Nanstructured Materials for Magnetoelectronics

This book provides an up-to-date review of nanometer-scale magnetism and focuses on the investigation of the basic properties of magnetic nanostuctures. It describes a wide range of physical aspects together with theoretical and experimental methods. A broad overview of the latest developments in this emerging and fascinating field of nanstructured materials is given with emphasis on the practical understanding and operation of submicron devices based on nanstructured magnetic materials.

Features

- Combines theoretical and experimental methods
- Supports practical understanding and operation of submicron magnetic devices
- Includes a chapter on magnetic nanoparticle hyperthermia treatment of tumours

Contents


Fields of interest

Magnetism, Magnetic Materials; Nanotechnology; Nanoscale Science and Technology

Target groups

Research

Product category

Monograph

Due March 2013

2013. 210 p. 205 illus., 35 in color. (Springer Series in Materials Science, Volume 175) Hardcover

* € (D) 106,95 | € (A) 109,95 | sFr 133,50

€ 99,95 | £90.00

ISBN 978-3-642-34957-7

Due January 2013


* € (D) 106,95 | € (A) 109,95 | sFr 133,50

€ 99,95 | £90.00

ISBN 978-3-642-35105-1

Due February 2013

2013. X, 328 p. 75 illus., 43 in color. Hardcover

* € (D) 74,85 | € (A) 76,95 | sFr 93,50

€ 69,95 | £62.99

ISBN 978-1-4614-6223-1

B. Aktaş, F. Mikailzade, Gebze Institute of Technology, Turkey (Eds)

A. Avella, F. Mancini, Università degli Studi di Salerno, Baronissi (SA), Italy (Eds)

B. E. Baaquie, National University of Singapore, Singapore

The Theoretical Foundations of Quantum Mechanics

The Theoretical Foundations of Quantum Mechanics addresses fundamental issues that are not discussed in most books on quantum mechanics.

Features

- Introduces the Quantum Principle, which encodes the entire theoretical construction of quantum mechanics
- Explains the counter-intuitive construction of the nature of the mathematical techniques required to solve quantum mechanics equations
- Clarifies the implicit meaning of the symbols and operations of quantum mechanics and leads to a deeper understanding of its foundations
- A new theoretical framework based on the interplay of empirical and trans-empirical aspects of quantum mechanics is developed to explain the paradoxes of quantum mechanics
- All the discussions are carried out at a rigorous level employing the mathematics of quantum mechanics

Contents


Fields of interest

Quantum Physics; Mathematical Physics; Quantum Optics

Target groups

Upper undergraduate

Product category

Graduate/Advanced undergraduate textbook
Nonequilibrium Green’s Function Approach to Inhomogeneous Systems

This research monograph provides a pedagogical and self-contained introduction to non-equilibrium quantum particle dynamics for inhomogeneous systems, up to and including a survey of recent breakthroughs pioneered by the authors and other groups. The theoretical approach is based on real-time Green’s functions (Keldysh Green’s functions), directly solving the two-time Kadanoff-Baym equations (KBE). This field has seen a rapid development over the last decade, with new applications emerging in plasma physics, semiconductor optics and transport, nuclear matter and high-energy physics.

Features
- First monographical account of this topic
- Both self-contained and state-of-the-art
- Authored by leading researchers in the field

Contents

Fields of interest
Mathematical Methods in Physics; Quantum Physics; Numerical and Computational Physics

Target groups
Research

Product category
Monograph

Due March 2013

Surface Science Techniques

The book describes the experimental techniques employed to study surfaces and interfaces. The emphasis is on the experimental method. Therefore all chapters start with an introduction of the scientific problem, the theory necessary to understand how the technique works and how to understand the results. Descriptions of real experimental setups, experimental results at different systems are given to show both the strength and the limits of the technique. In a final part the new developments and possible extensions of the techniques are presented. The included techniques provide microscopic as well as macroscopic information. They cover most of the techniques used in surface science.

Features
- Gives a concise presentation of surface analytical techniques and their applications
- Contains also the latest developments of surface analytical techniques
- Useful for students and newcomers in the field of surface science and nanoscience

Contents

Fields of interest
Surface and Interface Science, Thin Films; Measurement Science and Instrumentation; Nanotechnology

Target groups
Research

Product category
Monograph

Due January 2013

Liquid Crystalline Semiconductors

This is an exciting stage in the development of organic electronics. It is no longer an area of purely academic interest as increasingly real applications are being developed, some of which are beginning to come on-stream. Areas that have already been commercially developed or which are under intensive development include organic light emitting diodes (for flat panel displays and solid state lighting), organic photovoltaic cells, organic thin film transistors (for smart tags and flat panel displays) and sensors. Within the family of organic electronic materials, liquid crystals are relative newcomers. The first electronically conducting liquid crystals were reported in 1988 but already a substantial literature has developed.

Feature
- First book on liquid crystalline semiconductors

Contents
Preface.- 1 Introduction.- 2 Charge Transport in Liquid Crystalline Semiconductors.- 3 Columnar Liquid Crystalline Semiconductors.- 4 Synthesis of Columnar Liquid Crystals.- 5 Charge Transport in Reactive Mesogens and Liquid Crystal Polymer Networks.- 6 Optical Properties of Liquid Crystals.- 7 Organic Light-Emitting diodes (OLEDs) and OLEDs with Polarised Emission.- 8 Liquid Crystals for Organic Photovoltaics.- 9 Liquid Crystals for Organic Field-Effect Transistors.

Fields of interest
Semiconductors; Optical and Electronic Materials; Soft and Granular Matter, Complex Fluids and Microfluidics

Target groups
Research

Product category
Contributed volume

Due November 2012

Jointly published with Canopus Academic Publishing Ltd

Due 2013. 150 p. (Lecture Notes in Physics, Volume 867) Softcover
* € (D) 37,40 | € (A) 38,45 | SFr 47,00
* € (D) 34,95 | £ 31.99
ISBN 978-3-642-35081-8

Due 2013. XXII, 714 p. 326 illus., 158 in color. (Springer Series in Surface Sciences, Volume 51) Hardcover
* € (D) 149,75 | € (A) 153,94 | SFr 186,50
* € 139,95 | £126.00
ISBN 978-3-642-34242-4

Due 2013. IX, 268 p. 124 illus., 46 in color. (Springer Series in Materials Science, Volume 169) Hardcover
* € (D) 139,05 | € (A) 142,94 | SFr 173,00
* € 129,95 | £117.00
Formation of the Solar System
A New Theory of the Creation and Decay of the Celestial Bodies

Features
- Presents the unique physics and mechanisms of creation, separation and orbiting of the Solar System bodies proved by observational data
- Provides evidence that because of expansion and decay of the Universe as a whole the hierarchy of celestial bodies (galaxy – star – planet satellite) was created
- Shows that all the observed dynamical processes on Earth (earthquakes and volcanism, climate and weather change, dynamics of the atmosphere and oceans) are consequences of the continuing process of the evolution of the Earth and the Sun
- Provides a solid basis for development of dynamical branches

Contents
- The nature of creation and orbiting of the planets and satellites.- Physical meaning of hydrostatic equilibrium of celestial bodies.- Physical meaning of dynamical equilibrium of an interacting body-Jacob's virial equation as a basis of the theory of dynamical equilibrium of natural systems.- Solution of Jacob's virial equation for conservative and dissipative systems.- Creation, separation and orbiting of the Solar System bodies.- Evolutionary processes as a consequence of dynamical effects.- The nature of electromagnetic field of a celestial body and mechanism for its generation.- Decay and creation of a hierarchic body system at expansion and attraction of the force field.

Fields of interest
- Astronomy, Astrophysics and Cosmology; Geophysics/Geodesy; Planetology

Target groups
- Research

Product category
- Monograph

Due January 2013
2013. X, 270 p. 34 illus., 7 in color. Hardcover
- *€ (D) 106,95 | € (A) 109,95 | sFr 133,50
- € 99,95 | £90.00
ISBN 978-94-007-5907-7

Available
2012. XVII, 294 p. 29 illus. (Lecture Notes in Physics, Volume 846) Softcover
- *€ (D) 48,10 | € (A) 49,45 | sFr 60,00
- € 44,95 | £40.99
ISBN 978-3-642-24524-4

Due February 2013
2013. XI, 144 p. 48 illus., 32 in color. (Springer Theses) Hardcover
- *€ (D) 106,95 | € (A) 109,95 | sFr 133,50
- € 99,95 | £90.00
ISBN 978-3-642-34954-6

Quantum Opto-Mechanics with Micromirrors
Combining Nano-Mechanics with Quantum Optics

Quantum effects in macroscopic systems have long been a fascination for researchers. Over the past decade mechanical oscillators have emerged as a leading system of choice for many such experiments. The work reported in this thesis investigates the effects of the radiation-pressure force of light on macroscopic mechanical structures. The basic system studied is a mechanical oscillator that is highly reflective and part of an optical resonator. It interacts with the optical cavity mode via the radiation-pressure force. Both the dynamics of the mechanical oscillation and the properties of the light field are modified through this interaction.

Features
- Nominated as an outstanding contribution by the University of Vienna
- A world-class contribution from the Zeilinger Institute
- A well written stand-alone exposition giving access to a rapidly expanding research field
- Contains extensive introduction to both theory and experiment
- Includes several "first-timers" that have significantly influenced the field of optomechanics

Contents

Fields of interest
- Quantum Optics; Quantum Physics; Quantum Information Technology, Spintronics

Target groups
- Research

Product category
- Monograph

Features
- Authored by a leading system of choice for many such experiments
- Contains extensive introduction to both theory and experiment
- Includes several "first-timers" that have significantly influenced the field of optomechanics

Contents

Fields of interest
- Numerical and Computational Physics; Classical and Quantum Gravitation, Relativity Theory; Astronomy, Astrophysics and Cosmology

Target groups
- Research

Product category
- Monograph
K. Hashimoto, Kyoto University, Japan

Non-Universal Superconducting Gap Structure in Iron-Pnictides Revealed by Magnetic Penetration Depth Measurements

The Author has revealed that the superconducting gap structure in the iron-based superconductors, which exhibit high transition temperature superconductivity up to 55 K, depends on the detailed electronic structure via high-precision magnetic penetration depth measurements.

Features
- Studies on the superconducting gap structure in the recent discovered iron-based superconductors
- Provides a detailed description of experimental principles and methods for the magnetic penetration measurements including the tunnel diode oscillator and microwave cavity perturbation techniques
- Investigates non-universal superconducting gap structure with and without nodes in iron-pnictides
- Nominated as an outstanding Ph.D thesis by Kyoto University’s Physics Department in 2011

Contents
Iron-based Superconductors.- Experimental Setup.- Superconducting Gap Structure and Quantum Critical Point Beneath the Superconducting Dome of BaFe2(As1-xPx)2.- Evidence for Superconducting Gap Nodes in the Zone-centered Hole Bands of KFe2As2.- Nodeless vs. Nodal Or-
Superconducting Gap Structure in the Zone-centered Superconductors
- Experimental Setup.- Superconducting Gap Structure and Quantum Critical Point Beneath the Superconducting Dome of BaFe2(As1-xPx)2.- Evidence for Superconducting Gap Nodes in the Zone-centered Hole Bands of KFe2As2.- Nodeless vs. Nodal Or-

Fields of interest
Strongly Correlated Systems, Superconductivity; Quantum Physics; Magnetism, Magnetic Materials

Target groups
Research

Product category
Monograph

M. Khlopov, Virtual Institute of Astroparticle Physics, Paris, France

Fundamentals of Cosmic Particle Physics

This current updated and expanded text reflects the large number of scientific advances, both theoretically and experimentally, within the discipline of cosmoparticle physics in the last 10 years. Some of the topics that have been added, updated include but are not limited to: HND or CMD+HND scenarios being implemented into sterile neutrino scenarios, the ramifications of extending the forms of dark matter with respect to our view of neutrinos, the origin of baryon matter and the need for non-baryonic matter in current theories, problems the existence of dark matters raises with respect to cosmoparticle physics and the relationship with (meta) stable (super) weakly interacting particles predicted by the extension of the standard model, restrictions on baryon and lepton photons, as well as problems associated with cosmological expansion just to name a few. These and many other topics are readdressed in light of recent both experimental and theoretical developments. Other areas of that will be of interest to the reader include the puzzles presented by direct and indirect effects of dark matter (e.

Contents

Fields of interest
Astronomy, Astrophysics and Cosmology; Astrophysics and Astroparticles

Target groups
Research

Product category
Monograph

Landolt-Börnstein: Numerical Data and Functional Relationships in Science and Technology – New Series

Editor-in-chief: W. Martienssen

Physical Chemistry
Subvolume 12B

F. Predel, MPI, Stuttgart, Germany
B. Predel (Ed)

B-Ac...Cu-Zr Supplement to IV/5B

Volume 12 of group IV presents phase diagrams, crystallographic and thermodynamic data of binary alloy systems. The subvolume B contains systems from B-Ba to C-Zr. Volume 12 forms a supplement to volume 5.

Features
- Standard reference book with selected and easily retrievable data from the fields of physics and chemistry collected by acknowledged international scientists
- Also available online in www.springermaterials.com

Fields of interest
Physics, general; Physical Chemistry; Thermodynamics

Target groups
Research

Product category
Reference work

Due January 2013

2013. 154 p. 67 illus., 40 in color. (Springer Theses)

Hardcover
- approx. * € (D) 106,95 | € (A) 109,95 | sFr 133,50
- approx. € 99,95 | €90.00
ISBN 978-4-431-54293-3

Available
- * € (D) 139,05 | € (A) 142,94 | sFr 173,00
- € 129,95 | £117.00

Available
2012. 500 p. / Physical Chemistry, Subvolume 12B) Hardcover
- * € (D) 4055,30 | € (A) 4169,00 | sFr 5045,50
- € 3790,00 | £3411.00

Landolt-Börnstein: Numerical Data and Functional Relationships in Science and Technology – New Series

Editor-in-chief: W. Martienssen

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Target groups
Research

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- approx. * € (D) 106,95 | € (A) 109,95 | sFr 133,50
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ISBN 978-4-431-54293-3

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- € 129,95 | £117.00

Available
2012. 500 p. / Physical Chemistry, Subvolume 12B) Hardcover
- * € (D) 4055,30 | € (A) 4169,00 | sFr 5045,50
- € 3790,00 | £3411.00
L. Macdonald, University of Cambridge, UK

How to Observe the Sun Safely

“How to Observe the Sun Safely, 2nd Edition” gives all the basic information and advice the amateur astronomer needs to get started in observing our own ever-fascinating star. Unlike many other astronomical objects, you do not need a large telescope or expensive equipment to observe the Sun. And it is possible to take excellent pictures of the Sun with today’s low-cost digital cameras! This book surveys what is visible on the Sun, before describing how to record solar features and measure solar activity levels.

Features
- This new edition provides updated advice to amateur astronomers on how to observe the Sun using digital vs. film cameras
- Includes more than twice the illustrations and many of them new that explain and illustrate solar phenomena in detail
- Describes advances in image processing since the first edition was published

Contents

Fields of interest
Astronomy, Observations and Techniques; Popular Science in Astronomy; Astrophysics and Astroparticles

Target groups
Popular/general

Product category
Popular science

M. C. March, University of Sussex, Brighton, UK

Advanced Statistical Methods for Astrophysical Probes of Cosmology

This thesis explores advanced Bayesian statistical methods for extracting key information for cosmological model selection, parameter inference and forecasting from astrophysical observations. Bayesian model selection provides a measure of how good models in a set are relative to each other - but what if the best model is missing and not included in the set? Bayesian Doubt is an approach which addresses this problem and seeks to deliver an absolute rather than a relative measure of how good a model is.

Features
- Nominated by the astrophysics group of Imperial College, London as best dissertation of 2011
- The work presented in this thesis constitutes a major leap forward in the field of supernova cosmology
- Opens the way to more accurate and robust constraints on dark energy properties
- Stands out for the sophistication of the statistical approach adopted

Contents
Introduction.- Cosmology background.- Dark energy and apparent late time acceleration.- Supernovae Ia.- Statistical techniques.- Bayesian Doubt: Should we doubt the Cosmological Constant?.- Bayesian parameter inference for SNeIa data.- Robustness to Systematic Error for Future Dark Energy Probes.- Summary and Conclusions.- Index.

Fields of interest
Cosmology; Astronomy, Observations and Techniques; Statistics for Engineering, Physics, Computer Science, Chemistry and Earth Sciences

Target groups
Research

Product category
Ph.D. Thesis

D. Möhl, CERN, Geneva, Switzerland

Stochastic Cooling of Particle Beams

This lecture note describes the main analytical approaches to stochastic cooling. The first is the time domain picture, in which the beam is rapidly sampled and a statistical analysis is used to describe the cooling behaviour. The second is the frequency domain picture, which is particularly useful since the observations made on the beam are mainly in this domain. This second picture is developed in detail to assess key components of modern cooling theory like mixing and signal shielding and to illustrate some of the diagnostic methods. Finally the use of a distribution function and the Fokker-Planck equation, which offer the most complete description of the beam during the cooling, are discussed.

Features
- First topical monograph on this subject matter
- Provides conceptual and theoretical introduction
- Introduces modern cooling schemes

Contents

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

Target groups
Research

Product category
Monograph

Available
2nd ed. 2012. XXV, 214 p. 87 illus., 55 in color. (Patrick Moore's Practical Astronomy Series) Softcover
- € (D) 37,40 | € (A) 38,45 | sFr 47,00
- € 34,95 | £31.99

Due February 2013
2013. XVIII, 191 p. 46 illus., 11 in color. (Springer Theses) Hardcover
- € (D) 106,95 | € (A) 109,95 | sFr 133,50
- € 99,95 | £90.00
ISBN 978-3-642-35059-7

Due March 2013
2013. 120 p. (Lecture Notes in Physics, Volume 866) Softcover
- approx. * € (D) 37,40 | € (A) 38,45 | sFr 50,50
- approx. € 34,95 | £31.99
ISBN 978-3-642-34978-2
Analytic Tools for Feynman Integrals

The goal of this book is to describe the most powerful methods for evaluating multipole Feynman integrals that are currently used in practice. This book supersedes the author’s previous Springer book “Evaluating Feynman Integrals” and its textbook version “Feynman Integral Calculus.” Since the publication of these two books, powerful new methods have arisen and conventional methods have been improved in essential ways. A further qualitative change is the fact that most of the methods and the corresponding algorithms have now been implemented in computer codes which are often public. In comparison to the two previous books, three new chapters have been added: One is on sector decomposition, while the second describes a new method by Lee.

Features
► Most powerful methods of evaluating Feynman integrals are presented  ► Reader will be able to apply them in practice  ► Contains numerous examples

Contents

Fields of interest
Particle and Nuclear Physics; Quantum Physics; Field Theory and Polynomials

Target groups
Research

Product category
Monograph

Due December 2012
2013. IX, 288 p. 63 illus. (Springer Tracts in Modern Physics, Volume 250) Hardcover  ► * € (D) 160,45 | € (A) 164,94 | sFr 200,00  ► € 149,95 | £135.00  ISBN 978-3-642-34891-4

Effective Theories in Physics
From Planetary Orbits to Elementary Particle Masses

There is significant interest in the Philosophy of Science community to understand the role that “effective theories” have in the work of forefront science. The ideas of effective theories have been implicit in science for a long time, but have only been articulated well in the last few decades. Since Wilson’s renormalization group revolution in the early 1970’s, the science community has come to more fully understand its power, and by the mid-1990’s it had gained its apotheosis. It is still one of the most powerful concepts in science, which has direct impact in how one thinks about and formulates theories of nature. It is this power that this Brief sets out to emphasize through historical analysis and current examples.

Contents
The Utility of Effective Theories.- Harmonic Oscillator as an Effective Theory.- Effective Theories of Classical Gravity.- Effective Theories and Elementary Particle Masses.- Effective Theories and Theory Choice.

Fields of interest
Theoretical, Mathematical and Computational Physics; History and Philosophical Foundations of Physics; Philosophy of Science

Target groups
Graduate

Product category
Brief

Due December 2012
2013. X, 80 p. (SpringerBriefs in Physics) Softcover  ► * € (D) 53,45 | € (A) 54,95 | sFr 66,50  ► € 49,95 | £44.99  ISBN 978-3-642-34891-4

Colloidal Dispersions under Slit-Pore Confinement

This dissertation contributes to the understanding of fundamental issues in the highly interdisciplinary field of colloidal science. Beyond colloid science, the system also serves as a model for studying interactions in biological matter. This work quantitatively investigated the scaling laws of the characteristic lengths of the structuring of colloidal dispersions and tested the generality of these laws, thereby explaining and resolving some long-standing contradictions in literature. It revealed the effect of confinement on the structuring, independently of specific properties of the confining interfaces. In addition, it resolved the influence of roughness and charge of the confining interfaces on the structuring and as well providing a method to measure the effect of surface deformability on colloidal structuring.

Contents
Scientific background.- Experimental Section.- Structuring of nanoparticle suspensions confined between two smooth solid surfaces.- Structuring of nanoparticles between modified solid surfaces.- Structuring of nanoparticles confined between a silica microsphere and an air bubble.- Structuring of nonionic surfactant micelles.

Fields of interest
Soft and Granular Matter, Complex Fluids and Microfluidics; Physical Chemistry; Nanotechnology

Target groups
Research

Product category
Monograph

Due February 2013
2013. XIV, 140 p. 62 illus., 14 in color. (Springer Theses) Hardcover  ► * € (D) 106,95 | € (A) 109,95 | sFr 133,50  ► € 99,95 | £90.00  ISBN 978-3-642-34990-4