H. Alloul, Université Paris sud, France

**Introduction to the Physics of Electrons in Solids**

This textbook sets out to enable readers to understand fundamental aspects underlying quantum microscopic phenomena in solids, primarily through the modern experimental techniques and results. The classic independent-electrons approach for describing the electronic structure in terms of energy bands helps explain the occurrence of metals and insulating states and to introduce their magnetic and semiconducting properties. Since superconductivity and magnetism can only be understood by taking into account the interactions between electrons, the text recounts the experimental observations that have revealed the main properties of the superconductors and were essential to track its physical origin. While fundamental concepts are underlined, those which are required to describe the high technology applications, present or future, are emphasized as well. Problem sets involve experimental approaches and tools which support a practical understanding of the materials and their behaviour.

**Features**
- Employs a modern experimental approach that deemphasizes mathematical derivations
- Uniquely combines fundamental explanation of both magnetism and band structure
- Learning reinforced by content-rich figures, chapter-end summaries, exercises and solutions
- Developed and class-tested in the eminent program of the Ecole Polytechnique

**Fields of interest**
Condensed Matter Physics; Magnetism, Magnetic Materials; Physical Chemistry

**Target groups**
Graduate

**Type of publication**
Graduate/Advanced undergraduate textbook

---

A. Bartók-Pártay, University of Cambridge, UK

**The Gaussian Approximation Potential**

**An Interatomic Potential Derived from First Principles Quantum Mechanics**

Simulation of materials at the atomistic level is an important tool in studying microscopic structures and processes. The atomic interactions necessary for the simulations are correctly described by Quantum Mechanics, but the size of systems and the length of processes that can be modelled are still limited. The framework of Gaussian Approximation Potentials that is developed in this thesis allows us to generate interatomic potentials automatically, based on quantum mechanical data. The resulting potentials offer several orders of magnitude faster computations, while maintaining quantum mechanical accuracy. The method has already been successfully applied for superconductors and metals.

**Features**
- Describes an important advance in the generation of accurate interatomic potentials
- The method yields several orders of magnitude faster computations
- Nominated as an outstanding contribution by the Theory of Condensed Matter Group of Cambridge University’s Cavendish Laboratory

**Contents**
Introduction.
- Representation of Atomic Environments.
- Gaussian Process.
- Interatomic Potentials.
- Conclusion and Further Work.
- Appendices.

**Fields of interest**
Solid State Physics; Theoretical, Mathematical and Computational Physics

**Target groups**
Research

**Type of publication**
Monograph

---

C. Beck, Université de Strasbourg, France (Ed.)

**Clusters in Nuclei**

**Volume 1**

Following the pioneering discovery of alpha clustering and of molecular resonances, the field of nuclear clustering is presently one of the domains of heavy-ion nuclear physics facing both the greatest challenges and opportunities. After many summer schools and workshops, in particular over the last decade, the community of nuclear molecular physics decided to team up in producing a comprehensive collection of lectures and tutorial reviews covering the field. By promoting new ideas and developments while retaining a pedagogical nature of presentation throughout, these lectures will both serve as a reference and as advanced teaching material for future courses and schools in the fields of nuclear physics and nuclear astrophysics.

**Features**
- State-of-the-art content written by the leading experts in the field
- Tutorial self-contained style, useful as a self-study guide
- First volume of a set of volumes on the topic

**Contents**
Cluster Radioactivity.
- Coexistence of Cluster States and Mean-field-type States.
- Alpha-cluster Condensations in Nuclei and Experimental Approaches for their Studies.
- Cluster Structure of Neutron-rich Nuclei Studied With Antisymmetrized Molecular Dynamics Model.
- Di-neutron Clustering and Deutron-like Tensor Correlation in Nuclear Structure Focusing on 11Li.
- Collective Clusterization in Nuclei and Excited Compound Systems: The Dynamical Cluster-decay Model.
- Giant Nuclear System of Molecular Type.

**Field of interest**
Nuclear Physics, Heavy Ions, Hadrons

**Target groups**
Research

**Type of publication**
Monograph

---

Due September 2010


2010. 630 p. 400 illus., 51 in color. (Graduate Texts in Physics) Hardcover

- € 89,95 | £81.00
- £ (D) 96.25 | £ (A) 98.95 | sFr 140.00
ISBN 978-3-642-13564-4

Due September 2010

2010. 122 p. 58 illus., 29 in color. (Springer Theses) Hardcover

- € 99.95 | £90.00
- £ (D) 106.95 | £ (A) 109.95 | sFr 155.50
ISBN 978-3-642-14066-2

Due August 2010

2010. 280 p. (Lecture Notes in Physics, Volume 818) Softcover

- approx. € 44,95 | £40.99
- £ (D) 48.10 | £ (A) 49.45 | sFr 70.00
ISBN 978-3-642-13609-8
**Introduction to the Physics of Massive and Mixed Neutrinos**

The discovery of neutrino oscillations opened a new era in neutrino physics: an era of investigation of neutrino masses, mixing, magnetic moments and other neutrino properties. On the other hand small neutrino masses cannot be explained by the standard Higgs mechanism of mass generation. Thus, small neutrino masses are the first signature in particle physics of a new beyond the Standard Model physics. One of the most important challenges ahead is the problem of the very nature of neutrinos with definite masses: are they Dirac neutrinos possessing a conserved lepton number which distinguish neutrinos and antineutrinos or Majorana neutrinos with identical neutrinos and antineutrinos? Many experiments of the next generation and new neutrino facilities are now under preparation and investigation.

**Features**
- Written by one of the pioneers in the field of modern neutrino physics (Bruno Pontecorvo Prize in 2002).
- Self contained introduction useful for a self-study guide
- Integrates classic material and state-of-the-art survey

**Contents**
- Introduction.
- Weak Interaction before the Standard Model.
- The Standard model of the Electroweak Interaction.
- Neutrino Mass Terms.
- Neutrino Mixing Matrix.
- Neutrino Oscillations in Vacuum.
- Neutrino in Matter.
- Neutrinoless Double Beta-Decay.
- On Absolute Values of Neutrino Masses.
- Neutrino Oscillation Experiments.
- Neutrino and Cosmology.
- Conclusions and Prospects.
- Diagonalization of a Hermitian Matrix. The Case 2x2.
- Diagonalization of a Complex Matrix.
- Diagonalization of a Complex Symmetrical Matrix.

**Field of interest**
- Physics, general

**Target groups**
- Research

**Type of publication**
- Monograph

---

**Analysis of Excitation and Ionization of Atoms and Molecules by Electron Impact**

The content of this book describes in detail the results of the present measurements of the partial and total doubly differential cross sections for the multiple-ionization of rare gas atoms by electron impact. These measurements show, beside other trends, the role of Auger transitions in the production of multiply ionized atoms in the region where the incident electron energy is sufficient to produce inner shell ionization. Other processes like Coster-Kronig transitions and shake off also contribute towards increasing the charge of the ions. The incident electron having energy of 6 keV, for example, in a collision with xenon atom can remove up to nine electrons! (*X-ray-ion coincidence spectroscopy of the electron xenon atom collisions is also described.

**Features**
- Describes the apparatuses, experimental techniques and results for the investigations of the fundamental processes of multiple ionizations and dissociative ionizations.
- Shows how sulfur dioxide can be removed from the atmosphere by electron impact dissociation.
- Explores in detail the measurements of the partial and total doubly differential cross sections for the multiple-ionization of rare gas atoms by electron impact.

**Contents**
- Introduction.
- Theoretical Approaches.
- Apparatus for the electron-atom collision studies.
- Experimental Techniques.
- Results and Discussion.
- Conclusion.

**Fields of interest**
- Atomic, Molecular, Optical and Plasma Physics;
- Environmental Physics;
- Spectroscopy/Spectrometry

**Target groups**
- Research

**Type of publication**
- Monograph

---

**New Structures for Physics**

This volume provides a series of tutorials on mathematical structures which recently have gained prominence in physics, ranging from quantum foundations, via quantum information, to quantum gravity. These include the theory of monoidal categories and corresponding graphical calculi, Girard’s linear logic, Scott domains, lambda calculus and corresponding logics for typing, topos theory, and more general process structures. Most of these structures are very prominent in computer science; the chapters here are tailored towards an audience of physicists.

**Features**
- Only coherent collection of reviews available on this emergent topic
- Tutorial approach will facilitate the use by graduate students and newcomers to the field
- Unrivalled comprehensiveness, with close to 1000 pages of material

**Contents**
- Part I An ABC on Compositionality.
- Part II Manifestations of Linearity.
- Part III More Example Applications.
- Part IV Informatic Geometry.
- Part V Spatio-Temporal Geometry.
- Part VI Geometry and Topology in Computation.

**Fields of interest**
- Mathematical Methods in Physics;
- Category Theory;
- Homological Algebra;
- Theory of Computation

**Target groups**
- Graduate

**Type of publication**
- Contributed volume
Classical Mechanics
Hamiltonian and Lagrangian Formalism

Hamiltonian formalism of classical mechanics is the basis of a few powerful mathematical methods, widely used in theoretical and mathematical physics. In this book we have collected the basic facts of the Hamiltonian mechanics as well as the related topics: canonical transformations, integral invariants, potential motion in geometric setting, symmetries and the Noether theorem. Only the elementary mathematical methods are used in the exposition of the material. The only prerequisites are linear algebra, multivariable calculus and some familiarity with the Lagrangian formulation of classical mechanics. Other mathematical constructions involved are explicitly described and explained, so the book can be a good starting point for the undergraduate student new to this field.

At the same time we have tried, where possible, to replace the intuitive motivations by explicit proofs and direct computations, preserving the level of rigor that makes the book useful for the graduate students intended to work in one of the branches of a vast field of theoretical physics.

Features

- With worked examples, 55 end of chapter exercises and chapter summaries
- The equivalence of various definitions of the canonical transformation is proved explicitly, in contrast to competing books
- Discussion of (global) symmetries and the Noether theorem in the framework of classical mechanics gives a new approach not covered by most mechanics textbooks

Fields of interest
Mechanics; Applications of Mathematics; Appl. Mathematics/Computational Methods of Engineering

Target groups
Graduate

Type of publication
Monograph

The Pursuit of Quantum Gravity
Memoirs of Bryce DeWitt from 1946 to 2004

1946 is the year Bryce DeWitt entered Harvard graduate school. Quantum Gravity was his goal and remained his goal throughout his lifetime until the very end. The pursuit of Quantum Gravity requires a profound understanding of Quantum Physics and Gravitation Physics. As G. A. Vilkovisky commented, “Quantum Gravity is a combination of two words, and one should know both. Bryce understood this as nobody else, and this wisdom is completely unknown to many authors of the flux of papers that we see nowadays.”

Distinguished physicist Cecile DeWitt-Morette skillfully blends her personal and scientific account with a wealth of her late husbands often unpublished writings on the subject matter.

This volume, through the perspective of the leading researcher on quantum gravity of his generation, will provide an invaluable source of reference for anyone working in the field.

Features

- This volume, through the perspective of the leading researcher on quantum gravity of his generation, provides a unique source of reference for anyone working in the field
- Gives a unique historical perspective on the early days and the development of quantum gravity
- Contains little known or unpublished material from personal archives
- Written by an eminent and well-respected researcher (American Society of the French Legion of Honor 2007 Medal for Distinguished Achievement)

Density Functional Theory
An Advanced Course

Density Functional Theory (DFT) has firmly established itself as the workhorse for the atomic-level simulation of condensed matter phases, pure or composite materials and quantum chemical systems.

The present book is a rigorous and detailed introduction to the foundations up to and including such advanced topics as orbital-dependent functions and both time-dependent and relativistic DFT. Given the many ramifications of contemporary DFT, this text concentrates on the self-contained presentation of the basics of the most widely used DFT variants. This implies a thorough discussion of the corresponding existence theorems and effective single particle equations, as well as of key approximations utilized in implementations. The formal results are complemented by selected quantitative results, which primarily aim at illustrating strengths and weaknesses of a particular approach or functional. DFT for superconducting or nuclear and hadronic systems are not addressed in this work.

Features

- Written by two well-known experts in the field
- Useful as advanced study text, self-study guide and reference regarding the fundamentals
- Contains advanced level material such as time-dependent and relativistic DFT

From the contents

Fields of interest
Atomic, Molecular, Optical and Plasma Physics; Theoretical and Computational Chemistry; Numerical and Computational Physics

Target groups
Graduate

Type of publication
Monograph
Functional Renormalization and Ultracold Quantum Gases

Modern techniques from quantum field theory are applied in this work to the description of ultracold quantum gases. This leads to a unified description of many phenomena including superfluidity for bosons and fermions, classical and quantum phase transitions, different dimensions, thermodynamic properties and few-body phenomena as bound state formation or the Efimov effect. The non-perturbative treatment with renormalization group flow equations can account for all known limiting cases by solving one single equation. It improves previous results quantitatively and brings qualitatively new insights. As an example, new quantum phase transitions are found for fermions with three spin states. Ultracold atomic gases can be seen as an interesting model for features of high energy physics and for condensed matter theory. The research reported in this thesis helps to solve the difficult complexity problem in modern theoretical physics.

Features
- A major contribution to the way we describe ultracold quantum gases
- Represents a quantitative improvement over previous methods and brings qualitatively new insights.
- Nominated by the University of Heidelberg as an outstanding theoretical contribution

Contents

Fields of interest
Quantum Physics; Low Temperature Physics; Quantum Gases and Condensates

Target groups
Research

Type of publication
Monograph

Due August 2010

2010. 180 p. 12 illus., 60 in color. (Springer Theses)
Hardcover
- € 99.95 | £90.00
- * € (D) 106,95 | € (A) 109.95 | sFr 155,50
ISBN 978-3-642-14112-6

An Introduction to the Confinement Problem

This book addresses the confinement problem, which quite generally deals with the behavior of non-abelian gauge theories, and the force which is mediated by gauge fields, at large distances. The word “confinement” in the context of hadronic physics originally referred to the fact that quarks and gluons appear to be trapped inside mesons and baryons, from which they cannot escape. There are other, and possibly deeper meanings that can be attached to the term, and these will be explored in this book. Although the confinement problem is far from solved, much is now known about the general features of the confining force, and there are a number of very well motivated theories of confinement which are under active investigation. This volume gives a both pedagogical and concise introduction and overview of the main ideas in this field, their attractive features, and, as appropriate, their shortcomings.

Features
- Written by a leading expert in the field
- Useful both as a reference and self-study guide
- Clear, concise and modern approach and presentation

Contents

Fields of interest
Nuclear Physics, Heavy Ions, Hadrons; Mathematical Methods in Physics; Elementary Particles, Quantum Field Theory

Target groups
Research

Type of publication
Monograph

Due September 2010

2010. 960 p. (Lecture Notes in Physics, Volume 814)
Hardcover
- € 119,95 | £108.00
- * € (D) 128,35 | € (A) 131,95 | sFr 186,50
ISBN 978-3-642-13292-6

Strongly Interacting Matter

The CBM Physics Book

This exhaustive survey is the result of a four year effort by many leading researchers in the field to produce both a readable introduction and a yardstick for the many upcoming experiments using heavy ion collisions to examine the properties of nuclear matter. The books falls naturally into five large parts, first examining the bulk properties of strongly interacting matter, including its equation of state and phase structure. Part II discusses elementary hadronic excitations of nuclear matter, Part III addresses the concepts and models regarding the space-time dynamics of nuclear collision experiments, Part IV collects the observables from past and current high-energy heavy-ion facilities in the context of the theoretical predictions specific to compressed baryonic matter. Part V finally gives a brief description of the experimental concepts. The book explicitly addresses everyone working or planning to enter the field of high-energy nuclear physics.

Features
- The ultimate and exhaustive introduction and review of the topic by leading scientists in the field
- Comprehensive account, written by leading researchers in the field
- Suitable also for self-study and advanced level teaching

Contents

Fields of interest
Nuclear Physics, Heavy Ions, Hadrons; Particle Acceleration and Detection, Beam Physics; Astrophysics and Astroparticles

Target groups
Research

Type of publication
Monograph

Due October 2010

2011. 220 p. (Lecture Notes in Physics, Volume 821)
Softcover
- approx. € 44,95 | £40.99
- * approx. * € (D) 48,10 | € (A) 49,45 | sFr 70,00
ISBN 978-3-642-13281-9
Measurement of the Top Quark Mass in the Dilepton Final State Using the Matrix Element Method

The top quark discovered in 1995 at the Fermilab Tevatron Collider is the heaviest known elementary particle. The precise knowledge of its mass yields important constraints on the mass of the yet undiscovered Higgs boson and allows to probe for physics beyond the Standard Model. With an excellent adaption of a novel measurement technique described and applied for the first time here, the sensitivity to the top quark mass in the dilepton final state at the D0 experiment could have been improved by more than 30%. Moreover, an extension to the method is presented which allows future measurements to reduce the main limiting systematic uncertainty significantly.

Features
- Describes an important advance in measuring mass of top quark
- With many colour illustrations
- Nominated as an outstanding contribution by the University of Munich

Contents
1. Introduction.
2. Experimental Environment.
3. Event Reconstruction and Simulation.
7. Conclusion.
A. Solving for the Event Kinematics.
B. The Jacobian Determinant for the Signal Integration.

Field of interest
Particle Acceleration and Detection, Beam Physics

Type of publication
Monograph

The Physics of Semiconductors
An Introduction Including Devices and Nanophysics

The Physics of Semiconductors provides material for a comprehensive upper-level undergraduate and graduate course on the subject, guiding readers to the point where they can choose a special topic and begin supervised research. The textbook provides a balance between essential aspects of solid-state and semiconductor physics, on the one hand, and the principles of various semiconductor devices and their applications in electronic and photonic devices, on the other. It highlights many practical aspects of semiconductors such as alloys, strain, heterostructures, nanostructures, that are necessary in modern semiconductor research but typically omitted in textbooks. For the interested reader some additional advanced topics are included, such as Bragg mirrors, resonators, polarized and magnetic semiconductors are included. Also supplied are explicit formulas for many results, to support better understanding. In the second edition many topics have been extended and are treated in more detail, dopant diffusion, nanowires, recombination in organic semiconductors, multi-junction solar cells, quantum dot and organic LEDs, thin film transistors, carbon-based nanostructures and transparent conductive oxides, e.g. The Physics of Semiconductors requires little or no prior knowledge of solid-state physics and evolved from a highly regarded two-semester course.

Features
- One of the best existing textbooks with the broadest scope
- Treats semiconductor physics from the basics to modern applications
- Connects semiconductor material physics with devices and nanostructures

Fields of interest
Semiconductors; Electronic Circuits and Devices; Electrical Engineering

Type of publication
Graduate Advanced undergraduate textbook

Due September 2010
2010. 140 p. 140 illus., 70 in color. (Springer Theses)
Hardcover
- approx. € 99,95 | £90.00
- approx. * (D) 106,95 | € (A) 109,95 | sFr 155,50
ISBN 978-3-642-14069-3

Due August 2010
2nd ed. 2010. 900 p. 1300 illus., 650 in color.
(Graduate Texts in Physics)
Hardcover
- approx. € 79,95 | £72.00
- approx. * (D) 85,55 | € (A) 87,95 | sFr 124,50
ISBN 978-3-642-13883-6

Handbook of Particle Detection and Imaging

The handbook centers on detection techniques in the field of particle physics, medical imaging and related subjects. It is structured into three parts. The first one is dealing with basic ideas of particle detectors, followed by applications of these devices in high energy physics and other fields. In the last part the large field of medical imaging using similar detection techniques is described. The different chapters of the book are written by world experts in their field. Clear instructions on the detection techniques and principles in terms of relevant operation parameters for scientists and graduate students are given. Detailed tables and diagrams will make this a very useful handbook for the application of these techniques in many different fields like physics, medicine, biology and other areas of natural science.

Fields of interest
Particle Acceleration and Detection, Beam Physics; Imaging / Radiology; Nuclear Engineering

Target groups
Professional/practitioner

Type of publication
Handbook

Due July 2011
2011. 1000 p. 500 illus., 50 in color. Hardcover
- € 499,00 | £449.00
- * (D) 533,92 | (A) 548,90 | sFr 774,50
ISBN 978-3-642-13271-1

Due August 2011
2011. 1000 p. 500 illus., 50 in color. eReference
- approx. € 499,00 | £449.50
- approx. * (D) 593,81 | (A) 598,80 | sFr 813,50
ISBN 978-3-642-13270-4

Due September 2011
2011. 1000 p. 500 illus., 50 in color. Print + eReference
- approx. € 624,00 | £562.00
- approx. * (D) 667,68 | (A) 686,40 | sFr 968,50
ISBN 978-3-642-13271-1
Control of Complex Nonlinear Systems with Delay

This research addresses delay effects in nonlinear systems, which are ubiquitous in various fields of physics, chemistry, biology, engineering, and even in social and economic systems. They may arise as a result of processing times or due to the finite propagation speed of information between the constituents of a complex system. Time delay has two complementary, counterintuitive and almost contradictory facets. On the one hand, delay is able to induce instabilities, bifurcations of periodic and more complicated orbits, multi-stability and chaotic motion. On the other hand, it can suppress instabilities, stabilize unstable stationary or periodic states and may control complex chaotic dynamics. This thesis deals with both aspects, and presents novel fundamental results on the controllability of nonlinear dynamics by time-delayed feedback, as well as applications to lasers, hybrid-mechanical systems, and coupled neural systems.

Features

- Contains fundamental new results on the controllability of nonlinear dynamics by time-delayed feedback
- Demonstrates potentially important applications in physics and medicine
- Nominated as an outstanding contribution by the Technical University of Berlin

Contents

Conclusion. Abstract. Introduction. Time-Delayed Feedback Control.- Control of Steady States.- Refuting the Odd Number Limitation Theorem.- Control of Neutral Delay-Differential Equations.- Refuting the Odd Number Limitation Theorem.- Feedback Control.- Control of Steady States.- Conclusion. Abstract. Introduction. Time-Delayed Feedback Control.- Control of Steady States.- Refuting the Odd Number Limitation Theorem.- Control of Neutral Delay-Differential Equations.- Refuting the Odd Number Limitation Theorem.- Feedback Control.- Control of Steady States.- Conclusion.

Field of interest

Statistical Physics, Dynamical Systems and Complexity

Target groups

Research

Type of publication

Monograph

Due October 2010

2010. 290 p. 462 illus., 231 in color. (Springer Theses) Hardcover

- € 99.95 | £90.00
- *EUR (D) 106.95 | EUR (A) 109.95 | sFr 155,50 ISBN 978-3-642-14109-6

High-Tc Superconductors Based on FeAs Compounds

Physical properties and models of electronic structure are analyzed for a new class of high-TC superconductors which belong to iron-based layered compounds. Despite their variable chemical composition and differences in the crystal structure, these compounds possess similar physical characteristics, due to electron carriers in the FeAs layers and the interaction of these carriers with fluctuations of the magnetic order. A tremendous interest towards these materials is explained by the prospects of their practical use. In this monograph, a full picture of the formation of physical properties of these materials, in the context of existing theory models and electron structure studies, is given. The book is aimed at a broad circle of readers: physicists who study electronic properties of the FeAs compounds, chemists who synthesize them and specialists in the field of electronic structure calculations in solids. It is helpful not only to researchers active in the fields of superconductivity and magnetism, but also for graduate and postgraduate students and all those who would like to get acquainted with this vivid area of the materials science.

Features

- First book on the new class of High-Tc superconductors based on FeAs-compounds
- Systematically summarizes the current knowledge about these superconductors
- Full picture of the formation these new materials with theoretical background

Contents

Introduction.- Compositions of the ReOFeAs Type.- Compounds of the AFe2As2 (A=Ba,Sr,Ca) Type.- Other FeAs-Based Compounds.- Theory Models.- Conclusion.

Field of interest

Low Temperature Physics; Solid State Physics; Structural Materials

Target groups

Graduate

Type of publication

Monograph

Due October 2010


- approx. € 119,95 | £108.00
- *EUR (D) 128,35 | EUR (A) 131,95 | sFr 186,50 ISBN 978-3-642-14529-2

Microfluidics Based Microsystems

Fundamentals and Applications

This volume provides a comprehensive state-of-the-art review of the fundamentals and applications of the microfluidics based microsystems. As the world becomes increasingly concerned with terrorism, early on-spot detection of terrorist’s weapons, particularly bio-weapons agents such as bacteria and viruses are extremely important. Microfluidics are great tools for security and anti-terrorism with many applications. New and better diagnostic technology must be developed in order to be prepared for an act of bio-terrorism.

Features

- The Book is prepared in order to provide a better understanding of Microfluidics based Microsystems fundamentals and applications
- The subject is treated by invited lecturers eminent in the field of international standing
- The book provides a comprehensive state of the art assessment of the scientific basics and very recent applications of microfluidics in microsystems

Fields of interest

Fluid- and Aerodynamics; Microengineering; Engineering Thermodynamics, Heat and Mass Transfer

Target groups

Graduate

Type of publication

Proceedings

Due July 2010


- € 199,95 | £180.00
- *EUR (D) 213,95 | EUR (A) 219,94 | sFr 310,50 ISBN 978-90-481-9028-7

Also available as softcover

- approx. € 99,95 | £90.00
- *EUR (D) 106,95 | EUR (A) 109,95 | sFr 155,50 ISBN 978-90-481-9027-0
**Kinetic Theory of the Inner Magnetospheric Plasma**

The inner magnetosphere plasma is a very unique composition of different plasma particles and waves. It covers a huge energy plasma range with spatial and time variations of many orders of magnitude. In such a situation, the kinetic approach is the key element, and the starting point of the theoretical description of this plasma phenomena which requires a dedicated book to this particular area of research.

**Contents**


**Fields of interest**

Plasma Physics; Planetology; Extraterrestrial Physics, Space Sciences

**Target groups**

Research

**Type of publication**

Monograph

**Due October 2010**

2011. 550 p. 170 illus., 85 in color. (Astrophysics and Space Science Library; Volume 372) Hardcover

- approx. € 139,95 | £ 133.00
- approx. € (D) 149.75 | € (A) 153.94 | sFr 229.00

ISBN 978-1-4419-1419-6796,1

A. C. Luo, Southern Illinois University Edwardsville, IL, USA; V. Afraimovich, San Luis Potosi University, San Luis Potosi, Mexico (Eds.)

**Hamiltonian Chaos Beyond the KAM Theory**

Dedicated to George M. Zaslavsky (1935–2008)

The book covers the recent developments and advances in the theory and application of Hamiltonian chaos in nonlinear Hamiltonian systems. It is dedicated to Dr. George Zaslavsky, who was one of three founders of the theory of Hamiltonian chaos. Each chapter in this book was written by well-established scientists in the field of nonlinear Hamiltonian systems. The development presented in this book goes beyond the KAM theory, and the onset and disappearance of chaos in the stochastic and resonant layers of nonlinear Hamiltonian systems are predicted analytically, instead of qualitatively.

**Contents**


**Fields of interest**

Nonlinear Dynamics; Systems Theory, Control; Vibration, Dynamical Systems, Control

**Target groups**

Research

**Type of publication**

Monograph

**Due August 2010**

Distribution rights in China: Higher Education Press

Jointly published with Higher Education Press

2010. 275 p. 110 illus., 10 in color. (Nonlinear Physical Science) Hardcover

- approx. € 99,95 | £ 90.00
- approx. € (D) 106.95 | € (A) 109.95 | sFr 155,50

ISBN 978-3-642-12342-9

Dedicated to George M. Zaslavsky (1935–2008)

In memory of Dr. George Zaslavsky, "Long-range Interactions, Stochasticity and Fractional Dynamics" covers the recent developments of long-range interaction, fractional dynamics, brain dynamics and stochastic theory of turbulence, each chapter was written by established scientists in the field. The book is dedicated to Dr. George Zaslavsky, who was one of three founders of the theory of Hamiltonian chaos. The book discusses self-similarity and stochasticity and regularity for discrete and continuous dynamical systems, as well as long-range interactions and diluted networks. A comprehensive theory for brain dynamics is also presented. In addition, the complexity and stochasticity for soliton chains and turbulence are addressed.

**Fields of interest**

Nonlinear Dynamics; Systems Theory, Control; Vibration, Dynamical Systems, Control

**Target groups**

Research

**Type of publication**

Monograph

**Due August 2010**

2010. 275 p. 110 illus., 10 in color. (Nonlinear Physical Science) Hardcover

- approx. € 99,95 | £ 90.00
- approx. € (D) 106.95 | € (A) 109.95 | sFr 155,50

ISBN 978-3-642-12717-5

Dedicated to George M. Zaslavsky (1935–2008)

G. V. Khazanov, GSFC/NASA, Greenbelt, MD, USA

**Vibration, Dynamical Systems, Control**

Nonlinear Dynamics; Systems Theory, Control; Vibration, Dynamical Systems, Control

**Fields of interest**

dynamics and brain thinking mechanism

**Target groups**

Research

**Type of publication**

Monograph
Solid Surfaces, Interfaces and Thin Films

This book emphasises both experimental and theoretical aspects of surface, interface and thin film physics. As in previous editions the preparation of surfaces and thin films, their atomic and morphological, their vibronic and electronic properties as well as fundamentals of adsorption are treated. Because of their importance in modern information technology and nanostructure physics particular emphasis is paid to electronic surface and interface states, semiconductor space charge layers and heterostructures as well as to superconductor/semiconductor interfaces and magnetic thin films. The latter topic was significantly extended in this new edition by more details about the giant magnetoresistance and a section about the spin-transfer torque mechanism including one new problem as exercise. Two new panels about Kerr-effect and spin-polarized scanning tunneling microscopy were added, too. Furthermore, the meanwhile important group III-nitride surfaces and high-k-oxide/semiconductor interfaces are shortly discussed in this new 5th edition of the book.

Features
- Well established standard textbook around the world at many universities and research institutions
- Most comprehensive textbook on surfaces, interfaces and thin films in one volume
- Didactically well written textbook with exercises after the chapters
- Theoretical concepts and experimental techniques and practical applications presented
- In 5th edition new material topics about the surfaces of the important class of group III-nitride and high k-oxide/semiconductor heterostructures added

Fields of interest
Surface and Interface Science, Thin Films; Surfaces and Interfaces, Thin Films; Semiconductors

Target groups
Graduate

Type of publication
Graduate/Advanced undergraduate textbook

Due August 2010

Electronique & opto-électronique organiques

Ce livre expose les bases de l’électronique organique, aussi dite « plastique » ou « souple », par opposition à l’électronique conventionnelle. Il présente les bases théoriques physico-chimiques de ce domaine : théorie des matériaux unidimensionnels ; théorie des semiconducteurs organiques ; délocalisation possible des électrons dans ces matériaux et leur bande d’absorption/emission, etc. Il décrit d’autre part les divers composants électroniques/ optoélectroniques auxquels ces matériaux organiques ont pu donner naissance et qui sont actuellement commercialisés (ou prêts à l’être) tels que : les écrans à angles de vue élargis, les cellules solaires destinées à recouvrir des surfaces souples, les panneaux transparents le jour et lumineux la nuit, les transistors de commande des pixels, etc.

Features
- Un auteur de référence dans ce domaine
- Une thématique de pointe à la base de nombreuses innovations technologiques et commerciales
- Une approche non seulement descriptive mais aussi critique qui propose de nombreuses améliorations possibles des technologies actuelles

Fields of interest
Électronique et micro-électronique

Type of publication
Monographie

Due September 2010

Go-To Telescopes Under Suburban Skies

Go-To Telescopes Under Suburban Skies is the first book specifically written for amateur astronomers who own, or who are about to purchase, a computer-controlled ‘go-to’ telescope. The advantage of the ‘go-to’ capability is enormous – the telescope can be aimed at any object in the sky with great speed and accuracy – which is why these instruments are so popular. Making the realistic assumption that the observer is using a relatively small telescope and is observing from a backyard in a suburban area, this book provides literally hundreds more targets beyond those offered by the built-in ‘nightly tours’ that feature on the telescope’s computer tours. And instead of wasting many pages on maps and coordinates, it leads the computer to locate the targets, and so has room to suggest many more fascinating deep-sky objects and provide detailed observing lists and information about what’s being viewed.

Features
- Appeals to both beginners and more experienced amateur astronomers who already have a Go-To telescope or want to buy one
- Includes information on many different manufacturers
- Gives advice on maintaining Go-To telescopes for optimum performance

Contents
Introduction.– Go-To Telescopes.– Using a Go-To Telescope: Setting Up; Alignment; Maintenance.– Winter Objects.– Spring Objects.– Summer Objects.– Autumn Objects.– Appendices: Light Pollution Reduction Filters; Nebular Filters; Go-To Telescope manufacturers; Useful Books; Useful Websites.

Fields of interest
Astronomy, Astrophysics and Cosmology; Popular Science in Astronomy

Target groups
Popular/general

Type of publication
Popular science

Due September 2010

A paraître septembre 2010

2010. VIII, 502 p. (Collection Technique et Scientifique des Télécommunications) Broché
- € 94,79 | £85.50
- ― (D): 104,27 | (A): 104,27 | Fr 147,50

2010. XXVII, 234 p. (Patrick Moore’s Practical Astronomy Series) Softcover
- approx. € 34,95 | £24.99
- approx. € 37,40 | £27,60
ISBN 978-1-4419-6850-0
**Planets, Stars and Stellar Systems**

**Features**
- Planets, Stars and Stellar Systems is a 6-volume compendium of modern astronomical research covering subjects of key interest to the main fields of contemporary astronomy and astrophysical cosmology

**Fields of interest**
Astronomy, Astrophysics and Cosmology; Planetary Science; Astronomy, Observations and Techniques

**Target groups**
Professional/practitioner

**Type of publication**
Handbook

---

**The Power of Stars**

**How Celestial Observations Have Shaped Civilization**

What are some of the connections that bind us to the stars? How have these connections been established? And how have people all around the world and throughout time reacted to the night sky, the sun and moon, in their poetry, mythology, rituals, and temples? This book explores the influence of the sky on both ancient and modern civilization, by providing a clear overview of the many ways in which humans have used the stars as an ordering principle in their cultures, and which today still inspire us intellectually, emotionally, and spiritually.

The book explores constellation lore from around the world, celestial alignments of monuments and temples, both from ancient and modern civilizations, and the role the sky has played in the cultures of the Greek, Egyptian, Babylonian, Native American, Chinese, Mayan, Aztec, and Inca. Models of the universe from each of these cultures are described clearly, and each culture's explanation of the stars, planets, and other celestial objects are described. The roots of astronomy and astrology are presented with original imagery and reproductions of ancient manuscripts that portray the structure of the physical universe as conceived by a diverse array of human cultures over the centuries. Our own scientific Big Bang cosmology and the origin of the stars and elements are discussed in a philosophical context, to explore how we as modern people learn about the Universe, and incorporate the findings of science into our world views.

**Features**
- Considers the present-day context – how does astrology and the modern Big Bang cosmology get incorporated into our modern understanding of the skies?
- First hand accounts of celestial events, and interviews with several practitioners of cosmology and archaeoastronomy.
- Includes an interactive planisphere of ancient cultures

**Fields of interest**
Astronomy, Astrophysics and Cosmology; Popular Science in Astronomy; History of Science

**Target groups**
Popular/general

**Type of publication**
Popular science

---

**Space, Time, and Spacetime**

**Physical and Philosophical Implications of Minkowski’s Unification of Space and Time**

This volume is dedicated to the centennial anniversary of Minkowski’s discovery of spacetime. It contains selected papers by physicists and philosophers on the Nature and Ontology of Spacetime. The first six papers, comprising Part I of the book, provide examples of the impact of Minkowski’s spacetime representation of special relativity on the twentieth century physics. Part II also contains six papers which deal with implications of Minkowski’s ideas for the philosophy of space and time. The last part is represented by two papers which explore the influence of Minkowski’s ideas beyond the philosophy of space and time.

**Features**
- Addresses some of the deepest questions in all of physics
- Describes how other areas of physics are influenced by our choice of spacetime description
- Substantial contributions provide overviews for newcomers to the area

**From the contents**

**Field of interest**
Classical and Quantum Gravitation, Relativity Theory

**Target groups**
Research

**Type of publication**
Monograph

---

**Due September 2010**

2010. 300 p. 40 illus., 20 in color. (Fundamental Theories of Physics, Volume 167) Hardcover

- approx. € 99,95 | £90.00
- approx. € (D) 106,95 | € (A) 109,95 | sFr 155,50
- ISBN 978-3-642-13537-8
Magnetothermal Properties near Quantum Criticality in the Itinerant Metamagnet Sr3Ru2O7

The compound Sr3Ru2O7 of the strontium ruthenate family has been intensely studied because experimental evidence suggests that quantum fluctuations dominate the magnetic phase diagram in the vicinity of a novel low-temperature phase. In order to understand the interplay between the quantum critical fluctuations and the phase formation, comprehensive thermodynamic information is essential. This thesis reports the results of both specific-heat and magnetocaloric experiments carried out with a bespoke experimental apparatus whose design particularly addresses the demanding constraints of the low-temperature, high-magnetic-field environment. The experimental data give evidence for unusual thermodynamic properties of the novel phase and its bounding phase transitions. Furthermore they show that the phase formation takes place against a background of strongly peaked entropy, suggesting that quantum criticality plays a key role in the physics of this system.

Features
- Sheds light on interplay of quantum critical fluctuations and phase formation
- Describes new and highly acclaimed experimental approach
- Nominated as an outstanding contribution by the University of St. Andrews

Contents
1. Introduction.
2. Background Physics.
4. Experimental Setup Design and Characterisation.
5. Experimental Results and Discussion.
6. Conclusions and Future Work.

Field of interest
Magnetism, Magnetic Materials

Target groups
Research

Type of publication
Monograph

A. W. Rost, University of St Andrews, UK

Aperture Synthesis
Methods and Applications to Optical Astronomy

This book deals with the fundamentals of stellar interferometry with emphasis on aperture synthesis using sparse array of telescopes particularly at optical/IR wavelengths, the origin, properties, and optical effects of turbulence in the Earth's atmosphere, techniques developed to overcome image degradation. Studded with more than one hundred and fifty illustrations and tens of footnotes, it addresses the basic tricks of trade, current trend, motivation, methods, and path to future promise of true interferometry both from the ground and space. Also discussed are the technical challenges involved, such as beam transportation and recombination, detecting fringes using modern sensors, and image synthesis. Astronomical science that benefits from aperture synthesis imaging are highlighted as well.

Features
- Discusses the fundamentals of electromagnetic fields, wave optics, interference, diffraction, and imaging at length
- Deals with the fundamentals of stellar interferometry
- Includes more than 100 illustrations
- Describes new and highly acclaimed experimental approach
- Nominated as an outstanding contribution by the University of St. Andrews

Contents

Field of interest
Astronomy, Observations and Techniques; Optics, Optoelectronics, Plasmonics and Optical Devices

Target groups
Graduate

Type of publication
Graduate/Advanced undergraduate textbook

S. K. Saha, Indian Institute of Astrophysics, Bangalore, India

Dense Matter in Compact Stars
A Pedagogical Introduction

In order to fulfill their primary goal - to remain both concise and accessible to the beginning graduate student or other newcomers to the field - the only prerequisites are a working knowledge of statistical mechanics and thermodynamics as well as a first course in quantum field theory. More advanced material will be introduced as the text progresses and an appendix covers basic elements of thermal quantum field theory at finite chemical potential. Instead of developing all relevant formal tools (which is not even fully possible in the regime of QCD considered here), calculations are physically motivated, making the reader familiar with the theories and technicalities by "learning by doing". In this way these lectures will guide and prepare the reader towards further investigations and own theoretical research in this exciting field at the interface of nuclear, particle and astrophysics.

Features
- The most elementary and concise introduction to this topic
- Guides the reader rapidly towards a level suitable for own research through a "learning by doing" approach
- Written in a style suitable as either textbook or for self-study

Contents

Field of interest
Astrophysics and Astroparticles; Nuclear Physics, Heavy Ions, Hadrons; Elementary Particles, Quantum Field Theory

Target groups
Graduate

Type of publication
Monograph

A. Schmitt, Technische Universität Wien, Austria
Searching for Extraterrestrial Intelligence
SETI Past, Present, and Future

This book is a collection of essays written by the very scientists and engineers who have led, and continue to lead, the scientific quest known as SETI, the search for extraterrestrial intelligence. Divided into three parts, the first section, ‘The Spirit of SETI Past’, written by the surviving pioneers of this then emerging discipline, reviews the major projects undertaken during the first 50 years of SETI science and the results of that research. In the second section, ‘The Spirit of SETI Present’, the present-day science and technology is discussed in detail, providing the technical background to contemporary SETI instruments, experiments, and analytical techniques, including the processing of the received signals to extract potential alien communications. In the third and final section, ‘The Spirit of SETI Future’, the book looks ahead to the possible directions that SETI will take in the next 50 years, addressing such important topics as interstellar message construction, the risks and assumptions of interstellar communications, when we might make contact, what aliens might look like and what is likely to happen in the aftermath of such a contact.

Features
► The only book that brings together seminal papers on SETI science, each authored by the pre-eminent authority on the topic
► Reviews the technical aspects of this highly interdisciplinary intellectual pursuit
► Covers the past, present and future of SETI science
► Demonstrates why new scientific knowledge, coupled with emerging technologies, promise a positive result within the next half-century

Fields of interest
Astronomy, Observations and Techniques; Astrobiology; Signal, Image and Speech Processing

Target groups
Popular/general

Type of publication
Popular science

Laser Precision Microfabrication

Miniaturization and high precision are rapidly becoming a requirement for many industrial processes and products. As a result, there is greater interest in the use of laser microfabrication technology to achieve these goals. This book composed of 16 chapters covers all the topics of laser precision processing from fundamental aspects to industrial applications to both inorganic and biological materials. It reviews the state of the art of research and technological development in the area of laser processing.

Features
► Covers the major developments in laser-assisted materials processing
► Includes theory, design of laser technologies, applications to inorganic as well as biological materials and to microtechnology
► Most comprehensive scientific monograph with the widest scope
► A must for all researchers in applied laser technology
► Graduate students will also benefit from this systematically written book

From the contents

Fields of interest
Laser Technology, Photonics; Nanotechnology

Target groups
Professional/practitioner

Type of publication
Monograph

Induction Accelerators

A broad class of accelerators rests on the induction principle whereby the accelerating electrical fields are generated by time-varying magnetic fluxes. Particularly suitable for the transport of bright and high-intensity beams of electrons, protons or heavy ions in any geometry (linear or circular) the research and development of induction accelerators is a thriving subfield of accelerator physics. This text is the first comprehensive account of both the fundamentals and the state of the art about the modern conceptual design and implementation of such devices. Accordingly, the first part of the book is devoted to the essential features of and key technologies used for induction accelerators at a level suitable for postgraduate students and newcomers to the field. Subsequent chapters deal with more specialized and advanced topics.

Features
► Edited and written by leading experts in the field (K. Takayama received the Japanese 21st Century Invention Prize for 2008)
► The only comprehensive monograph on the topic available
► Introduces new concepts

Contents

Fields of interest
Particle Acceleration and Detection, Beam Physics; Measurement Science and Instrumentation; Electrical Engineering

Target groups
Research

Type of publication
Monograph
Fractional Dynamics
Applications of Fractional Calculus to Dynamics of Particles, Fields and Media

"Fractional Dynamics: Applications of Fractional Calculus to Dynamics of Particles, Fields and Media" presents applications of fractional calculus, integral and differential equations of non-integer orders in describing systems with long-time memory, non-local spatial and fractal properties. Mathematical models of fractal media and distributions, generalized dynamical systems and discrete maps, non-local statistical mechanics and kinetics, dynamics of open quantum systems, the hydrodynamics and electrodynamics of complex media with non-local properties and memory are considered. This book is intended to meet the needs of scientists and graduate students in physics, mechanics and applied mathematics who are interested in electrodynamics, statistical and condensed matter physics, quantum dynamics, complex media theories and kinetics, discrete maps and lattice models, and nonlinear dynamics and chaos.

Features
► Describes modern approaches and new results in fractional dynamics ► Both self-contained and can be used as a teaching resource in fractional calculus and theory of fractals ► Describes some modern applications of fractional calculus to complex physical systems and new results of recent years

Contents
Fractional Models of Fractal Distributions of Particles. - Fractional Dynamics and Long-Range Interactions. - Fractional Dynamics of Particles and Fields. - Fractional Temporal Dynamics. - Fractional Quantum Dynamics.

Fields of interest
Statistical Physics, Dynamical Systems and Complexity; Theoretical, Mathematical and Computational Physics; Calculus of Variations and Optimal Control; Optimization

Target groups
Research

Type of publication
Monograph

Due October 2010

CFN Lectures on Functional Nanostructures – Volume 2
Nanoelectronics

This series of books contains selected and edited lectures from summer schools organized by the Center for Functional Nanostructures (CFN) at the University of Karlsruhe. The mission of the CFN is to carry out research in the following areas: nanophotonics, nanoelectronics, molecular nanostructures and nanostructured materials. The aim of the summer schools is mainly to exchange new ideas and illustrate emerging research methodologies through a series of topical, introductory lectures. This is reflected by both the selection of topics addressed in the present volume, nanoelectronics, as well as the tutorial aspect of the contributions.

Features
► Written by leading experts in the field ► Tutorial and introductory style ► Useful both as reference and self-study guide

Contents

Fields of interest
Nanoscale Science and Technology; Nanotechnology; Quantum Information Technology, Spintronics

Target groups
Research

Type of publication
Monograph

Due August 2010

Self-organization and Pattern-formation in Neuronal Systems Under Conditions of Variable Gravity

The book describes the interaction of gravity with neuronal systems. To deliver the basic scientific and technological background, the structures of neuronal systems are described and platforms for gravity research are presented. The book is rounded off by information about the interaction of chemical model systems with gravity and some simulations, and results about the interaction of gravity with neuronal systems from single molecules to the entire human brain are demonstrated. This is the first book to give a complete overview about neurophysiological research under conditions of variable gravity.

Features
► Bringing together nonlinear biological systems and gravitational research ► Describing neurophysiological research under conditions of variable gravity from single molecules to the human brain ► Discussing a classical model for non-linear systems (BZ) under the influence of gravity including micro-gravity

From the contents

Fields of interest
Nonlinear Dynamics; Neurosciences; Neurobiology

Target groups
Research

Type of publication
Monograph

Due November 2010