AttractorsRobust Chaos in One-Dimensional MapsRobust Chaos in 2-D Piecewise Smooth Maps Readership: Advanced undergraduate and graduate students, researchers, engineers and instructors interested in chaos and dynamical systems.

Keywords:PoincarÃ©;Map Technique;Smale Horseshoe;Symbolic Dynamics;Robustness of Chaos;Statistical Properties of Chaotic Attractors;Structural Stability Transversality;Invariant Foliation;Shadowing Lemma;Hyperbolic Structure;Lorenz-Type Systems;Quasi-Attractors;Robust Chaos in One Dimensional Maps;Robust Chaos in 2-D Piecewise Smooth Maps

The aim of this book is twofold. On the one hand, it gives a quick, self-contained introduction to Poisson geometry and related subjects. On the other hand, it presents a comprehensive treatment of the normal form problem in Poisson geometry. Even when it comes to classical results, the book gives new insights. It contains results obtained over the past 10 years which are not available in other books.

An ideal text for students that ties together classical and modern topics of advanced vibration analysis in an interesting and lucid manner. It provides students with a background in elementary vibrations with the tools necessary for understanding and analyzing more complex dynamical phenomena that can be encountered in engineering and scientific practice. It progresses steadily from linear vibration theory over various levels of nonlinearity to bifurcation analysis, global dynamics and chaotic vibrations. It trains the student to analyze simple models, recognize nonlinear phenomena and work with advanced tools such as perturbation analysis and bifurcation analysis. Explaining theory in terms of relevant examples from real systems, this book is user-friendly and meets the increasing interest in non-linear dynamics in mechanical/structural engineering and applied mathematics and physics. This edition includes a new chapter on the useful effects of fast vibrations and many new exercise problems.

The two-volume set LNCS 4051 and LNCS 4052 constitutes the refereed proceedings of the 33rd International Colloquium on Automata, Languages and Programming, ICALP 2006, held

in Venice, Italy, July 2006. In all, these volumes present more 100 papers and lectures. Volume II (4052) presents 2 invited papers and 2 additional conference tracks with 24 papers each, focusing on algorithms, automata, complexity and games as well as on security and cryptography foundation.

This volume concerns invariants of G-torsors with values in mod p Galois cohomology--in the sense of Serre's lectures in the book Cohomological invariants in Galois cohomology--for various simple algebraic groups G and primes p. The author determines the invariants for the exceptional groups F_4 mod 3, simply connected E_6 mod 3, E_7 mod 3, and E_8 mod 5. He also determines the invariants of Spin_n mod 2 for $n \leq 12$ and constructs some invariants of Spin_{14}. Along the way, the author proves that certain maps in nonabelian cohomology are surjective. These surjectivities give as corollaries Pfister's results on 10- and 12-dimensional quadratic forms and Rost's theorem on 14-dimensional quadratic forms. This material on quadratic forms and invariants of Spin_n is based on unpublished work of Markus Rost. An appendix by Detlev Hoffmann proves a generalization of the Common Slot Theorem for 2-Pfister quadratic forms.

There is no recent elementary introduction to the theory of discrete dynamical systems that stresses the topological background of the topic. This book fills this gap: it deals with this theory as 'applied general topology'. We treat all important concepts needed to understand recent literature. The book is addressed primarily to graduate students. The prerequisites for understanding this book are modest: a certain mathematical maturity and course in General Topology are sufficient.

This book is based on research on the rigorous proof of chaos and bifurcations in 2-D quadratic maps, especially the invertible case such as the H•non map, and in 3-D ODE's, especially piecewise linear systems such as the Chua's circuit. In addition, the book covers some recent works in the field of general 2-D quadratic maps, especially their classification into equivalence classes, and finding regions for chaos, hyperchaos, and non-chaos in the space of bifurcation parameters. Following the main introduction to the rigorous tools used to prove chaos and bifurcations in the two representative systems, is the study of the invertible case of the 2-D quadratic map, where previous works are oriented toward H•non mapping. 2-D quadratic maps are then classified into 30 maps with well-known formulas. Two proofs on the regions for chaos, hyperchaos, and non-chaos in the space of the bifurcation parameters are presented using a technique based on the second-derivative test and bounds for Lyapunov exponents. Also included is the proof of chaos in the piecewise linear Chua's system using two methods, the first of which is based on the construction of Poincar• map, and the second is based on a computer-assisted proof. Finally, a rigorous analysis is provided on the bifurcational phenomena in the piecewise linear Chua's system using both an analytical 2-D mapping and a 1-D approximated Poincar• mapping in addition to other analytical methods.

Chaotic behavior arises in a variety of control settings. In some cases, it is beneficial to remove this behavior; in others, introducing or taking advantage of the existing chaotic components can be useful for example in cryptography. Chaos in Automatic Control surveys the latest methods for inserting, taking advantage of, or removing chaos in a variety of applications. This book supplies the theoretical and pedagogical basis of chaos in control systems along with new concepts and recent developments in the field. Presented in three parts, the book examines open-loop analysis, closed-loop control, and applications of chaos in control systems. The first section builds a background in the mathematics of ordinary differential and difference equations on which the remainder of the book is based. It includes an introductory chapter by Christian Mira, a pioneer in chaos research. The next section explores solutions to problems arising in observation and control of closed-loop chaotic control systems. These include model-independent control methods, strategies such as H-infinity and sliding modes, polytopic observers, normal forms using homogeneous transformations, and observability

normal forms. The final section explores applications in wireless transmission, optics, power electronics, and cryptography. Chaos in Automatic Control distills the latest thinking in chaos while relating it to the most recent developments and applications in control. It serves as a platform for developing more robust, autonomous, intelligent, and adaptive systems.

Classical mechanics is a subject that is teeming with life. However, most of the interesting results are scattered around in the specialist literature, which means that potential readers may be somewhat discouraged by the effort required to obtain them. Addressing this situation, Hamiltonian Dynamical Systems includes some of the most significant papers in Hamiltonian dynamics published during the last 60 years. The book covers bifurcation of periodic orbits, the break-up of invariant tori, chaotic behavior in hyperbolic systems, and the intricacies of real systems that contain coexisting order and chaos. It begins with an introductory survey of the subjects to help readers appreciate the underlying themes that unite an apparently diverse collection of articles. The book concludes with a selection of papers on applications, including in celestial mechanics, plasma physics, chemistry, accelerator physics, fluid mechanics, and solid state mechanics, and contains an extensive bibliography. The book provides a worthy introduction to the subject for anyone with an undergraduate background in physics or mathematics, and an indispensable reference work for researchers and graduate students interested in any aspect of classical mechanics.

The field of nonlinear optics has witnessed a tremendous evolution since its beginnings in the early sixties. Its frontiers have been extended in many direc tions and its techniques have intruded upon many areas of both fundamental and practical interest. The field itself has been enriched with many new phe nomena and concepts that have further extended its scope and strengthened its connection with other areas. As a consequence, it is becoming increasingly unrealistic to expect to cover the different facets and trends of this field in the lectures or proceed ings of a summer school, however advanced these may be. However much of the current progress and interest in this field springs to a large extent from the promise and expectation that highly performing all-optical devices that exploit and operate on the principles of nonlinear optics will constitute an important branch of future technology and will provide new alternatives in information processing and transmission. The conception of new devices, in general, requires an intricate and bold combination of facts and methods from most diverse fields, in order to perform functions and operations that fit into an overall technological ensemble.

Contents: Dynamical Systems and Recurrences. GeneralitiesSome Properties of One-Dimensional Recurrences (Maps)Myrberg's Results on the One-Dimensional Quadratic Recurrences. Their ConsequencesThe Box-Within-a-Box Bifurcations Structure and Its ConsequencesSome Properties of Two-Dimensional Recurrences (Maps)Two-Dimensional Diffeomorphisms and the Foliated Box-Within-a-Box Bifurcations Structureand other papers Readership: Applied mathematicians, engineers and other physicists. Keywords:Endomorphism;Diffeomorphism;Recurrences;Bifurcations Structure

The present volume contains the contributions for the 9th European Conference on Genetic Programming (EuroGP 2006). The conference took place during April 10-12, 2006 in Budapest, Hungary. EuroGP is a well-established conf- ence and the only one exclusively devoted to genetic programming worldwide. EuroGP began as a

workshopin 1998 in Paris, and has been held annually since then,becomingaconferenceinEdinburghin2000.Allpreviousproceedingshave been published by Springer in the Lecture Notes in Computer Science series. More recently, EuroGP has been co-located with EvoCOP 2006, the 6th Eu- pean Conference on Evolutionary Computation in Combinatorial Optimization, and the EvoWorkshops, focusing on applications of evolutionary computation, resulting in the largest combined event dedicated to evolutionary computation in Europe. Genetic programming (GP) is evolutionary computation that solves complex problems or tasks by evolving and adapting a population of computer programs, using Darwinian evolution and Mendelian genetics as its sources of inspiration. The 32 papers included in these proceedings address fundamental and theore- cal issues, along with a wide variety of papers dealing with di'erent application areas,suchascomputerscience,engineering,machinelearning,Kolmogorovc- plexity, biology and computational design, showing that GP is a powerful and practical problem-solving paradigm. A rigorous, double-blind, selection mechanism was applied to 59 submitted papers,thatresultedintheacceptanceof21plenarytalks(36%acceptancerate) and 11 poster presentations (54% global acceptance rate for talks and posters).

For a long time - at least from Fermat to Minkowski - the theory of quadratic forms was a part of number theory. Much of the best work of the great number theorists of the eighteenth and nineteenth century was concerned with problems about quadratic forms. On the basis of their work, Minkowski, Siegel, Hasse, Eichler and many others crea ted the impressive "arithmetic" theory of quadratic forms, which has been the object of the well-known books by Bachmann (1898/1923), Eichler (1952), and O'Meara (1963). Parallel to this development the ideas of abstract algebra and abstract linear algebra introduced by Dedekind, Frobenius, E. Noether and Artin led to today's structural mathematics with its emphasis on classification problems and general structure theorems. On the basis of both - the number theory of quadratic forms and the ideas of modern algebra - Witt opened, in 1937, a new chapter in the theory of quadratic forms. His most fruitful idea was to consider not single "individual" quadratic forms but rather the entity of all forms over a fixed ground field and to construct from this an algebra ic object. This object - the Witt ring - then became the principal object of the entire theory. Thirty years later Pfister demonstrated the significance of this approach by his celebrated structure theorems.

This textbook, now in its second edition, provides a broad introduction to both continuous and discrete dynamical systems, the theory of which is motivated by examples from a wide range of disciplines. It emphasizes applications and simulation utilizing MATLAB®, Simulink®, the Image Processing Toolbox® and the Symbolic Math toolbox®, including MuPAD. Features new to the second edition include · sections on series solutions of ordinary differential equations, perturbation methods, normal forms, Gröbner bases, and chaos synchronization; · chapters on image processing and binary oscillator computing; · hundreds of new illustrations, examples, and exercises with solutions; and · over eighty up-to-date MATLAB program files and Simulink model files available online. These files were voted MATLAB Central Pick of the Week in July 2013. The hands-on approach of Dynamical Systems with Applications using MATLAB, Second Edition, has minimal prerequisites, only requiring familiarity with ordinary differential equations. It will appeal to advanced undergraduate and graduate students,

applied mathematicians, engineers, and researchers in a broad range of disciplines such as population dynamics, biology, chemistry, computing, economics, nonlinear optics, neural networks, and physics. Praise for the first edition Summing up, it can be said that this text allows the reader to have an easy and quick start to the huge field of dynamical systems theory. MATLAB/SIMULINK facilitate this approach under the aspect of learning by doing. —OR News/Operations Research Spectrum The MATLAB programs are kept as simple as possible and the author's experience has shown that this method of teaching using MATLAB works well with computer laboratory classes of small sizes.... I recommend 'Dynamical Systems with Applications using MATLAB' as a good handbook for a diverse readership: graduates and professionals in mathematics, physics, science and engineering. —Mathematica

2-D Quadratic Maps and 3-D ODE SystemsA Rigorous ApproachWorld Scientific

During the last fifty years, Gopinath Kallianpur has made extensive and significant contributions to diverse areas of probability and statistics, including stochastic finance, Fisher consistent estimation, non-linear prediction and filtering problems, zero-one laws for Gaussian processes and reproducing kernel Hilbert space theory, and stochastic differential equations in infinite dimensions. To honor Kallianpur's pioneering work and scholarly achievements, a number of leading experts have written research articles highlighting progress and new directions of research in these and related areas. This commemorative volume, dedicated to Kallianpur on the occasion of his seventy-fifth birthday, will pay tribute to his multi-faceted achievements and to the deep insight and inspiration he has so graciously offered his students and colleagues throughout his career. Contributors to the volume: S. Aida, N. Asai, K. B. Athreya, R. N. Bhattacharya, A. Budhiraja, P. S. Chakraborty, P. Del Moral, R. Elliott, L. Gawarecki, D. Goswami, Y. Hu, J. Jacod, G. W. Johnson, L. Johnson, T. Koski, N. V. Krylov, I. Kubo, H.-H. Kuo, T. G. Kurtz, H. J. Kushner, V. Mandrekar, B. Margolius, R. Mikulevicius, I. Mitoma, H. Nagai, Y. Ogura, K. R. Parthasarathy, V. Perez-Abreu, E. Platen, B. V. Rao, B. Rozovskii, I. Shigekawa, K. B. Sinha, P. Sundar, M. Tomisaki, M. Tsuchiya, C. Tudor, W. A. Woycynski, J. Xiong.

This book is a comprehensive study of the algebraic theory of quadratic forms, from classical theory to recent developments, including results and proofs that have never been published. The book is written from the viewpoint of algebraic geometry and includes the theory of quadratic forms over fields of characteristic two, with proofs that are characteristic independent whenever possible. For some results both classical and geometric proofs are given. Part I includes classical algebraic theory of quadratic and bilinear forms and answers many questions that have been raised in the early stages of the development of the theory. Assuming only a basic course in algebraic geometry, Part II presents the necessary additional topics from algebraic geometry including the theory of Chow groups, Chow motives, and Steenrod operations. These topics are used in Part III to develop a modern geometric theory of quadratic forms.

Summary: "As memristors are not yet on the market, the development of memristor emulators and memristor based circuits is very important for real and practical engineering applications. The objectives of this book are to review the basic concepts of the memristor, describe state-of-the-art memristor based

circuits and to stimulate further research and development in this area."--Preface.
This is the third version of a book on differential manifolds. The first version appeared in 1962, and was written at the very beginning of a period of great expansion of the subject. At the time, I found no satisfactory book for the foundations of the subject, for multiple reasons. I expanded the book in 1971, and I expand it still further today. Specifically, I have added three chapters on Riemannian and pseudo Riemannian geometry, that is, covariant derivatives, curvature, and some applications up to the Hopf-Rinow and Hadamard-Cartan theorems, as well as some calculus of variations and applications to volume forms. I have rewritten the sections on sprays, and I have given more examples of the use of Stokes' theorem. I have also given many more references to the literature, all of this to broaden the perspective of the book, which I hope can be used among things for a general course leading into many directions. The present book still meets the old needs, but fulfills new ones. At the most basic level, the book gives an introduction to the basic concepts which are used in differential topology, differential geometry, and differential equations. In differential topology, one studies for instance homotopy classes of maps and the possibility of finding suitable differentiable maps in them (immersions, embeddings, isomorphisms, etc.).
This book provides a self-contained exposition of the theory of plane Cremona maps, reviewing the classical theory. The book updates, correctly proves and generalises a number of classical results by allowing any configuration of singularities for the base points of the plane Cremona maps. It also presents some material which has only appeared in research papers and includes new, previously unpublished results. This book will be useful as a reference text for any researcher who is interested in the topic of plane birational maps.
Chaotic Signals in Digital Communications combines fundamental background knowledge with state-of-the-art methods for using chaotic signals and systems in digital communications. The book builds a bridge between theoretical works and practical implementation to help researchers attain consistent performance in realistic environments. It shows the possible shortcomings of the chaos-based communication systems proposed in the literature, particularly when they are subjected to non-ideal conditions. It also presents a toolbox of techniques for researchers working to actually implement such systems. A Combination of Tutorials and In-Depth, Cutting-Edge Research Featuring contributions by active leading researchers, the book begins with an introduction to communication theory, dynamical systems, and chaotic communications suitable for those new to the field. This lays a solid foundation for the more applied chapters that follow. A Toolbox of Techniques—Including New Ways to Tackle Channel Imperfections The book covers typical chaos communication methods, namely chaotic masking, chaotic modulation, chaotic shift key, and symbolic message bearing, as well as bidirectional communication and secure communication. It also presents novel methodologies to deal with communication channel imperfections.

These tackle band-limited channel chaos communication, radio channels with fading, and the resistance of a special chaotic signal to multipath propagations. In addition, the book addresses topics related to engineering applications, such as optical communications, chaotic matched filters and circuit implementations, and microwave frequency-modulated differential chaos shift keying (FM-DCSK) systems. Insights for Both Theoretical and Experimental Researchers Combining theory and practice, this book offers a unique perspective on chaotic communication in the context of non-ideal conditions. Written for theoretical and experimental researchers, it tackles the practical issues faced in implementing chaos-based signals and systems in digital communications applications.