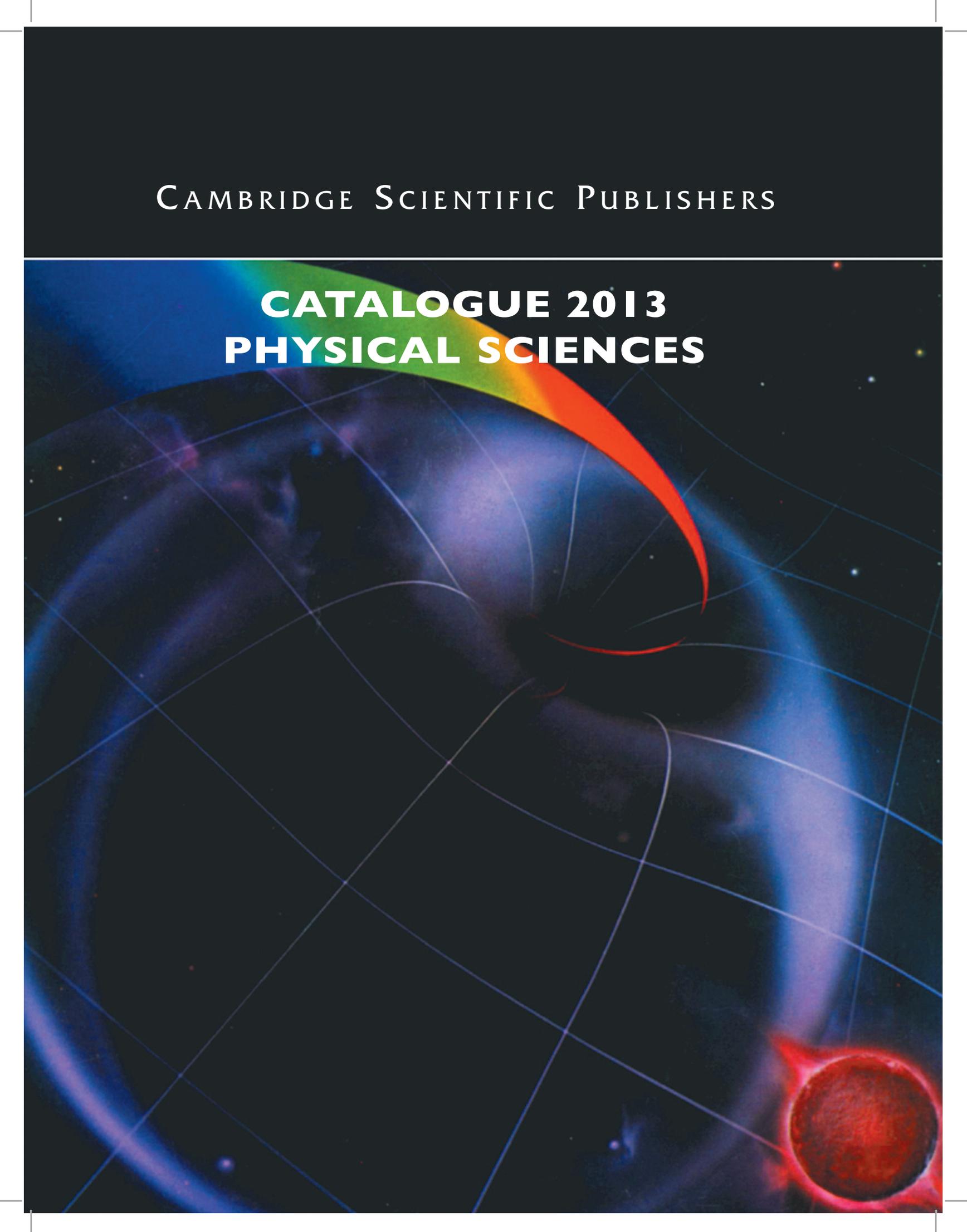


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GEOMETRIC INTEGRATION THEORY ON SUPERMANIFOLDS

T. Voronov, University of Manchester, UK

This volume provides a detailed account of the theory of forms on supermanifolds – a correct and non-trivial analogue of Cartan-de Rham theory based on new concepts. It also develops supermanifold differential topology including such notions as supermanifolds with boundary and supermanifold bordism, naturally arising for the needs of integration theory. One of the key features is the identification of a class of “proper morphisms” of supermanifolds, intimately connected with Berezin integration, and of fundamental importance in various problems.

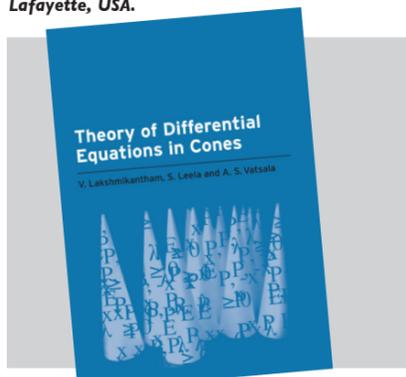
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THEORY OF DIFFERENTIAL EQUATIONS IN CONES

V. Lakshmikantham, FIT, USA

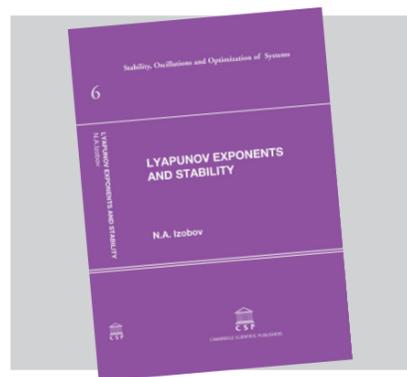
S. Leela, State University of NY at Geneseo, USA

A. S. Vatsala, University of Louisiana at Lafayette, USA.



This volume deals essentially with the theory of differential equations in arbitrary cones and demonstrates that developing Lyapunov method in cones greatly enhances the power of that method. It also presents theoretical approximation methods in terms of order relations induced by cones and shows that utilizing cones in investigating the theory of several dynamic systems is significantly more useful. The monograph provides a timely introduction to the study of the theory of differential equations in cones and is a useful source of reference for graduates and researchers working in this developing area of mathematics.

2012 170pp Hbk 978-1-904868-96-5 £50/\$78/€58



LYAPUNOV EXPONENTS AND STABILITY THEORY

N. A. Izobov

Institute of Mathematics, Minsk, Belarus

This monograph discusses the modern theory of Lyapunov characteristic exponents of ordinary linear differential systems. It details the results obtained by the author, connected with development of the following parts: theory of Perron lower exponents, the freezing method, theory of exponential and sigma-exponents and their connection with characteristic, central, and general exponents, dependence of characteristic exponents of linear systems on exponentially decreasing perturbation and the theory of their stability with respect to small perturbations. The author considered the Lyapunov problem on the exponential stability of an ordinary differential system by linear approximation. The method of rotations by V.M. Millionschikov is systematically used. This volume is intended for post-graduates and students specialising in the field of differential equations.

2013 380pp Hbk 978-1-905106-35-4 £60/\$93/€74

Pi, Epsilon, Phi, WITH MATLAB: RANDOM AND RATIONAL SEQUENCES WITH SCOPE IN SUPERCOMPUTING ERA

S. K. Sen, Department of Mathematical Sciences, Florida Institute of Technology, USA, and R. P.

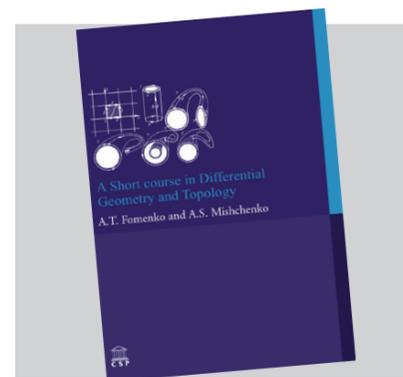
Agarwal, Department of Mathematics, Texas A&M University-Kingsville, USA

The authors present some characters of three famous irrational numbers: pi (the area of the circle of unit radius), Epsilon (the exponential function with argument 1) and Phi (the golden ratio), along with their formulas and their variable precision computations in Matlab. They also explore the possible use and efficacy of each of these numbers as random sequence sources for solving real world problems specifically in the ultra-high speed computing era. In addition, algorithms are described for the best absolute rational approximation of these numbers and their usage in error-free computations. The concerned programs/commands are included, written in high level, user friendly, and globally available programming language Matlab. This volume is intended to be a useful reference book for students of engineering and science courses that involve numerical computations including error-free computations and those underlying evolutionary approaches/genetic and randomized algorithms for optimization and for other applications.

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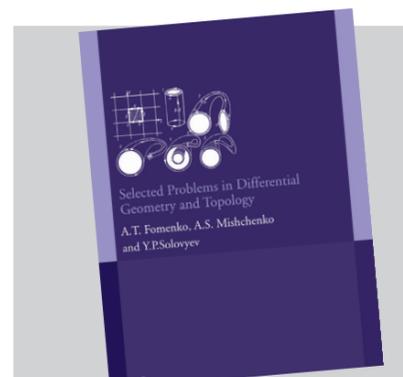


A SHORT COURSE IN DIFFERENTIAL GEOMETRY AND TOPOLOGY

A. T. Fomenko and A. S. Mishchenko, Moscow State University, Russia

This volume is intended for graduate and research students in mathematics and physics. It covers general topology, nonlinear co-ordinate systems, theory of smooth manifolds, theory of curves and surfaces, transformation groups, tensor analysis and Riemannian geometry, theory of integration and homologies, fundamental groups and variational principles in Riemannian geometry. The text is presented in a form that is easily accessible to students and is supplemented by a large number of examples, problems, drawings and appendices.

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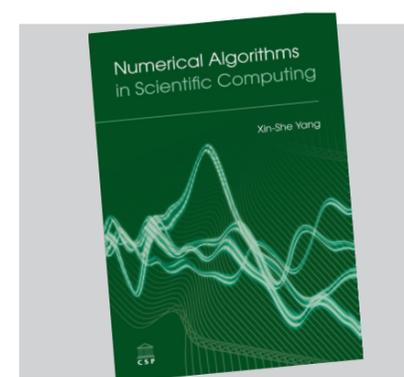


SELECTED PROBLEMS IN DIFFERENTIAL GEOMETRY AND TOPOLOGY

A. T. Fomenko, A. S. Mishchenko and Y. P. Solov'ev, Moscow State University, Russia

This volume is intended as a supplementary text for a course on differential geometry and topology and other courses in mathematics, physics and mechanics for graduate students specializing in mathematics and applied fields. The volume is divided into two parts. Part I includes problems prescribed in standard courses of geometry and topology. Part II contains problems intended for a more profound grasp of modern geometry and its applications. There are Answers and Solutions given to the problems presented in Parts I and 2.

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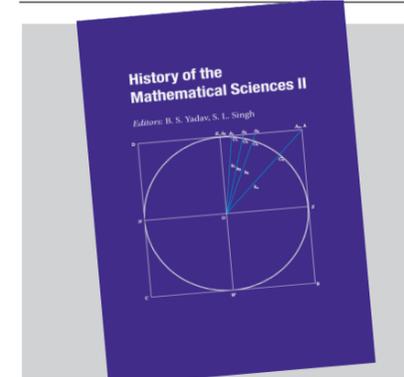


NUMERICAL ALGORITHMS IN SCIENTIFIC COMPUTING

X-S. Yang, University of Cambridge, UK

This book is structured in three parts: Part I: Basic Algorithms, Part II: Conventional Algorithms, Part III: Unconventional Algorithms. It introduces all major numerical algorithms used in modern scientific computing with worked examples to show how each algorithm works. Topics include root-finding algorithms, numerical integration, solution of linear systems, interpolation, numerical solutions of ODEs and PDEs, cellular automata, statistical modelling, random number generation, Monte Carlo methods, function optimization and unconventional metaheuristic algorithms such as ant algorithms, harmony search and firefly algorithms. The book is intended as a text book or supplementary text and will provide a useful source of reference for students and researchers.

2010 200pp Pbk 978-1-904868-66-8 £35/\$60/€42



HISTORY OF THE MATHEMATICAL SCIENCES II

B. S. Yadav and S. L. Singh, Indian Society of Mathematics

The international conference on History of the Mathematical Sciences was organized by the Indian Society for History of Mathematics and the G. B. Pant University of Agriculture and Technology, Pant Nagar in December 2007. This volume comprises selected papers, presented at the conference, on topics relating to periods in history from Vedic times to the nineteenth and twentieth centuries and covering many cultures.

2012 250pp Hbk 978-1-904868-94-1 £50/\$78/€58



THEORY OF FRACTIONAL DYNAMIC SYSTEMS

V. Lakshmikantham, S. Leela, J. Vasundhara Devi, Florida Institute of Technology, USA

This is the first book that attempts to describe the theory of fractional differential equations as an independent discipline. It incorporates the recent upsurge in the general theory of fractional differential equations, shows the interconnection between fractional differential equations and classical differential equations of integer order derivatives and uses both smooth and non-smooth analysis for investigation. It is a timely introduction to the study of fractional differential equations that follows the classical approach and to compare and contrast the differences as well as intricacies that result in the development. It is a useful reference text for post graduates and researchers/nonlinear analysts, and engineering and computational scientists working in real world problems where fractional derivatives are involved in their modeling.

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HANDBOOK OF MELLIN TRANSFORMS

Yu. Brychkov, A. Kilbas, O. Marichev and A. Prudnikov

This volume presents the tables of formulae for the evaluation of Mellin Transforms of elementary and special functions. The Handbook includes some formulae obtained by the authors and published for the first time. The tables are prefaced by a summary of notation for special functions and certain constants. The appendix contains some properties of the Mellin transform and applications. The results in tables are important for applications in different areas of mathematics, physics, mechanics, engineering, chemistry, biology and other applied sciences. The Handbook is a useful source of reference for graduate students and researchers.

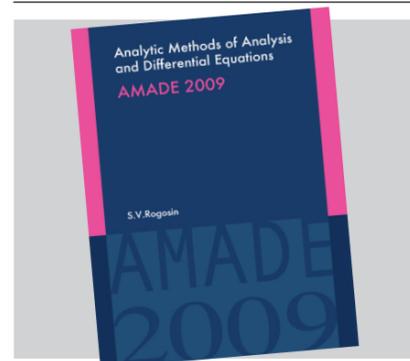
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TITLES IN MATHEMATICS

ANALYTIC METHODS OF ANALYSIS AND DIFFERENTIAL EQUATIONS: AMADE 2012

S.V.Rogosin, Belarusian State University, Minsk and M.V.Dubatonovskaya, Belarusian State University, Minsk
The seventh international workshop of AMADE was held in Minsk, Belarus in September 2012 and covered key topics including integral transforms and special functions; differential equations; integral, difference, functional equations and fractional calculus; real and complex analysis; operator theory; mathematical methods in economics; modern problems of mechanics, biomechanics and nanomechanics. The volume is prepared on the base of plenary invited lectures presented at AMADE 2012.

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ANALYTIC METHODS OF ANALYSIS AND DIFFERENTIAL EQUATIONS: AMADE 2009

A. A. Kilbas and S. V. Rogosin, Belarusian State University, Minsk

The fifth international conference of AMADE was held in September 2009 in Minsk, Belarus and covered key topics including integral transforms and special functions; differential equations; integral, difference, functional equations and fractional calculus; real and complex analysis; applied questions of analysis and difference equations; modern problems of mechanics.

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ANALYTIC METHODS OF ANALYSIS AND DIFFERENTIAL EQUATIONS: AMADE 2006

A. A. Kilbas and S. V. Rogosin, Belarusian State University, Minsk

The fourth international conference of AMADE was held in Minsk in September 2006 and covered key topics including real and complex analysis, ordinary and partial differential equations, fractional calculus and functional equations, operator theory, potential theory as well as their applications.

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ANALYTIC METHODS OF ANALYSIS AND DIFFERENTIAL EQUATIONS: AMADE 2003

A. A. Kilbas and S. V. Rogosin, Belarusian State University, Minsk

The third international conference of AMADE was held in Minsk, Belarus in September 2003 and covered key topics including integral transforms and special functions; differential equations and their applications.

2006 300pp Pbk 1-904868-41-X £55/\$90/€64

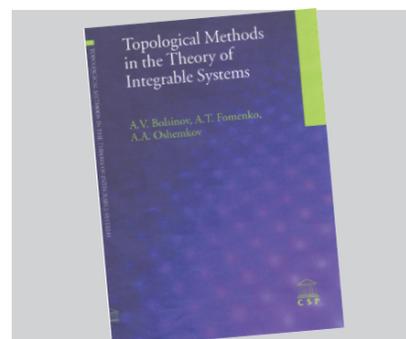


THEORY OF SET DIFFERENTIAL EQUATIONS IN METRIC SPACES

V. Lakshmikantham, T. Gana Bhaskar and J. Vasundhara Devi, Florida Institute of Technology, USA

The aim of this volume is to describe the theory of set differential equations (SDEs) as an independent discipline. It incorporates the recent general theory of set differential equations, discusses the interconnections between set differential equations and fuzzy differential equations and uses both smooth and nonsmooth analysis for investigation. This volume provides a timely introduction to a subject that follows the present trend of studying analysis and differential equations in metric spaces. It is a useful reference text for postgraduates and researchers/nonlinear analysts, engineering and computational scientists working in fuzzy systems.

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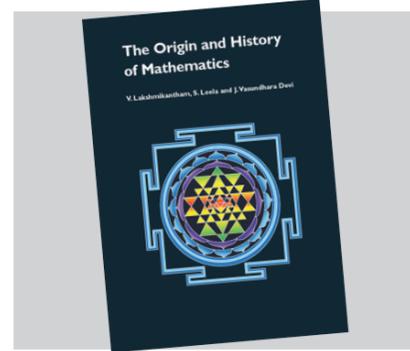


TOPOLOGICAL METHODS IN THE THEORY OF INTEGRABLE SYSTEMS

A. V. Bolsinov, A. T. Fomenko and A. A. Oshemkov, Moscow State University, Russia

This volume comprises selected papers on the subject of the topology of integrable systems theory which studies their qualitative properties, singularities and topological invariants. The aim of this volume is to develop the classification theory for integrable systems with two degrees of freedom which would allow for distinguishing such systems up to two natural equivalence relations. The first is the equivalence of the associated foliations into Liouville tori. The second is the usual orbital equivalence. Also, general methods of classification theory are applied to the classical integrable problems in rigid body dynamics. In addition, integrable geodesic flows on two-dimensional surfaces are analysed from the viewpoint of the topology of integrable systems.

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THE ORIGIN AND HISTORY OF MATHEMATICS

V. Lakshmikantham, S. Leela and J. Vasundhara Devi, Florida Institute of Technology, USA

This is the first book on the history of mathematics that attempts to report the immense mathematical activity and contribution of Bharat (greater India) which has been ignored in existing books. This volume also provides the true origin of mathematical knowledge correcting the existing historical distortions and rectifies the chronology of important early mathematicians of India so that priority of discovery can be properly attributed and acknowledged.

The authors stress the work of the fourteenth century Indian astronomer and mathematician, Madhava, who discovered the limiting process to infinity before Newton and Leibnitz. The authors introduce a balanced view of the origin and history of mathematics by incorporating the extensive mathematical knowledge relative to the origin and continuity of mathematical research so as to present the true facts of history.

2005 180pp Pbk 1-904868-47-9 £35/\$56/€42



NONLINEAR ALGEBRAIC ANALYSIS AND APPLICATIONS (ICGF 2000)

A. Delcroix, M. Hasler, J.-A. Marti, V. Valmorin, University of French West Indies

This volume is a collection of refereed and edited papers originally presented at the International Conference on Generalized Functions (ICGF 2000) and provides a useful source of reference for graduates and researchers in mathematics and applied subjects. Section I: Theoretical Structures; Section II: Integral and Partial Differential Equations. Section III: Geometry and Applications. Section IV: Application to Numerical Analysis covers numerical algorithms

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STABILITY OSCILLATIONS AND OPTIMIZATION OF SYSTEMS

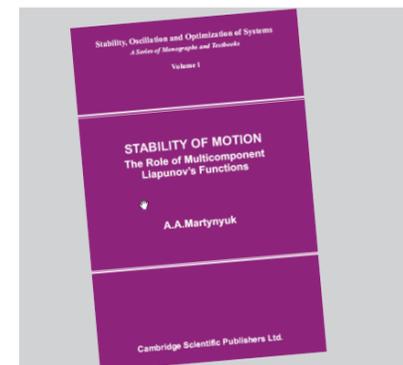
EDITORS

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P. Borne, Ecole Centrale de Lille, France

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The new international book series, Stability Oscillations and Optimization of Systems, provides a medium for the publication of high quality original monographs and multi-author volumes in the following areas; development of the theory and methods of stability analysis; development of up-to-date methods of the theory of nonlinear oscillations; development of the theory and methods of optimization of systems; applications in all areas of physical sciences, engineering, mathematics, mechanics, mathematical biology, life sciences and social sciences.



STABILITY OF MOTIONS: THE ROLE OF MULTICOMPONENT LIAPUNOV'S FUNCTIONS

A. A. Martynyuk, Institute of Mechanics, Kiev, Ukraine

This volume presents stability theory for ordinary differential equations, discrete systems and systems on time scale, functional differential equations and uncertain systems via multicomponent Liapunov's functions. The book sets out a new approach to solution of the problem of constructing Liapunov's functions for three classes of systems of equations. This approach is based on the application of matrix-valued function as an appropriate tool for scalar or vector Liapunov function.

Contents include: Stability analysis of continuous systems; stability analysis of discrete-time systems; stability in functional differential systems; stability analysis of impulsive systems; applications.

The volume is intended for postgraduate students, applied physicists, researchers in aerospace, control and electrical engineers, industrial engineers and performance analysts.

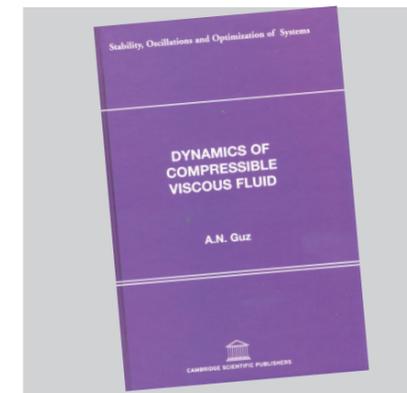
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MATRIX EQUATIONS, SPECTRAL PROBLEMS AND STABILITY OF DYNAMIC SYSTEMS

A. G. Mazko, Institute of Mathematics, National Academy of Sciences, Kiev, Ukraine

This volume contains the methods for localization of eigenvalues of matrices and matrix functions, based on the construction and study of the generalized Lyapunov equation. The theory of linear equations and operators in a matrix space is developed and the known theorems on the inertia of Hermitian solutions of matrix equations are generalized. The volume is intended for researchers, engineers and postgraduates interested in the theory of stability and stabilization of dynamic systems, matrix analysis and applications.

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A. N. Guz, Institute of Mechanics, Kiev, Ukraine

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Control of chaos in a convective loop system.

A. K. M. Murshed, B. Huang and K. Nandakumar

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N. A. Izobov, Institute of Mathematics, Minsk, Belarus

This monograph discusses the modern theory of Lyapunov characteristic exponents of ordinary linear differential systems. It details the results obtained by the author, connected with development of the following parts: theory of Perron lower exponents, the freezing method, theory of exponential and sigma-exponents and their connection with characteristic, central, and general exponents, dependence of characteristic exponents of linear systems on exponentially decreasing perturbation and the theory of their stability with respect to small perturbations. The author considered the Lyapunov problem on the exponential stability of an ordinary differential system by linear approximation. The method of rotations by V. M. Millionschikov is systematically used. This volume is intended for post-graduates and students specialized in the field of differential equations.

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S. Sivasundaram
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REGIONS OF ATTRACTION AND APPLICATIONS TO CONTROL THEORY

S. Balint, L. Braescu and E. Kaslik
Faculty of Mathematics and Computer
Science, West University of Timisoara,
Romania

Regions of attraction are important not only for mathematics but also for the control of dynamics in mechanics, thermodynamics, electronics, chemistry and biology. Real systems in general are built so that for a given external input (control) they exhibit one (or several) equilibrium states. The transfer from a steady state to another steady state is made by changing the values of the control parameters (inputs). It is known in engineering applications that large transfers may not be possible by a single change but if the change is made in small steps the transfer can be successful. The mathematical explanation is that by small successive changes the system is conducted through the regions of attraction of asymptotically stable steady states to the desired steady state.

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Edited by: S. Sivasundaram, J. Vasundhara Devi, Zahia Drici, Farzana Mcrae

This multi-author felicitation volume in honor of Professor V. Lakshmikantham, Florida Institute of Technology, USA reviews his publications, achievements and outstanding contribution to mathematics. Advances in Nonlinear Analysis: Theory Methods and Applications explores new ideas, results and research directions and will provide a useful source of reference for post graduate students and researchers.

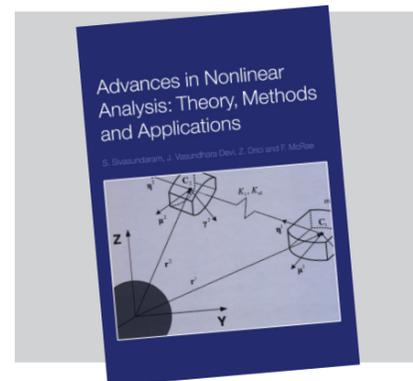
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This multi-author volume in honor of Professor A. V. Balakrishnan reviews his outstanding contribution to engineering and applied mathematics and explores new ideas, results and research directions in the rapidly growing field of dynamics and control. This volume provides a useful source of reference for post graduate students and researchers.

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E. Kaslik and S. Sivasundaram,

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The design motivation is what distinguishes neural networks from other mathematical techniques: A neural network is a processing device, either actual hardware or an algorithm, whose design was motivated by the design and functioning of human brains and components. There are several different types of neural networks, each of which has different strengths particular to their applications. The abilities of different networks can be related to their structure, dynamics, learning methods and control. Neural networks offer improved performance over conventional technologies in areas which include: adaptive control, optimization and scheduling, complex mapping, synchronization, machine vision, robust pattern detection, signal filtering, virtual reality, data segmentation, data compression, data mining, text mining, artificial life, flexible space systems etc. In general overall design process for aerospace systems typically consists of the following steps: design, analysis, and evaluation. Dynamics and controls analyses, which define the critical performance of any aerospace system, are particularly important.

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TITLES IN ASTRONOMY AND ASTROPHYSICS



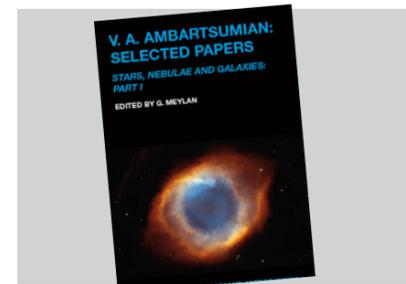
PROCEEDINGS OF THE THIRD STUECKELBERG WORKSHOP ON RELATIVISTIC FIELD THEORIES

N. Carlevaro, University of Florence and ICRA,
R. Ruffini and G. Vereshchagin, University of
Rome and ICRANet, Pescara, Italy

The Third Stueckelberg Workshop on Relativistic Field Theories was held in Pescara July 2008. The series of workshops are part of ICRANet programme and are held in recognition of Ernst Carl Gerlach Stueckelberg (1905-1984) and his significant contribution to research in quantum field theory. The proceedings of this workshop report on subjects of current interest including:

- Quantum effects around black holes including vacuum processes
- Observations of GRBs and lightening with the latest observations by the AGILE satellite
- Quantum physics and the gravitational field

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V. A. AMBARTSUMIAN: SELECTED PAPERS

Stars, Nebulae and Galaxies, Part I. Edited by G. Meylan. With a Foreword by S. Chandrasekhar

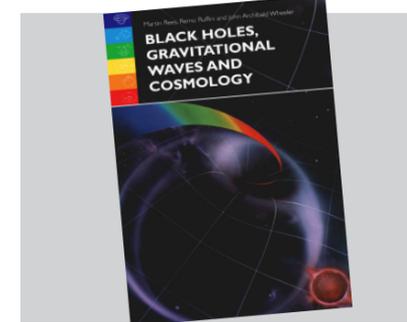
This important volume contains selected papers by the celebrated astronomer Victor A. Ambartsumian, many of which are being published for the first time in English.

The first section contains papers relating to nebulae, including his simple formulation of Zanstra's methods for determining the temperature of the central star illuminating a planetary nebula, which led to the first treatment of the radiative equilibrium of a planetary nebula.

Section 2 contains Ambartsumian's papers on stellar dynamics. Section 4 relates to interstellar absorption, and includes articles on the fluctuations of brightness of our Galaxy, formulated in terms of the principle of invariance, and the astronomical consequences of this principle in stellar statistics.

Advances in Astronomy and Astrophysics

2011 450pp Hbk 978-1-904868-26-2 £80/\$150/€112



BLACK HOLES, GRAVITATIONAL WAVES AND COSMOLOGY

M. Rees, University of Cambridge, UK, R. Ruffini,
University of Rome La Sapienza, Italy and J.
Archibald Wheeler, Princeton University, USA.

This volume, faithfully reprinted here in its entirety, first appeared in the English and Russian editions in 1974 as an introduction to the rapidly developing field of relativistic astrophysics and cosmology. Some of the classic concepts introduced in that first edition included:

- the lines of force of electric and magnetic fields near a black hole
- the ergosphere and effective potential techniques for a rotating black hole
- the details of rotational energy extraction from a black hole
- basic estimates for the cross-sections of gravitational wave detectors and for the energy sources of gravitational waves
- the scenario for gravitational collapse

In cosmology, the foundations of the hot big bang model, the cosmic background radiation and cosmological nucleosynthesis were reviewed; the volume concluded with a lecture entitled 'Beyond the End of Time' by J. A. Wheeler.

This new edition is an effort to bridge the gap since 1974 in view of the enormous progress made in some of these areas. An appendix of key articles that mark this progress has been added here together with a lengthy new introduction.

2013 690pp Pbk 978-1-904868-25-5 £50/78/€55

V. A. AMBARTSUMIAN: SELECTED PAPERS

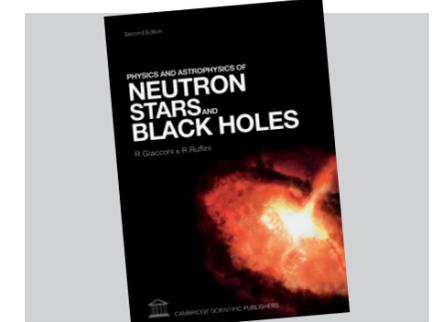
Stars, Nebulae and Galaxies, Part II. Edited by G. Meylan. With a foreword by S. Chandrasekhar

The second part of this important volume, containing selected papers by the celebrated Armenian astronomer Victor A. Ambartsumian, includes a number of papers describing his discovery of stellar associations as a dynamical entity. Although originally treated with scepticism by fellow astronomers this discovery has had far-reaching implications in its field.

The second section of the book contains groundbreaking papers on the evolution of galaxies and the violent activity within them, which were early presentations of ideas now central to the study of astronomy and astrophysics. The final section contains two papers about the philosophy of astronomy and Ambartsumian's ideas about how the field would develop. It will be an invaluable reference source for astronomers and astrophysicists all over the world.

Advances in Astronomy and Astrophysics

2013 450pp Hbk 978-1-904868-27-9 £80/\$150/€112



PHYSICS AND ASTROPHYSICS OF NEUTRON STARS AND BLACK HOLES (SECOND EDITION)

R. Giacconi, Johns Hopkins University,
Baltimore, USA and R. Ruffini, University of
Rome, La Sapienza and ICRANet, Pescara, Italy

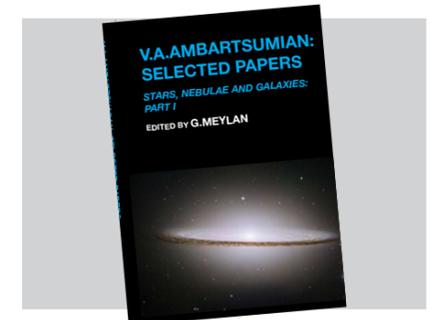
The first edition of Physics and Astrophysics of Neutron Stars and Black Holes was published in 1978 and comprised the proceedings of the international school "Enrico Fermi" (Italian Physical Society). The scope of the international school was to review the progress made in our understanding of neutron stars in the light of experimental knowledge acquired from binary X-ray sources. Some concepts, which have become classic, were presented in the first edition and this book is of interest to students and researchers. The aim of this second edition is to provide additional reprints and make accessible the original reference material. The second edition comprises two parts:

Part I: provides valuable reference and reviews the progress made in the development and understanding of neutron stars and black holes and enables the reader to look back at the presentation of classic concepts and ideas.

Part 2: an Appendix of classic and key papers including the Nobel Lectures of three participants of the School: S. Chandrasekhar, J. H. Taylor and R. Giacconi.

This volume will be an invaluable reference source for astronomers and astrophysicists all over the world.

2009 950pp Hbk 978-1-904868-71-2 £60/\$100/€72



TITLES IN ASTRONOMY AND ASTROPHYSICS



THE SUN, THE STARS, THE UNIVERSE AND GENERAL RELATIVITY: PROCEEDINGS OF SOBRAL 2009

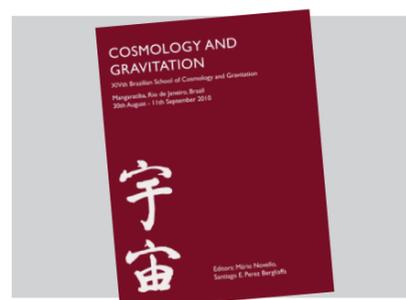
S.E.Perez Begliaffa, DFT/IF, UERJ, Rio de Janeiro, Brazil, M.Novello, ICRA/CBPF, Rio de Janeiro, Brazil, R.Ruffini, ICRANet, Pescara, Italy.

The international conference entitled The Sun, the Stars, the Universe and General Relativity was held in Fortaleza, Brazil in May 2009 to celebrate three major events which occurred in Brazil and have fundamentally influenced scientific knowledge and development throughout the world:

1. The mission at Sobral to observe the Solar Eclipse of May 29, 1919 which according to Arthur Eddington, gave the first evidence for the observation of the bending of star light by the gravitational field of the Sun as predicted by Albert Einstein.
2. The discovery of the Pi meson by Cesare Lattes and Giuseppe Occhialini in Brazil and by Cecil Powell in England heralding the beginning of elementary particle physics.
3. The work on gravitational collapse by George Gamow and Mario Schoenberg on the URCA process, conceived at the "Cassino da URCA".

The proceedings of this conference highlight developments arising from these revolutionary discoveries including new space missions from South America, the Auger experiment in Argentina and the observations of gamma ray bursts and supernovae from the ESO Very Large Telescope in Chile.

2011 250pp Hbk 978-1-908106-12-4 £60/\$110/€70



PROCEEDINGS OF XIVTH BRAZILIAN SCHOOL OF COSMOLOGY AND GRAVITATION

M.Novello ICRA/CBPF, Rio de Janeiro, Brazil and S.E.Perez Bergliaffa DFT/IF, UERJ, Rio de Janeiro, Brazil.

This volume comprises the set of lectures presented at the XIVth Brazilian School of Cosmology and Gravitation (BSCG). The meeting took place at Mangaratiba, a small village by the sea, located 74 km to the south of Rio de Janeiro. Since its first edition, which was published more than 35 years ago, the BSCG has become a well-established tradition among the practitioners and students in the areas of Gravitation, Cosmology, Astrophysics and Field Theory. Most of the relevant issues in these areas were covered in some edition of the School. An example of this richness and diversity is given by the topics presented in the fourteenth edition, which range from theoretical matters to the latest observational developments, including also philosophical issues of spacetime theories.

Contents include:

- Nonlocal Gravity: Bahram Mashhoon
- On the Phenomenon of Singularity in Cosmology: Vladimir Belinski
- Aspects of the Discrete Universe: Kjell Rosquist
- Black Holes Reconsidered: Adam D. Helfer
- Multipolar Solutions: Hernando Quevedo
- Stellar Black Holes: Microquasars: I. Félix Mirabel
- Black Holes Cannot Blow Jets: Wolfgang Kundt

2011 300pp Hbk 978-1-908106-20-9 £60/\$110/€70

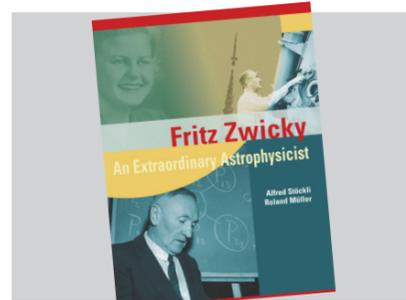
RADIOASTRONOMICAL TOOLS AND TECHNIQUES

Proceedings of Lebedev Physical Institute Edited by N.S. Kardashev and S.A. Dagkesamanski, Astro Space Centre, Lebedev Physical Institute, Moscow, Russia

This volume provides a useful and timely reference for postgraduates and researchers in radioastronomy. It presents methods of processing radioastronomical data and also reviews current developments in equipment, radioastronomical antennae and observation techniques. The volume comprises two parts:

- **Space projects** which consists of papers contributing to the ongoing ground-space radiointerferometer RadioAstron VLBI (Very Long Baseline Interferometry) project as well as the orbital projects Millimetron and Submillimetron (antennae working at short wavelength to achieve higher sensitivity and angular resolution)
- **Ground-based radiotelescope techniques**, which includes papers describing projects to develop and improve ground-based radiotelescopes and new additional equipment (receivers and data acquisitions systems).

2006 452pp Hbk 1-904868-29-0 £70/\$120/€82



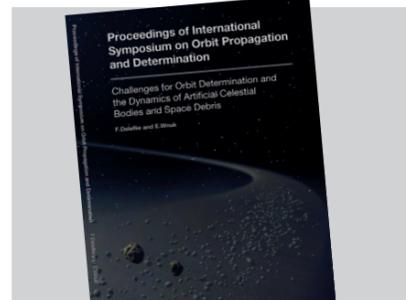
FRITZ ZWICKY: AN EXTRAORDINARY ASTROPHYSICIST

A. Stockli And R. Muller Translated by Ian Gordon

Foreword to the English Edition: L. Woltjer

This English edition of the biography of Fritz Zwicky highlights his fundamental research and discoveries including supernovae, dark matter, clusters of galaxies, neutron stars, gravitational lenses and morphology and also recognises his significant contribution to research in astronomy and astrophysics. It presents a fascinating account of the life and work of this great twentieth century Swiss scientist and will appeal to a wide readership.

2012 260pp Hbk 978-1-904868-78-1 £40/\$60/€45



PROCEEDINGS OF INTERNATIONAL SYMPOSIUM ON ORBIT PROPAGATION AND DETERMINATION

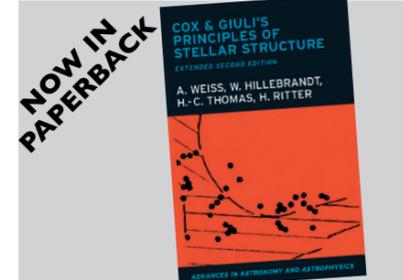
Challenges For Orbit Determination And The Dynamics Of Artificial Celestial Bodies And Space Debris

F.Deleflie, IMCCE, Observatoire de Paris, France, E.Wnuik, University of Poznan, Poland

This international symposium was held at University of Lille in September 2011 and provided an opportunity to review and focus on the issues related to the recent developments and new challenges in orbit determination and propagation methods. The applications concern the motion of artificial satellites (including space debris, artificial satellites of other planets than the Earth), asteroids, or meteoroids. Scientific sessions included: Numerical integration of the equations of motion of a satellite; Analytical integration of the equations of motion; Orbit determination methods for artificial satellites and asteroids; Experience from actual spacecraft flight dynamics operations. This volume provides a useful reference for postgraduates and researchers working in this area of astronomy and astrophysics.

2013 250pp Pbk 978-1-908106-22-3 £60/\$110/€70

TITLES IN ASTRONOMY AND ASTROPHYSICS



COX AND GIULI'S PRINCIPLES OF STELLAR STRUCTURE EXTENDED SECOND EDITION

A. Weiss, W. Hillebrandt, H.-C. Thomas and H. Ritter, Max-Planck-Institut für Astrophysik, Garching, Germany

Cox and Giuli's Principles of Stellar Structure has been the reference textbook for studies of the structure of stars for several decades. This new edition has been extended by four specialists in the field to take into account the most recent improvements relevant for the modelling and understanding of stars. New developments have been added to the original text.

Contents include:

- Introduction and Survey of Observations
- Physical Conditions in Stellar Interiors
- Radiation Theory
- Thermodynamic Equilibrium
- Local Thermodynamic Equilibrium (LTE)
- Thermal and Radiative Equilibrium
- Solution of the Equation of Transfer
- Conditions for LTE

Appendix 7-A. Solving the Equation of Transfer

Appendix 9-A. Semi-Degenerate Equations of State

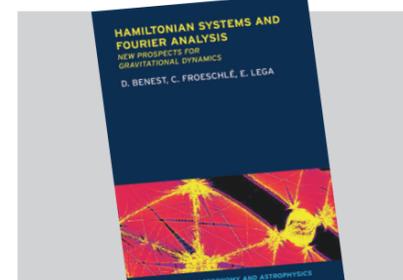
Appendix 10-A. Non-ideal Gas Effects

Appendix 13-A. Stability of the Radiative Gradient

Advances in Astronomy and Astrophysics

2004 782pp Hbk 1-904868-20-7 £70/\$110/€82

2006 782pp Pbk 1-904868-55-X £50/\$78/€58



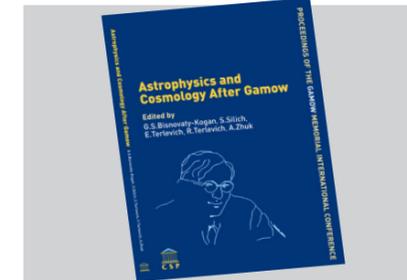
HAMILTONIAN SYSTEMS AND FOURIER ANALYSIS

D. Benest, C. Froeschlé, E. Lega Observatoire de la Côte d'Azur, Nice, France

This multiauthor volume comprises selected and additional papers covering different domains of dynamics. It introduces mathematical methods for the theory of Hamiltonian systems and Fourier analysis in a comprehensive way, starting at elementary level but also including up-to-date research and applications.

Advances in Astronomy and Astrophysics

2005 350pp Hbk 1-904868-24-X £70/\$110/€82

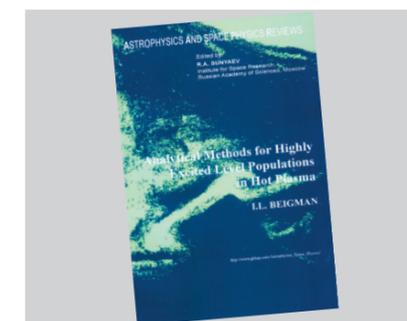


ASTROPHYSICS AND COSMOLOGY AFTER GAMOW

Proceedings of the Gamow Memorial International Conference Edited by G. S. Bisnovaty-Kogan, IKI, Moscow, Russia, S. Silich, E. Terlevich, R. Terlevich, INAOE, Puebla, Mexico, A. Zhuk, Odessa National University, Ukraine

The Gamow Memorial International Conference was held in Odessa, Ukraine in August 2004. The conference was dedicated to 100th anniversary of George Gamow, one of the most prominent scientists of the twentieth century. His major scientific achievements include the development of the alpha and beta decay theory and the Big Bang theory of the expanding universe. The conference covered key topics including cosmology and gravitation; large-scale structure of the universe; gravitational lenses in the universe.

2006 400pp Pbk 1-904868-38-X £60/\$110/€70



ANALYTICAL METHODS IN RADIATIVE TRANSFER THEORY

D. I. Nagirner, Astronomical Institute of St Petersburg University, Russia

This volume presents an introduction to radiative transfer theory and covers the theory of scattering of isotropic and anisotropic monochromatic radiation and the theory of line radiation with complete or partial frequency redistribution. The geometry of the media considered is assumed to be planar and infinite and semi-infinite media are studied as well as the case of a finite plane layer. The volume is intended for graduates, postgraduates and researchers in theoretical astrophysics.

Astrophysics and Space Physics Reviews

2006 350pp Pbk 1-904868-51-7 £50/\$78/€58

ASTROPHYSICS AND SPACE PHYSICS REVIEWS

Edited by R. Sunyaev, Max Planck Institut für Astrophysik, Garching, Germany

DEEP MIXING IN GLOBULAR-CLUSTER RED GIANTS

P. A. Denissenkov, St Petersburg State University, Russia

This review presents the results of studies on subjects closely related to the problems of abundance anomalies in globular clusters. It covers the problem of deep mixing in globular-cluster red giants and describes a diffusion model and a mechanism for extra mixing in red giants. The volume provides a useful source of reference for graduates and researchers in astrophysics.

Astrophysics and Space Physics Reviews

2004 130pp Pbk 1-904868-21-5 £35/\$56/€42

OPTICS OF COSMIC DUST I

N.V.Voshchinnikov, Astronomy Department and Sobolov Astronomical Institute, St Petersburg University, Russia

The optics of small particles is useful in the interpretation of observational phenomena related to extinction, scattering and emission of radiation by dust grains in space. This review presents three components of dust modelling: Optical constants; Light scattering theories and models. The author aims to show how the general laws of the optics of dust particles work and to highlight the information about cosmic dust.

Part II: will be dedicated to the consideration of scattered radiation, dust absorption and emission, radiation pressure and dust properties.

Astrophysics and Space Physics Reviews

2004 166pp Pbk 1-904868-23-1 £35/\$56/€42

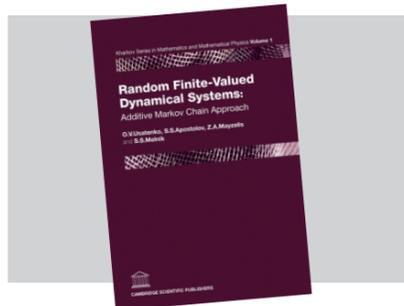
THE JETS AND SUPERCRITICAL ACCRETION DISK IN SS433

S. Fabrika, Special Astrophysical Observatory, Russian Academy of Sciences

The review describes observations and investigations of the unique object SS433 obtained after 23 years of studying this massive binary system. The main difference between SS433 and other known X-ray binaries is the action of a constant supercritical regime for the accretion of gas onto the relativistic star (most likely a black hole), which has led to the formation of a supercritical accretion disk and collimated relativistic jets. The properties of jets are to a large extent determined by their interaction with the disk wind. The precession of the disk and jets as well as the eclipsing in the binary system make SS433 a unique laboratory for studies of mechanisms for the microquasar phenomenon. The author describes the main ideas and results emerging from studies of the formation of the jets and supercritical accretion disk in SS433.

2004 152pp Pbk 1-904868-22-3 £35/\$56/€42

KHARKOV SERIES IN PHYSICS AND MATHEMATICS



RANDOM FINITE-VALUED DYNAMICAL SYSTEMS: ADDITIVE MARKOV APPROACH

O. V. Usatenko, S. S. Apostolov, Z. A. Mayzelis and S. S. Melnik, Institute for Radiophysics and Electronics, Kharkov, Ukraine.

This volume reviews one of the topical areas of research on random discrete dynamic systems from the common standpoint of multistep Markov chains. The authors present a new efficient tool for studying the random systems with a long-range memory which enables a number of crucial theoretical and applications issues to be solved. The proposed methods of constructing sequences with prescribed correlation properties make it possible to design real physical systems (antennas, waveguides, diffraction gratings, multilayered systems) with required spectral characteristics. The problem of generating random sequences is closely linked to forecasting. Therefore this book provides a useful reference for graduates, researchers and professionals in the study of prediction issues in meteorology, sociology, economics and financial areas (technical analysis for traders).

Contents include:

Introduction

Variety of Markov chains

General theoretical approach

Generation of correlated sequences

Convolution method

Markov generation

Filtering probability functions

Signum generation

Applications

Non-extensive thermodynamics

Josephson chains and superconducting multilayers

Spectral analysis and synthesis of correlated systems

Rank distributions and the Zipf law

Two kinds of correlations in literary and DNA "texts"

Symbolic dynamics

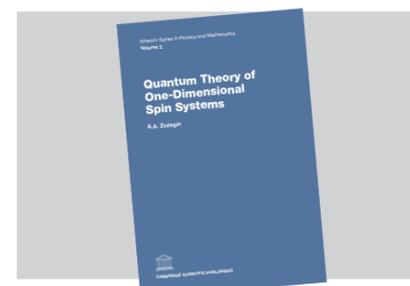
Kharkov Series in Physics and Mathematics

2010 176pp Hbk 978-1-904868-74-3 £50/\$78/€58

Series Editors: V. V. Eremenko, L. A. Pastur, V. A. Sirenko, Institute of Low Temperature Physics and Engineering, National Academy of Sciences of Ukraine, Kharkov.

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This new international book series entitled Kharkov Series in Physics and Mathematics provides a unique medium for the publication of high quality original monographs, multi-author volumes and reference texts in priority research areas of physics and mathematics for graduate, postgraduate and research/professional readership. The Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine, Kharkov has had a long and outstanding tradition in research in physics and mathematics, and is particularly associated with the classical studies and publications of L. D. Landau, L. V. Shubnikov, M. V. Ostrogradskii, A. M. Lyapunov and V. A. Steklov and more recently with the achievements of I. M. Lifshitz, A. I. Akhiezer, V. A. Marchenko, A. V. Pogorelov and V. G. Drinfeld. Continuing this tradition, this book series will publish and highlight research areas including: condensed matter (theory and experiment), superconductivity, low temperature magnetism and interaction of radiation with matter, cryocrystals, point-contact, optical and magnetic resonance spectroscopies, quantum phase transition, geometry and topology, complex analysis, mathematical modeling, statistical methods in mathematical physics.



QUANTUM THEORY OF ONE DIMENSIONAL SPIN SYSTEMS

A. A. Zvyagin, Institute for Low Temperature Physics and Engineering, Kharkov, Ukraine

This volume is presented in three parts and it reviews the main features of the theory of one-dimensional quantum insulating magnetic systems.

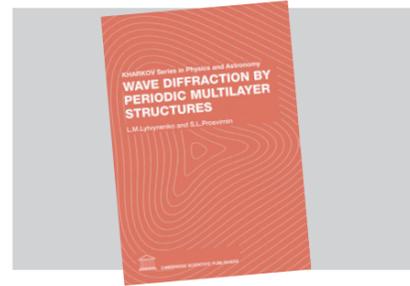
Part I: provides a general introduction to the theory of quantum magnets.

Part II: introduces the study of one-dimensional spin systems using special theoretical techniques and presents important exact theoretical results devoted to spin chain models.

Part III: discusses applications of exact results for more realistic models of quasi-one-dimensional magnets and introduces main approximations used in modern theory of one-dimensional magnets.

Kharkov Series in Physics and Mathematics

2010 330pp Hbk 978-1-904868-85-9 £55/\$86/€64



WAVE DIFFRACTION BY PERIODIC MULTILAYER STRUCTURES

L. M. Lytvynenko and S. L. Prosvirnin

Institute of Radioastronomy, Kharkov, Ukraine

This volume offers a new approach to constructing the theory of electromagnetic wave interaction (propagation and scattering) with periodic sequences of screens. The crucial point of the method is an embedding of reflection operator of semi-infinite layered complex structure into the theory of wave scattering. This new technique is applied to the solution of electromagnetic wave scattering by different kinds of periodic structures and includes the investigation of the diffractive properties of multilayer sequences of two-dimensional periodic plane screens.

The volume provides a useful reference for radiophysicists and radioengineers and for researchers working in areas of applied physics including acoustics, aero- and hydrodynamics.

Kharkov Series in Physics and Mathematics

2012 164pp Hbk 978-1-904868-75-0 £50/\$78/€58



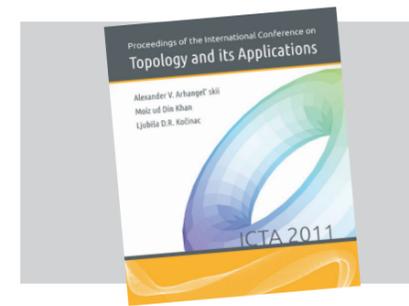
REGULAR AND CHAOTIC CLASSICAL AND QUANTUM DYNAMICS IN MULTI-WELL POTENTIALS

V. P. Berezovoj, Yu. L. Bolotin, V. A. Cherkaskiy, G. I. Ivashkevich, Kharkov Institute of Physics and Technology, Kharkov, Ukraine

This review is based mainly on the results of the authors original research and considers classical chaos and quantum manifestations of classical stochasticity in two-dimensional potentials with non-trivial topology. Non-linear models with complicated multi-well shape of potential energy surface represent the common case situation and they are used in many important processes in real systems, such as chemical reactions, phase transitions, nuclear reactions and decay of superdeformed nuclei. There is increasing world-wide interest in non-linear dynamics, and this volume provides a useful reference and guide to the exciting topic of classical and quantum chaos. The book is intended for a wide audience of readers who are familiar with the basics of classical and quantum mechanics.

Kharkov Series in Physics and Mathematics

2013 160pp Hbk 978-1-904-77-4 £50/\$78/€58



PROCEEDINGS OF INTERNATIONAL CONFERENCE ON TOPOLOGY AND ITS APPLICATIONS (ICTA 2011)

Alexander V. Arhangel'skii, Moiz ud Din Khan, Ljubisa D.R. Kocinac (eds)

ICTA 2011 was held in July 2011 in Islamabad, Pakistan. The aim of the conference was to review and explore some of the recent achievements in topology and to provide an opportunity for scientific exchange and interaction between scientists who work on different aspects and applications of topology. Topics include: Set Theory and Set-Theoretic Topology; General Topology; Algebraic Topology, Geometric Topology, Symplectic Topology; Continuum Theory; Asymmetric Topology; Symmetric Topology; Categorical, Point-free or Constructive Aspects of Topology; Topology on Lattices; History of Topology; Computational Topology; Applications of Topology. This volume will provide a useful reference for graduates and researchers working in this area of mathematics.

2012 250pp Pbk 978-1-908106-17-9 £60/\$110/€70



PI, EPSILON, PHI, WITH MATLAB: RANDOM AND RATIONAL SEQUENCES WITH SCOPE IN SUPERCOMPUTING ERA

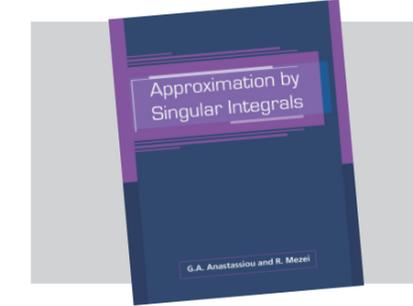
S. K. Sen, Department of Mathematical Sciences, FIT, USA, and R. P. Agarwal, Department of Mathematics, Texas A&M University-Kingsville, USA

The authors present some characters of three famous irrational numbers: pi (the area of the circle of unit radius), Epsilon (the exponential function with argument 1) and Phi (the golden ratio), along with their formulas and their variable precision computations in Matlab. The concerned programs/commands are included, written in high level, user friendly, and globally available programming language Matlab. This volume is intended to be a useful reference book for students of engineering, science courses that involve numerical computations including error-free computations, those underlying evolutionary approaches/genetic, randomized algorithms for optimization and other applications.

2012 300pp Hbk 978-1-908106-23-0 £55/\$88/€65

2012 300pp Pbk 978-1-904868-95-8 £35/\$56/€42

TITLES IN MATHEMATICS

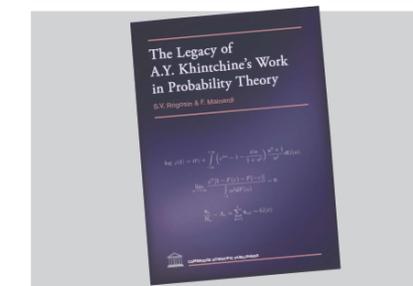


APPROXIMATION BY SINGULAR INTEGRALS

G. Anastassiou and R. Mezei, University of Memphis, USA

This monograph deals with the study of the approximation of singular integrals to the identity-unit operator. The authors study quantitatively the basic approximation properties of the general Picard, Gauss-Weierstrass and Poisson-Cauchy singular integral operators over the real line, which are not positive linear operators. In particular the authors study the rate of convergence of these operators to the unit operator, as well as the related simultaneous approximation and the global smoothness preservation property of these operators. The corresponding general approximation theory of general singular integral operators is presented with many applications to the trigonometric singular integral. For the convenience of the reader, the chapters of this book are written in a self-contained style. This monograph is intended for researchers, graduate students working in many areas of pure and applied mathematics, including mathematical analysis, probability, statistics, ordinary and partial differential equations.

2012 400pp Pbk 978-1-908106-19-3 £60/\$110/€70



THE LEGACY OF A. Y. KHINTCHINE'S WORK IN PROBABILITY THEORY

S. Rogosin, State University of Belarus, Minsk and F. Mainardi, University of Bologna, Italy

This volume describes and highlights the role of the work of the well-known Russian mathematician, Alexander Yakovlevich Khintchine (1894-1959), in the early development of modern Probability Theory. The authors present the English translations of many of the key papers and monographs by Khintchine, supplemented by comments and notes. Several important results of Khintchine's work were previously inaccessible and so this volume provides a useful reference text for students and researchers working in this area of mathematics.

2010 280pp Hbk 978-1-904868-65-1 £55/\$88/€65



TOPICS IN COMPLEX APPROXIMATION

G. Anastassiou, University of Memphis, USA

In this monograph we study quantitatively the order of simultaneous approximation and Voronovskaja type asymptotic results for complex Bernstein-Schurer, Kantorovich-Schurer and Bernstein-Durrmeyer polynomials related to analytic functions on compact disks. In this way the overconvergence phenomenon for Bernstein-Schurer and Bernstein-Durrmeyer polynomials is revealed. We continue with explicit quantitative estimates for the overconvergence in the complex plane of the partial sums of the Fourier-type expansions on $[-1, 1]$ with respect to Chebyshev and Legendre orthogonal polynomials. Furthermore we obtain quantitative estimates in the overconvergence phenomenon for the classical and generalized singular integrals of Gauss-Weierstrass, Poisson-Cauchy and Picard on a strip. Furthermore we present Jackson type approximation results by generalizations of multi-complex Picard, Poisson-Cauchy and Gauss-Weierstrass singular integrals in terms of higher order moduli of smoothness on polydisks. It follows quantitative estimates in the overconvergence phenomenon on polystrips, for the weighted and non-weighted cases, for generalized multicomplex singular integrals of Picard, Poisson-Cauchy and Gauss-Weierstrass types. We establish basic results concerning the best approximation of vector-valued functions by generalized polynomials. The overconvergence of singular integrals is presented for the first time in book form. This monograph is intended for researchers, graduate students working in many areas of pure and applied mathematics.

Contents include:

Quantitative Approximation by Complex Bernstein-Durrmeyer Polynomials on Compact Disks

Quantitative Overconvergence for Chebyshev and Legendre Orthogonal Expansions on compact interval

Quantitative Overconvergence for Singular Integrals on a Strip

Quantitative Overconvergence for Generalized Singular Integrals on a Strip

Approximation Properties of Multicomplex Singular Integrals in the Unit Polydisk

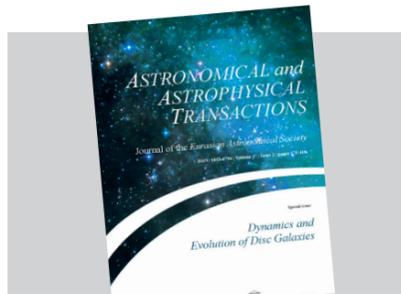
Quantitative Estimates in the Overconvergence of Multivariate Singular Integrals on a Polystrip

Approximation Properties of Multivariate Generalized Singular Integrals in the Unit Polydisk

Quantitative Estimates in the Overconvergence of Complex Multivariate Generalized Singular Integrals in Polystrips

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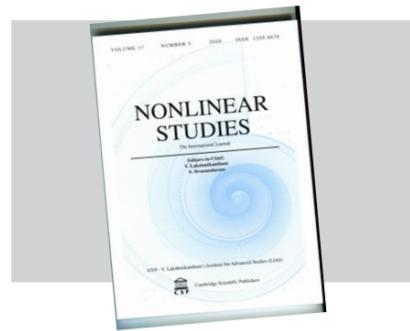
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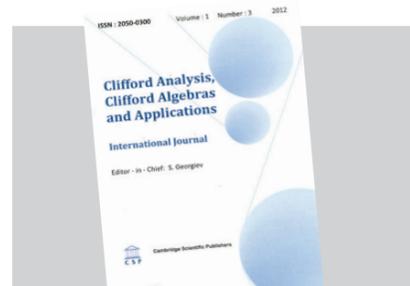
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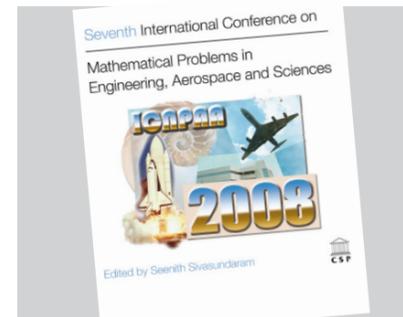
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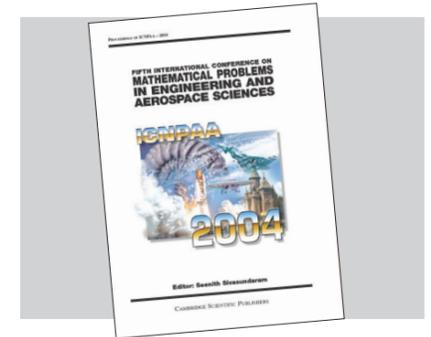


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The Eighth International Conference on Mathematical Problems in Engineering, Aerospace and Sciences was held at the Brazilian institute for space research (INPE), Brazil, June 30-July 3, 2010. This proceedings publication reports on new trends and research directions in engineering and aerospace sciences and comprises keynote addresses, invited lectures and contributed papers. The volume includes papers on: hybrid systems, new trends and application in transform theory, nonlinear flight dynamics problems: algorithm and software tools, Optimal control, stability in nonlinear sciences, multi disciplinary optimization, boundary value problems in engineering and aerospace sciences, modeling, optimization and simulation, air transport, economics, operation and management, unmanned aerial vehicles, orbital manures of satellites, numerical methods, region of attraction and its application to control theory, computational fluid dynamics, system identification, modeling and control in aerospace problems, space craft dynamics and control, hybrid evolution programming, modeling and optimization, hydro aero dynamics aero elasticity and vibration, robust stabilization, astrodynamics, control of defense systems, unsteady flight control, reentry vehicles, phase transition modeling, computational fluid dynamics, computational structures, material processing, trajectory optimization of solar airplanes, stability and control, nonlinear mechanical systems, advances in nonlinear dynamics, soft computing, modeling and simulation, high performance computing, structural dynamics, aero acoustics, hybrid systems, modern aero elasticity, fractional differential equations and nuclear power research, and Petri nets for complex systems.

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A. T. Fomenko, Moscow State University, Russia

INVARIANT KÄHLER STRUCTURES ON THE COTANGENT BUNDLE OF SYMMETRIC SPACES AND REDUCTION

I. V. Mykytyuk, Institute of Applied Problems of Mathematics and Mechanics, Lviv, Ukraine

The main objects of investigation are G-invariant polarizations on domains D in the cotangent bundles $T^*(G/K)$. The book comprises two parts. Part I: Invariant Kähler structures and Part II: Invariant hyperkähler structures.

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GEOMETRY OF SINGULARITIES OF INTEGRABLE SYSTEMS ON LIE ALGEBRAS

Yu. A. Brailov, Moscow State University, Russia

Integrable systems generated by consistent Poisson brackets on semi-simple Lie algebras are greatly related to the structure of ground algebra. The most important geometrical properties of Liouville's foliation are expressed in algebraic terms. The exact relation is also established between the singularities of momentum mapping and degenerations of the corresponding spectral curve.

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INVERSE FUNCTION THEOREMS AND THEIR APPLICATIONS TO THE THEORY OF POLYHEDRA

V. A. Alexandrov, Sobolev Institute of Mathematics, Novosibirsk, Russia

This volume reviews how the implicit and inverse function theorems operate in polyhedron theory, and how they are used to deduce classical and new theorems on polyhedra, for example, the existence, uniqueness and rigidity of a convex polyhedron with a given development; construction of flexible polyhedra; existence and uniqueness of a convex polyhedron with given areas and directions of faces; generalization of theorems for nonconvex polyhedra.

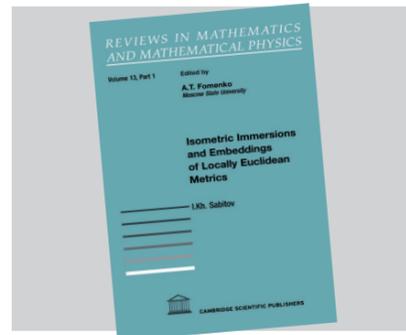
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TOPOLOGY OF INTEGRABLE SYSTEMS

D. B. Zotev, Volgograd State Technical University, Russia

The topological theory of integrable Hamiltonian systems was created and developed by A. T. Fomenko and his group. This review briefly describes the theory on a level of strictness sufficient for self-dependent applications. Some new results are presented, illustrating the theses of the theory and also a method of A.V. Bolsinov.

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ISOMETRIC IMMERSIONS AND EMBEDDINGS OF LOCALLY EUCLIDEAN METRICS

I. Kh. Sabitov, Moscow State University, Russia

The aim of this volume is to review the results on isometric immersions of locally Euclidean metrics into Euclidean spaces along with the description of the extrinsic geometry of these immersions. The review begins with the consideration of a problem specific only for constant curvature metrics, namely the problem of "natural" realization of locally Euclidean metrics by Euclidean-space domains of corresponding dimension with the standard Euclidean metric and then studies their isometric immersions into Euclidean spaces of greater dimension with emphasis on the problems of smoothness.

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BASIS PROPERTIES AND COMPLETENESS OF CERTAIN SYSTEMS OF ELEMENTARY FUNCTIONS

**E. I. Moiseev, A. P. Prudnikov and A. M. Sedletskii
A. A. Dorodnitsyn Computational Center, Russian Academy of Sciences, Moscow**

The possibility of approximating functions of a sufficiently general form by relatively simple functions and therefore more convenient for analysis and computation is the initial reason for approximation theory. The basic fact of this theory is the Weierstrasse theorem. In the first part of this book the authors consider the problem of description of complete power systems.

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MULTIDIMENSIONAL MONGE-AMPÈRE EQUATION

A. V. Pogorelov, Institute of Low Temperature Physics and Engineering, Kharkov, Ukraine

This review presents a detailed exposition of the results concerning the existence and uniqueness of the solutions of the general Monge-Ampère multidimensional equations of elliptic type. This division of the theory of partial differential equations is closely connected with geometry. This edition is also a tribute to A.V. Pogorelov (1919-2002) in recognition of his achievements and significant contribution to mathematics.

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SECOND EDITION

O. I. Mokhov, L. D. Landau Institute for Theoretical Physics, Moscow

This review is devoted to the differential-geometric theory of homogenous forms and other different homogenous structures (mainly, Poisson and symplectic structures) on loop spaces of smooth manifolds, their natural generalizations and applications in mathematical physics and field theory.

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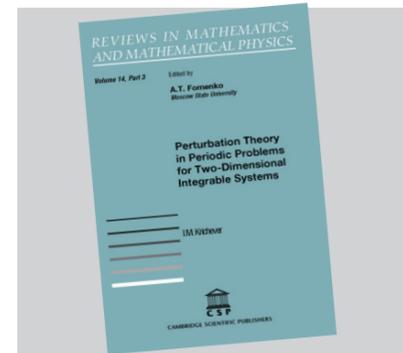
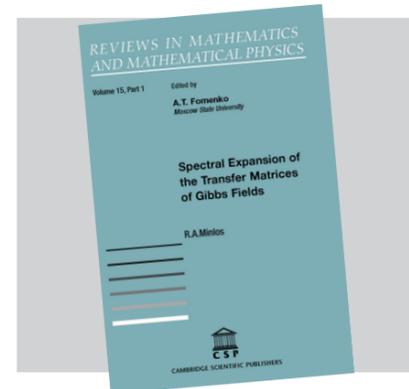
SPECTRAL EXPANSION OF THE TRANSFER MATRICES OF GIBBS FIELDS SECOND EDITION

R.A. Minlos, Institute for Information Transmission Problems, Moscow

This survey presents investigations of the structures of the spectrum of transfer matrices (stochastic operators) of lattice Gibbs fields and considers cluster expansion of the transfer matrix, invariant cluster R-particle subspaces of the transfer matrix and cluster operators in p-representation. This edition of a classic review provides a useful source of reference for students, postgraduates and researchers in these areas of mathematics. This edition has been updated with a supplementary review of recent investigations. The general methods of studying spectral structure of transfer-matrices of Gibbsian fields and related topics have some applications and development in recent papers of authors, their collaborators and students. The following themes and associated references are reviewed:

- The transfer-matrices of Gibbsian fields
- Random walks in random environment
- The asymptotics of decay of correlations for Gibbsian fields at high temperatures
- Inhomogeneous random walk on the lattice
- Some models from solid-state theory
- Stochastic dynamics

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PERTURBATION THEORY IN PERIODIC PROBLEMS FOR TWO-DIMENSIONAL INTEGRABLE SYSTEMS

SECOND EDITION

I.M. Krichever, L.D. Landau Institute of Theoretical Physics, Moscow

The perturbation theory of finite-zone solutions of two-dimensional integrable equations is developed. The contents of the review include:

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2. Spectral Theory of Non-Stationary Schrodinger Operators
3. Periodic Problem for Kadomtsev-Petviashvili-Type Equations
4. Spectral Theory of Two-Dimensional Periodic Schrodinger Operators.

This review was first published in 1992 and in the course of the last twenty years, these ideas, concepts and methods of the theory of integrable systems have been developed and applied to a wide range of contemporary problems of geometry and topology.

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SINGULARITIES OF FUNCTIONS, WAVE FRONTS, CAUSTICS AND MULTIDIMENSIONAL INTEGRALS

V.I. Arnold, A.N. Varchenko, A.B. Givental and A.G. Khovanskii

This classic survey paper is an introduction to some difficult contemporary fields of study in mathematics known under the rubric of Catastrophe Theory, which encompasses the theory of "typical" singularities of functions and mappings. The authors discuss the basic ideas, concepts and methods of the theory of singularities and the survey is presented in three sections:

- Section 1: Singularities of Functions, Caustics and Wave Fronts
- Section 2: Integrals of the Stationary Phase Method
- Section 3: The Geometry of Formulas

The survey provides a useful source of reference for students, postgraduates and researchers in these areas of mathematics.

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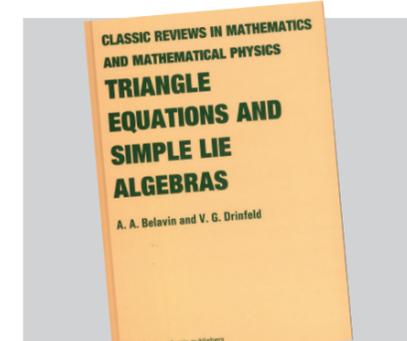


GEOMETRIC INTEGRATION THEORY ON SUPERMANIFOLDS

T. Voronov, University of Manchester, UK

This volume provides a detailed account of the theory of forms on supermanifolds – a correct and non-trivial analogue of Cartan-de Rham theory based on new concepts. It also develops supermanifold differential topology including such notions as supermanifolds with boundary and supermanifold bordism, naturally arising for the needs of integration theory. One of the key features is the identification of a class of "proper morphisms" of supermanifolds, intimately connected with Berezin integration, and of fundamental importance in various problems.

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Institute for Theoretical Physics, Moscow**

TRIANGLE EQUATIONS AND SIMPLE LIE ALGEBRAS

A. A. Belavin, L. D. Landau Institute for Theoretical Physics, Moscow, Russia and V. G. Drinfeld, Physical-Technical Institute of Low Temperatures, Kharkov, Ukraine

This classic paper pertaining to the theory of the Yang-Baxter equations presents results on the applications of methods of the theory of Lie algebras to the classification of solutions of the Yang-Baxter equations.

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TOPOLOGICAL AND ALGEBRAIC GEOMETRY METHODS IN CONTEMPORARY MATHEMATICAL PHYSICS

B. A. Dubrovin, International School for Advanced Studies, Trieste, Italy, I. M. Krichever & S. P. Novikov

A classic survey of algebraic geometry and topological methods in various problems of mathematical physics and provides an excellent reference text for graduate students and researchers. Part 1 concerns Hamiltonian formalism and methods that generalise Morse for certain dynamical systems of physical origin; Part 2 presents algebraic geometry analysis of the Yang-Baxter equations for two-dimensional models; Part 3 presents the theory of multidimensional theta functions of Abel, Riemann, Poincaré in a form that is elementally and convenient for applications.

Classic Reviews in Mathematics and Mathematical Physics

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INTRODUCTION TO THE THEORY OF REPRESENTATIONS OF FINITELY PRESENTED *-ALGEBRAS

**I. Representations by bounded operators
Second Edition**

V. Ostrovskiy and Yu. Samoilenko, Institute of Mathematics, Ukrainian National Academy of Sciences

This review gives fundamentals of representations of finitely *-algebras by bounded operators. The theory is illustrated with numerous examples of *-algebras. The examples, in particular, include *-algebras with two self-adjoint generators that satisfy a quadratic or a more general relation, *-algebras with three and four generators, *-algebras that arise from one and many-dimensional discrete dynamical systems, Wick *-algebras, various *-wild algebras. This review is intended for graduate students and researchers who specialize in this area of mathematics.

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Editor: I. M. Khalatnikov, L. D. Landau Institute for Theoretical Physics. Moscow, Russia

LANDAU-POMERANCHUK-MIGDAL EFFECT

A. I. Akhiezer, N. F. Shul'ga and S. P. Fomin, Kharkov Institute of Physics and Technology, Ukraine

This review considers various aspects of the theory of radiation of relativistic particles which is of interest to theorists and to experimental physicists. The authors introduce the problem of electron radiation in a given field of a separate atom and then study the influence of multiple scattering of a particle on the radiation. The authors also introduce the Landau Pomeranchuk effect (1953) consisting of the reduction of probability of radiation of the relativistic electron in an amorphous medium and consider in detail the contribution of the fundamental work by Migdal in 1954 and 1956. These methods have been developed significantly and the review describes the current applications.

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MAGNETIC & MAGNETOELASTIC PROPERTIES OF ANTIFERROMAGNETS AND SUPERCONDUCTORS

V. V. Eremenko and V. A. Sirenko, Institute for Low Temperature Physics, Kharkov, Ukraine

Magnetic and magnetoelastic properties of antiferromagnets and superconductors in the vicinity of phase transitions induced by a magnetic field are considered. At these conditions inhomogeneous states appear in antiferromagnets, similar to either intermediate state type I superconductors or the mixed one in type II superconductors. The authors discuss the measurements for simple representatives of antiferromagnets and superconductors such as the transition metal based uni-axial two-sublattice antiferromagnetic insulator and superconducting dichalcogenide 2H-NbSe₂, which revealed quantum oscillations of magnetostriction and its peculiarities in a peak effect regime. This book is intended for postgraduates and researchers in magnetic properties of strongly correlated electronic systems and for students of applied physics.

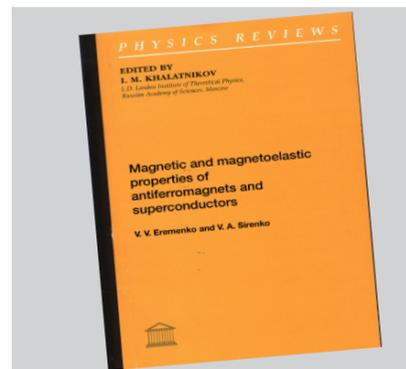
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POLARIZATION AND INTERFERENCE EFFECTS IN RADIATION PROCESSES

V. A. Astapenko, Moscow Institute for Physics and Technology

This review presents results of recent investigations concerning the polarization and interference effects that arise in radiation processes such as bremsstrahlung on targets with electron core, photo-effect in bichromatic electromagnetic field, femtosecond photon echo in nanocrystals and associated phenomena.

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SPACE PHYSICS & PLASMA PHYSICS

V. S. Beskin and V. L. Ginzburg, Lebedev Physical Institute, Moscow

This review comprises papers presented at a scientific meeting in recognition of Sergei Ivanovich Syrovatskii and his significant contribution to the development of modern astrophysics. V. S. Beskin and V. L. Ginzburg provide some biographical details and insight into the life and work and publications of S. I. Syrovatskii. His key scientific interests included magnetohydrodynamics, radioastronomy, cosmic ray astrophysics and solar physics. Other chapters contributed to the review include: Supernova Ia; The formation and evolution of the current sheet for driven magnetic reconnection field lines on plasma; Dynamic current sheets in the Earth's magnetotail; Syrovatskii and development of current sheet research.

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PHYSICAL PRINCIPLES OF BIOLOGICAL MOTION: ROLE OF HYDROGEN BONDS

S. V. Bupalova, Donetsk National University, Ukraine and V. G. Bar'yakhtar, Institute of Magnetism, Kiev, Ukraine

This review considers the physical mechanism of mechanochemical processes in living organisms, based on the determining role of excited hydrogen bonds in biological molecules in stimulation of muscle contraction and other biological motions. The review consists of two parts. The first part presents known facts on biomolecules, energy transmission mechanisms and experimentally established regularities. The second part is a detailed exposition of authors' results on the physical mechanisms of muscle contraction due to excited state – normal state transitions and inverse transitions. The problems are interdisciplinary, involving aspects of physics, biology, biochemistry and all natural sciences.

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COLLISION PROCESSES INVOLVING HIGHLY EXCITED ATOMS AND NEUTRAL PARTICLES

V. S. Lebedev, P.N. Lebedev Institute, Moscow, Russia

This volume presents a current review of knowledge on elementary collision processes of highly excited atoms with neutral particles. It provides the basic physical approaches and theoretical techniques for the description of a broad class of observed collision phenomena in gases and low temperature plasmas involving Rydberg atoms.

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L. V. Dekhtyaruk, Kharkov State University, Yu. A. Kolesnichenko and V.G. Peschansky, Institute for Low Temperature, Kharkov, Ukraine

This review describes a series of kinetic phenomena in metallic multilayers. The kinetic properties of multilayers differ from the properties of both massive metals and thin films.

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ATOM VIBRATIONS IN SOLIDS: AMPLITUDES AND FREQUENCIES

V. V. Levitin, Zaporozhye State Technical University, Ukraine

Many properties of solids are related to crystal lattice oscillations and this phenomenon is of theoretical and practical significance. This review describes experimental investigations of heat atom vibrations and associated data including specific physical values which have been measured directly and also the methods for X-ray measurements of the mean-square atom displacements.

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THE INVERSE SCATTERING PROBLEM AND INSTANTON CONSTRUCTION BY ALGEBRAIC GEOMETRY

A.A. Belavin, L.D.Landau Institute for Theoretical Physics, Moscow

This classic paper was first published in Soviet Scientific Reviews in 1979; Professor A.A.Belavin is one of the originators of instanton theory and the paper provides a clear summary of an important subject with some significant insights. More than thirty years later, instantons continue to be of interest and the timely republication of this classic paper provides an accessible reference text for students and researchers. Recently, L.F.Alday, D.Gaiotto and Y.Tachikawa proposed the striking relation between 2-conformal field theory and N=2 SUSY d=4 QCD confirms the current increasing interest in instantons and highlights the importance and contribution of the fundamental work.

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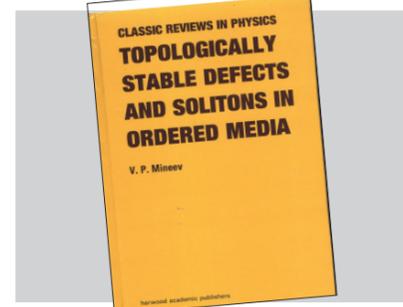
V.G.Knizhnik, L.D.Landau Institute of Theoretical Physics, Moscow, Russia

This review comprises papers presented at a scientific meeting Vadim Knizhnik (1962-1987) was a brilliant theoretical physicist who died tragically young. This classic paper was first published in Soviet Scientific Reviews in 1989 and is a review of the main results in the area of multiloop calculations in the theory of strings. The evaluation of multiloop amplitudes in the theory of closed oriented Bosonic strings reduces to finding the measure on the moduli space of Riemann surfaces. It is shown that the measure is the product of the squared modulus of a holomorphic function with the determinant of the imaginary part of the period matrix to the power-13. With the help of theta functions, the measure can be expressed in terms of theta functions. A version of the holomorphy theorem (Quillen's theorem) is used for evaluating the dependence of the determinants of the Laplace operators on the boundary conditions on the Riemann surface. In the case where the Riemann surfaces are presented as ramified coverings of CP¹ the measure is expressible in terms of the coordinates of the ramification points, in such a way that a vertex operator corresponds to each ramification point. The measure is the correlation function of these operators, so that the sum over all higher loops can be written as the statistical sum of a two-dimensional conformal field theory.

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This classic paper describes topologically stable patterns such as vortices, disclinations, dislocations and domain walls in ordered media (superfluids, liquid and solid crystals, magnets). It also introduces the basic notions of homotopic group theory and the necessary algebraic topology constructions. The author is one of the inventors of topological classification of defects in a theory of ordered media.

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FACTORIZED S MATRICES AND LATTICE STATISTICAL SYSTEMS

A. B. Zamolodchikov, Rutgers University, USA

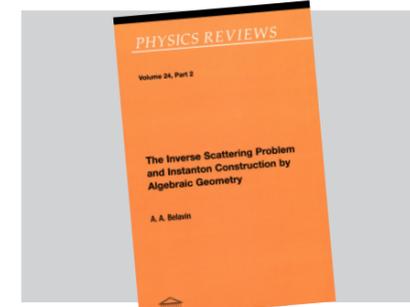
Factorized S Matrices and Lattice Statistical Systems – A.B.Zamolodchikov was first published in 1980 in the series Soviet Scientific Reviews/Physics Reviews edited by I.M.Khalatnikov: Volume 2: a compiled volume. This classic paper studies the general characteristics of relativistic factorized S-matrices in two dimensional space-time. It shows that for Euclidean values of external momenta, multiparticle elements in such S matrices formally define special model systems of lattice –statistics model systems (S models) that have a number of characteristics in common with the Baxter eight-vertex model.

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In the course of the last thirty years these ideas and concepts have been developed and applied extensively in theoretical physics and the republication of this classic paper provides an accessible reference text for students and researchers.

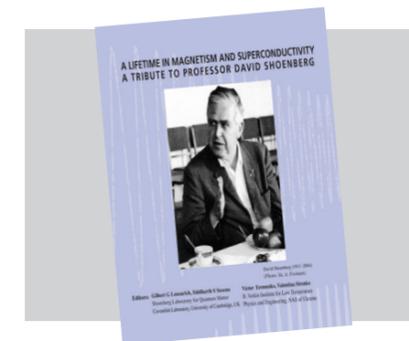
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A.A. Belavin, L.D.Landau Institute for Theoretical Physics, Moscow

This classic paper was first published in Soviet Scientific Reviews in 1979; Professor A.A.Belavin is one of the originators of instanton theory and the paper provides a clear summary of an important subject with some significant insights. More than thirty years later, instantons continue to be of interest and the timely republication of this classic paper provides an accessible reference text for students and researchers. Recently, L.F.Alday, D.Gaiotto and Y.Tachikawa proposed the striking relation between 2-conformal field theory and N=2 SUSY d=4 QCD confirms the current increasing interest in instantons and highlights the importance and contribution of the fundamental work.

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