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Acoustics

Forthcoming
M. Möser, G. Müller

Handbook of Engineering Acoustics

The book treats the physical background of engineering acoustics, focussing on empirically obtained engineering experience as well as on measurement techniques and engineering methods for prognostics. Its goal is not only to describe the state of art of engineering acoustics but also to give practical help to engineers in order to solve acoustical problems. It deals with the origin and the transmission and with the methods of the abatement of air-borne and structure-borne sound of different kinds – from traffic to machinery and flow-induced sound. In addition the modern aspects of room and building acoustics, as well as psychoacoustics and active noise control, are covered.

More on www.springer.com/978-3-540-24052-5
Due June 2010
2010. Approx. 650 p. 10 illus. in color. 978-3-540-24052-5 ► approx. 159,95 €

Applied Optics, Optoelectronics, Optical Devices

Forthcoming
O. Breitenstein, W. Warta, M. Langenkamp

Lock-in Thermography
Basics and Use for Evaluating Electronic Devices and Materials

This book deals with lock-in thermography (LIT) as a special active dynamic variant of the well-known IR thermography. It enables a much improved signal-to-noise ratio (up to 1000x) and a far better lateral resolution compared to steady-state thermography. The book concentrates on applications to electronic devices and materials, but the basic chapters are useful as well for non-destructive evaluation. Various experimental approaches to LIT are reviewed with special emphasis to different available commercial LIT systems. New LIT applications are reviewed, like illuminated LIT applied to solar cells, and non-thermal LIT lifetime mapping. Typical LIT investigation case studies are introduced.

More on www.springer.com/978-3-642-02416-0
Due January 2010
2010. Approx. 250 p. 90 illus., 5 in color. (Springer Series in Advanced Microelectronics, 10) 978-3-642-02416-0 ► 99,95 €

Forthcoming
E. Bründermann, H. Hübers, M. Kimmitt

Terahertz Techniques

Research and development in the terahertz portion of the electromagnetic spectrum has expanded very rapidly during the past fifteen years due to major advances in sources, detectors and instrumentation. Many scientists and engineers are entering the field and this volume offers a comprehensive and integrated treatment of all aspects of terahertz technology. The three authors, who have been active researchers in this region over a number of years, have designed Terahertz Techniques to be both a general introduction to the subject and a definitive reference resource for all those involved in this exciting research area.

More on www.springer.com/978-3-642-02591-4
Due March 2010
2010. Approx. 200 p. 205 illus., 5 in color. (Springer Series in Optical Sciences, 151) 978-3-642-02591-4 ► approx. 99,95 €

Forthcoming
G.A. Klein

Industrial Color Physics

This unique book starts with a short historical overview of the development of the theories of color vision and applications of industrial color physics. The three dominant factors producing color - light source, color sample, and observer - are described in detail. The standardized color spaces are shown and related color values are applied to characteristic color qualities of absorption as well as of effect colorants. The fundamentals of spectrometric and colorimetric measuring techniques together with specific applications are described. Theoretical models for radiative transfer in transparent, translucent, and opaque layers are detailed; the two, three, and multilayer approximations are presented for the first time in a coherent formalism. These methods constitute the fundamentals not only for the important classical methods, but also modern methods of recipe prediction applicable to all known colorants. The text is supplied with 52 tables, more than 200 partially colored illustrations, an appendix, and a detailed bibliography. This work is recommended particularly for physicists, chemists, and engineers in color industry and related fields of research, development, production, and processing; this work provides the fundamentals over the widespread physical properties and applications of absorption and effect colorants and is suitable for both the beginner and experienced developer. The author, Georg A. Klein, was awarded his Ph. D. in polymer physics from the University of Mainz, Germany. After several years of R&D in the chemical industry, he became a professor for physics, color physics, and technology of polymers at the University of Applied Sciences in Stuttgart. His extensive decades-long experience in color physics and color technology in Germany and abroad is condensed in the present book.

More on www.springer.com/978-1-4419-1196-4
Due January 2010
2010. Approx. 480 p. 180 illus., 19 in color. (Springer Series in Optical Sciences, 154) 978-1-4419-1196-4 ► 119,95 €

Forthcoming
K. Yamanouchi

Lectures on Ultrafast Intense Laser Science
Volume 1

This book features tutorial-like chapters on ultrafast intense laser science by world-leading scientists who are active in the rapidly developing interdisciplinary research field. It is written to give a comprehensive survey of all the essential aspects of ultrafast intense laser science. The volume covers theories of atoms and molecules in intense laser fields, quantum emission and applications, multiphoton microscopy, ultrafast X-ray spectroscopy, high intensity physics scaled to long wavelength, pulse shaping techniques, nonlinear optics in the XUV region, filamentation, and ultraintense-laser matter interaction.

More on www.springer.com/978-3-540-95943-4
Due February 2010
2010. Approx. 360 p. 100 illus. (Springer Series in Chemical Physics, 94) 978-3-540-95943-4 ► 119,95 €

Astronomy, Astrophysics and Cosmology (general)

Extra Dimensions in Space and Time

"...The Multiversal book series is equally unique, providing book-length extensions of the lectures with enough additional depth for those who truly want to explore these fields, while also providing the kind of clarity that is appropriate for interested lay people to grasp the general principles involved." – Lawrence M. Krauss
The aim of this book is to continue to raise public awareness in the exciting field of theoretical
Mysteries of Galaxy Formation

The mystery of how the galaxies formed is a complex and intriguing subject, involving several different theories and an understanding of many different phenomena. Françoise Combes outlines the context in which the Big Bang and the expansion of the universe occurred and the first ‘inhomogeneities’ from which arose the early structures of the universe. The author describes how, contrary to our everyday experiences, topics of appendices or footnotes) that explain the basic equations and formulas in the theories. The feature is very attractive to readers who want to learn more about the theories involved beyond the basic description for a layperson. Topics Covered: Structure of matter & fundamental forces Einstein’s relativistic view of space-time Equivalence Principle and General Relativity Symmetry and perspective Why higher space or time dimensions? Extra space dimensions and String Theory Einstein and the Fourth Dimension Traditional Extra Dimensions String Theory and Branes Warped Extra Dimensions How to Look For Extra Dimensions? Extra Dimensions: The equations behind the words Two Time Physics Current status of 2T-Physics and future directions Multiversal Journeys is a trademark of Farzad Nekoogar and Multiversal Journeys, a 501(c)(3) nonprofit organization.

More on www.springer.com/978-0-387-77637-8

Due January 2010

2010. XIV, 217 p. 89 illus., 11 in color. (Multiversal Journeys, ) 978-0-387-77637-8 ▶ 49,95 €

A. Doressoundiram, E. Lellouch

At the Edge of the Solar System

Icy New Worlds Unveiled

On August 24, 2006, the solar system lost its ninth planet! The astronomers’ decision at the IAU General Assembly in Prague to demote Pluto had been precipitated by the discovery, beyond the orbit of Neptune, of a very rich population of Pluto-like objects. The study of the recently discovered remote celestial bodies grows ever more fascinating. Their great variety in color, shape, size, and orbit has astonished observers. What is more, studies of the composition of these new-found objects reveals that they among the most primitive objects in the solar system. In their simple and lively style, the authors of At the Edge of the Solar System alternate discussions on historical aspects and physical descriptions of the remote regions, as well as amazing findings from the cutting edge of research. Beginning with a description of the structure of the solar system, the authors look at the discoveries of Pluto and its moon Charon and show how our knowledge of this mysterious world grew over the last 80 years of its study. They then describe the origins of our solar system and look at the discoveries of the first unusual objects in the outer solar system - Chiron and the first Centaurs. They trace the discoveries of the first Kuiper Belt objects and introduce the wide range of bodies found in the outer solar system, including “Plutinos.” Examining these objects in more detail, they then present the arguments concerning the status of Pluto and conclude with discussion of the essential characteristics of the Kuiper Belt and a look at how future observations may lead to yet more discoveries and a greater understanding of these bodies.

More on www.springer.com/978-1-4419-0867-4

Due January 2010

2010. X, 208 p. 75 illus., 12 in color. (Springer Praxis Books,) 978-1-4419-0867-4 ▶ 29,95 €

Forthcoming

S. Ringwood

Astronomers Anonymous

Getting Help with the Puzzles and Pitfalls of Practical Astronomy

This collection of “typical” astronomy questions and hilarious answers, compiled from Ringwood’s own experiences in the world of astronomy, has been written to entertain and amuse amateur (and professional) astronomers as well as armchair astronomers. In this parody of a typical “Lonely Hearts column,” specifically for troubled astronomers, readers will easily recognize the difficulties they face and enjoy the laughs being directed at them and their science. There is also plenty of background material provided to make the book accessible to non-astronomers, as a humorous and informative work about (mostly amateur) astronomy.

More on www.springer.com/978-1-4419-5816-7

Due March 2010

2010. Approx. 210 p. 60 illus. 978-1-4419-5816-7 ▶ approx. 29,95 €

Astronomy, Observations and Techniques

Forthcoming

M.E. Bakich

1001 Celestial Wonders to See Before You Die

The Best Sky Objects for Stargazers

1,001 Celestial Wonders is a guide to the night sky’s brightest and most fascinating objects. Each target is accessible to amateur astronomers using medium-sized telescopes from a dark site. In fact, many are so bright they remain visible under moderate light pollution, as from the outskirts of a city or the suburbs of a town. The book provides a chronological target list, making it easy to use. No matter what night you choose, this book will show you many of the most memorable objects to observe, whether you are using a small telescope or even binoculars, or an instrument of larger aperture. This is far more than just a list of interesting objects. It is structured so that objects of various observing difficulty are included, which will help readers become better observers, both encouraging beginners and challenging long-time amateur astronomers. This book is designed to be easy-to-use at the telescope, and observers will appreciate each object’s standardized layout and the book’s chronological organization. Finally, many amateur astronomers function best when presented with a list! Even the Meade Autostar controller features a “best tonight” list (although the list is far less comprehensive and detailed than the catalog provided in this book), a feature that has proved extremely popular.

More on www.springer.com/978-1-4419-5816-7
Every lunar day has something new to learn! And along your journey, you will be reading about the history, mystery, poetry, and legends that are associated with our Moon. Charts will help guide you to specific lunar features, as well as annotated photographic maps that pinpoint important or unusual craters. You’ll soon learn to identify major features at just a glance and be able to create your own world-class images. You’ll have right at hand the times and dates for every lunar day, phase, and eclipse for years to come. Imagine yourself at the telescope “crater hopping” to new challenges and being able to instantly identify Moon features. Picture yourself using binoculars and naming all you can see with ease! Within weeks, you’ll be able to show everyone where each mission landed and tell amazing facts. So go ahead and Moonwalk with your eyes. Once you start your journey, you won’t want to turn back!

More on www.springer.com/978-1-4419-1776-8
Due May 2010
978-1-4419-1776-8 ► approx. 29,95 €

**Forthcoming**

N. Haghighipour

**Planets in Binary Star Systems**

The discovery of extrasolar planets over the past decade has had major impacts on our understanding of the formation and dynamical evolution of planetary systems. There are features and characteristics unseen in our solar system and unexplainable by the current theories of planet formation and dynamics. Among these new surprises is the discovery of planets in binary and multiple-star systems. The discovery of such “binary-planetary” systems has confronted astrophysicists with many new challenges, and has led them to re-examine the theories of planet formation and dynamics. Among these challenges are: How are planets formed in binary star systems? What would be the notion of habitability in such systems? Under what conditions can binary star systems have habitable planets? How will volatiles necessary for life appear on such planets? This volume seeks to gather the current research in the area of planets in binary and multistar systems and to familiarize readers with its associated theoretical and observational challenges.

More on www.springer.com/978-90-481-8686-0
Due April 2010
978-90-481-8686-0 ► approx. 119,95 €

**Forthcoming**

R. Schmude Jr.

**Comets, and How to Observe Them**

Comets have inspired wonder, excitement and even fear ever since they were first observed. But they are important members of the solar system, that contain material from early in the life of the system, held in deep-freeze. This makes them key in our understanding of the formation and evolution of many Solar System bodies. Recent ground- and space-based observations have changed much in our understanding of comets. Comets, and How to Observe Them gives a summary of our current knowledge and describes how amateur astronomers can contribute to the body of scientific knowledge of comets. This book contains many practical examples of how to construct comet light-curves, measure how fast a comet’s coma expands, and determine the rotation period of the nucleus. All these examples are illustrated with drawings and photographs. Because of their unpredictable nature comets are always interesting and sometime spectacular objects to observe and image. The second part of the book therefore takes the reader through the key observing techniques that can be used with commercially available modern observing equipment, from basic observations to more scientific measurements.

More on www.springer.com/978-1-4419-5789-4
Due April 2010
978-1-4419-5789-4 ► approx. 34,95 €

**Forthcoming**

G.R. Eaton, S.S. Eaton, D. Barr, R. Weber

**Quantitative EPR**

A Practitioners Guide

The book is the first comprehensive practical guide for people who perform EPR measurements, or supervise the use of EPR spectroscopy, and want to obtain quantitative results. There is a growing need in both industrial and academic research to provide meaningful and accurate quantitative results from EPR experiments. Both relative intensity quantification and the absolute spin concentration of EPR samples are often of interest. This book is a practical guide for people who perform EPR measurements, or supervise the use of EPR spectroscopy. It discusses the various sample-related, instrument-related and software-related aspects for obtaining useful quantitative results from EPR experiments. Some specific items discussed include: choosing a reference standard, resonator considerations (Q, B1, Bm), power saturation characteristics, sample positioning, and finally, putting all the factors together to provide a calculation model for obtaining an accurate spin concentration of a sample. EPR practitioners are faced with many diverse problems, thus, even if the question is simply “is there a radical present?” you need to know, e.g., whether <% or 100% of the species are in the radical form or in a particular metal oxidation state. There are many examples in the literature in which an impurity or a slight dissociation resulted in the EPR signal observed. Among the common type of measurements in which intensity quantitation is essential are: How many spins are there in a biological sample? What is the spin state of a metal complex as a function of temperature? What is the age of an archeological artifact? What is the radiation dose? What will be the shelf life of foods and beverages? Line width quantitation is essential for: Oxymetry Molecular motion Relaxing line width to relaxation times and hyperfine couplings.

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2010. Approx. 225 p. 70 illus.
978-3-211-92947-6 ► approx. 99,95 €

**Forthcoming**

M. Bonitz, N. Horing, J. Meichsner, P. Ludwig

**Introduction to Complex Plasmas**

Complex plasmas differ from traditional plasmas in many ways: these are low-temperature high pressure systems containing nanometer to micrometer size particles which may be highly charged and strongly...
interacting. The particles may be chemically reacting or be in contact with solid surfaces, and the electrons may show quantum behaviour. These interesting properties have led to many applications of complex plasmas in technology, medicine and science. Yet complex plasmas are extremely complicated, both experimentally and theoretically, and require a variety of new approaches which go beyond standard plasma physics courses. This book fills this gap presenting an introduction to theory, experiment and computer simulation in this field. Based on tutorial lectures at a very successful recent Summer Institute, the presentation is ideally suited for graduate students, plasma physicists and experienced undergraduates.

More on www.springer.com/978-3-642-10591-3

Due April 2010

978-3-642-10591-3 ➔ approx. 129,95 €

Forthcoming

A. Piel

Plasma Physics

An Introduction to Laboratory, Space, and Fusion Plasmas

Plasma Physics gives a comprehensive introduction to the basic processes in plasmas and demonstrates that the same fundamental concepts describe cold gas-discharge plasmas, space plasmas, and hot fusion plasmas. Starting from particle drifts in magnetic fields, the principles of magnetic confinement fusion are explained and compared with laser fusion. Collective processes are discussed in terms of plasma waves and instabilities. The concepts of plasma description by magnetohydrodynamics, kinetic theory, and particle simulation are stepwise introduced. Space charge effects in sheath regions, double layers and plasma diodes are given the necessary attention. The new fundamental mechanisms of dusty plasmas are explored and integrated into the framework of conventional plasmas. The book concludes with a brief introduction to plasma discharges. Written by an internationally renowned researcher in experimental plasma physics, the text keeps the mathematical apparatus simple and emphasizes the underlying concepts. The guidelines of plasma physics are illustrated by a host of practical examples including plasma diagnostics with different Langmuir probe methods or laser interferometry, ionospheric sounding, Faraday rotation, space thrusters, and diagnostics of dusty plasmas. Though primarily addressing students in plasma physics, the book is easily accessible for researchers in neighboring disciplines, such as space science, astrophysics, material science, applied physics, and electrical engineering. The text is based on an introductory course to plasma physics and more specialized courses in plasma diagnostics, dusty plasmas, and plasma waves, which the author has taught at Kiel University for two decades. The pedagogical approach combines detailed explanations, a large number of illustrative figures, short summaries of the basics at the end of each chapter, and a selection of problems with detailed solutions. The book is primarily aimed at students meeting plasma physics for the first time after taking an advanced undergraduate course in electricity and magnetism. The book is structured to serve as a text for a two-semester introductory course in plasma physics at the advanced undergraduate or early graduate level. Some more advanced topics will help bridging the gap to plasma theory. In view of its practical advice in plasma discharges and diagnostics, Plasma Physics will become a useful resource on the bookshelf of PhD students and researchers.

More on www.springer.com/978-3-642-10490-9
Due June 2010

978-3-642-10490-9 ➔ 59,95 €

Biophysics and Biological Physics

Forthcoming

C. Grupen

Introduction to Radiation Protection

Practical Knowledge for Handling Radioactive Sources

The book presents an accessible account of the sources of ionizing radiation and the methods of radiation protection. The basics of nuclear physics which are directly related to radiation protection are briefly discussed. The book describes the units of radiation protection, the measurement techniques, biological effects of radiation, environmental radiation, and many applications of radiation. For each chapter there is a problem section with full solutions. A detailed glossary and many useful information in appendixes complete the book. The author has addressed the issue of internationality to make sure that the text and, in particular, the complicated regulations can be easily interpreted not only in Europe and the United States but also in other countries. The subject of radiation protection requires a certain amount of mathematics. For those who have forgotten the basic rules of calculus a short refresher course in the form of a mathematical appendix is added.

More on www.springer.com/978-3-642-02585-3
Due January 2010

2010. XIV, 417 p. 210 illus. (Graduate Texts in Physics, )
978-3-642-02585-3 ➔ 79,95 €

Forthcoming

T. Jue

Biomedical Applications in Biophysics

In keeping with goal and style of the Handbook in Modern Biophysics series, the proposed book will maintain a chapter structure that contains two parts: concepts and biological application. The book also integrates all the chapters into a smooth, continuous discourse. The first and second chapters establish the mathematical methods and theoretical framework underpinning the different topics in the rest of the book. Other chapters will use the theoretical framework as a basis to discuss optical and NMR approaches. Each chapter will contain innovative didactic elements that facilitate teaching, self-study, and research preparation (key points, summary, exercise, references).

Due June 2010

2010. Approx. 450 p. (Handbook of Modern Biophysics, )
978-1-60327-232-2 ➔ approx. 111,65 €
Forthcoming
E.B. Podgorsak
Radiation Physics for Medical Physicists

This well-received textbook and reference summarizes the basic knowledge of atomic, nuclear, and radiation physics that professionals working in medical physics and biomedical engineering need for efficient and safe use of ionizing radiation. Concentrating on the underlying principles of radiation physics, it covers the prerequisite knowledge for medical physics courses on the graduate and post-graduate levels in radiotherapy physics, radiation dosimetry, imaging physics, and health physics, thus providing the link between elementary physics on the one hand and the intricacies of the medical physics specialties on the other hand. This expanded and revised second edition offers reorganized and expanded coverage. Several of the original chapters have been split into two with new sections added for completeness and better flow. New chapters on Coulomb scattering; on energy transfer and energy absorption in photon interactions; and on waveguide theory have been added in recognition of their importance. Others training for professions that deal with ionizing radiation in diagnosis and treatment as well as medical residents, students of technology and dosimetry, and biomedical engineering will find many sections interesting and useful for their studies. It also serves as excellent preparatory material for candidates taking professional certification examinations in medical physics, medical dosimetry, and in medical specialties such as radiotherapy, diagnostic radiology, and nuclear medicine. From reviews of the first edition: "Any instructor teaching an introductory graduate-level course on the principles of medical physics should consider this book for adoption as a text... cover[s] the principles themselves, and it covers them very well." (Medical Physics, January 2006) "...a delight and ready-reference also to seasoned practitioners..." This textbook, based on notes the author developed over the past 25 years of teaching radiation physics to MSc and PhD students in medical physics at McGill University is a real gem for the bookshelf of anyone already professional working in the radiation sciences..." (John H. Hubbell, Radiation Physics and Chemistry) "...for the theory of radiation physics at a fundamental level, Podgorsak’s book provides a wonderful resource presented in a well organized and easy to learn manner, in a way not found in any other text..." (Jake van Dyk, London Regional Cancer Program, Can. Med Phys Newsletter (July 2006)

More on www.springer.com/978-3-540-85609-2

Due January 2010

Ceramics, Glass, Composites, Natural Materials

Forthcoming

K.K. Chawla
Composite Materials

Science and Engineering

This updated and enlarged third edition of a widely used text offers an integrated and completely up-to-date coverage of composite materials. Focusing on the relationship between structure and properties, it provides a well-balanced treatment of the mechanics and the materials science of composites, while not neglecting the importance of processing. The book has been revised and updated throughout, with new chapters on fatigue and creep of composites. The text presents a detailed description of how the various reinforcements (such as glass, polyethylene, aramid, carbon), the materials in which they are embedded (ceramics, metals, polymers), and of the interfaces between them, control the properties of the composite materials at both the micro- and macro-levels. Extensive use is made of micrographs and line drawings to emphasize the importance of processing, microstructure, and properties in composite materials. Examples of practical applications in various fields are given throughout the book, and extensive references to the literature are provided. The book is intended for use in graduate and upper-division undergraduate courses, but practicing engineers and researchers in industry and academia will also find it a useful reference. The third edition has been thoroughly updated and has a vast amount of new material, including plenty of new exercises and illustrations. The new edition covers: - New types of fibrous and particulate reinforcements - New ceramic fibers, such as Nextel 720 - New processing techniques of polymer matrix composites - Polymeric composite foams - New processing techniques in metal matrix composites - New applications such as power generation cables involving use of Nextel fiber reinforced aluminum composites - Metallic composite foams - New processing techniques for ceramic matrix composites - A detailed derivation of thermal stresses generated in fibrous and particulate composites - New material on the subject of thermal conductivity - Recent work in the area of fatigue and creep of different composites - New examples of designs of components with composites

Some praise for previous editions: "By employing an economic writing style and carefully selected references, figures, and suggested readings, [Chawla] has successfully produced a relatively short but thorough book.... Clear, concise, and complete, [it] is an excellent up-to-date introduction to fiber composite materials.... I would recommend it." -- MRS Bulletin "Covers polymer, metal, and ceramic matrix composites in a well-organized, up-to-date manner. It is filled with useful tables, graphs, references, suggested readings and illustrations." -- American Scientist "Overall, this is an excellent book for composite materials research. It can be used as a text book for undergraduate seniors, and as a reference book for engineers." -- Applied Mechanics Review

More on www.springer.com/978-0-387-74364-6

Due June 2010

Theoretical Molecular Biophysics

P. Scherer, S.F. Fischer

"Theoretical Molecular Biophysics" is an advanced study book for students, shortly before or after completing undergraduate studies in physics, chemistry or biology. It provides the tools for an understanding of elementary processes in biology, such as photosynthesis on a molecular level. A basic knowledge in mechanics, electrodynamics, quantum theory and statistical physics is desirable. The reader will be exposed to basic concepts in modern biophysics such as entropic forces, phase separation, potentials of mean force, proton and electron transfer, heterogeneous reactions coherent and incoherent energy transfer as well as molecular motors. Basic concepts such as phase transitions of biopolymers, electrodynamics, protonation equilibria, ion transport, radiationless transitions as well as energy- and electron transfer are discussed within the frame of simple models.

Forthcoming

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Due January 2010

Fiberglass and Glass Technology

Fiberglass and Glass Technology: Energy-Friendly Compositions and Applications

Fiberglass and Glass Technology: Energy-Friendly Compositions and Applications provides a detailed overview of fiber, float and container glass technology with special emphasis on energy- and environmentally-friendly compositions, applications and manufacturing practices which have recently become available and continue to emerge. Energy-friendly compositions are variants of incumbent fiberglass and glass compositions that are obtained by the reformulation of incumbent compositions to reduce the viscosity and thereby the energy demand. Environmentally-friendly compositions are variants of incumbent fiber, float and container glass compositions that are obtained by the reformulation of incumbent compositions to reduce environmentally harmful emissions from their melts. Energy- and environmentally-friendly compositions are expected to become a key factor in the future for the fiberglass and glass industries. This book consists of two complementary sections: continuous glass fiber technology and soda-lime-silica glass technology. Important topics covered include: o Commercial and experimental compositions and products o Design of energy-and
Composite Materials Engineering

In recent decades, composite materials have developed very rapidly and the applications continue to be of increasing importance. Composite Materials Engineering, the three-volume reference book, offers an integrated and completely up-to-date coverage on composite materials. Vol. 1 provides an introduction and the fundamentals of composite materials, covering reinforcements of composites, polymer matrix materials, textile composites, interfaces of composites and mechanics and the design of composites. Vol. 2 focuses on several important composite materials and provides detailed descriptions about the properties, the production technologies and the applications of these composite materials, including advanced polymer matrix composites, thermoplastic polymer matrix composites, metal matrix composites, etc. Vol. 3 mainly focuses on key points and knowledge regarding the application of composite materials, including the design and analysis of composite structures, performance testing, characterization and quality control of composites. In the final chapter, there are overviews of several new types of composite materials as well as the recent development trends. This book will be of value to scientists, engineers and researchers in advanced materials and manufacturing engineering as a comprehensive reference book. It also will provide an introduction for postgraduate students in materials science and engineering. Prof. Xiaosu Yi is the director of the National Key Lab of Advanced Composite Materials of the Beijing Institution of Aeronautical Materials, China. Shanyi Du is a professor at the Composite Materials and Structure Institution of the Harbin Institution of Technology, China. Litong Zhang is a professor at the Northwestern Polytechnical University, China. Prof. Shanyi Du and Litong Zhang are both members of the Chinese Academy of Engineering.

More on www.springer.com/978-3-642-05262-0
Due February 2010
978-3-642-05262-0 ▶ 599,00 €

Forthcoming
J. Šesták, J.J. Mareš, P. Hubík

Glassy, Amorphous and Disordered Materials
Thermal Physics, Analysis, Structure and Properties
<tentative> Provides a summary of non-equilibrium glassy and amorphous structures and their macro-and microscopic thermal properties. The book contains a carefully selected works of fourteen internationally recognized scientists involving the advances of the physics and chemistry of the glassy and amorphous states.

Due April 2010
2010. Approx. 260 p. (Hot Topics in Thermal Analysis and Calorimetry, 8)
978-90-481-2881-5 ▶ approx. 139,95 €

Characterization and Evaluation of Materials

Forthcoming
D.D. Chung

Composite Materials
Functional Materials for Modern Technologies
The applications of composite materials continue to be of increasing importance due to the industry’s need for modern analysis and improved performance. The first edition of Composite Materials introduced a new way of looking at composite materials: covering composites in accordance with their functions. This second edition expands the book’s scope to emphasize application-driven and process-oriented materials development. Although applications are the economical and technological driving force of materials development, processes often determine the feasibility and practicality. This tutorial-style reference book examines both structural composite materials (including their mechanical properties, durability, and degradation) and functional composite materials (including their electrical, piezoelectrical, and thermal properties), as needed for a substantial range of applications. The emphasis on application-driven and process-oriented materials development is enhanced by a large amount of experimental results that provide real illustrations of composite materials development. Composite Materials is an essential book for researchers and engineers who are interested in materials development for industrial applications. It has a vibrant yet functional approach, making it suitable for both students and practitioners, and provides a full explanation of all of the fundamental concepts related to the structural and functional properties covered. The Engineering Materials and Processes series focuses on all forms of materials and the processes used to synthesise and formulate them as they relate to the various engineering disciplines. The series deals with a diverse range of materials: ceramics; metals (ferrous and non-ferrous); semiconductors; composites; polymers, biomaterials, etc. Each monograph in the series is written by a specialist and demonstrates how enhancements in materials and the processes associated with them can improve performance in the field of engineering in which they are used.

More on www.springer.com/978-1-84882-830-8
Due March 2010
978-1-84882-830-8 ▶ 129,95 €

Heat Transfer in Multi-Phase Materials

This book provides a profound understanding, which physical processes and mechanisms cause the heat transfer in composite and cellular materials. It shows models for all important classes of composite materials and introduces into the latest advances. In three parts, the book covers Composite Materials (Part A), Porous and Cellular Materials (Part B) and the appearance of a conjoint solid phase and fluid aggregate (Part C).

More on www.springer.com/978-3-642-04402-1
Due June 2010
2010. Approx. 480 p. (Advanced Structured Materials, 2)
978-3-642-04402-1 ▶ approx. 129,95 €
Classical Electrodynamics, Wave Phenomena

Forthcoming
S.N. Lyle

Self-Force and Inertia

Old Light on New Ideas

The vast majority of particles in particle physics are today considered to be bound states of other particles. All forms of binding energy and kinetic energy in such a state have to be included in its inertial mass. This book revises the classical explanation for this in the case of electromagnetic interactions. But it is also a reminder of the many benefits of this classical understanding that are simply dropped in modern accounts of inertia. This is a book for the motivated student who feels it is useful to remember where our theories come from. There is also a comprehensive overview of the state of the art in particle physics.

More on www.springer.com/978-3-642-04784-8
Due January 2010
2010. XIV, 415 p. 38 illus. (Lecture Notes in Physics, 796)
978-3-642-04784-8 ► 69,95 €

Classical and Quantum Gravitation, Relativity Theory

Forthcoming
L. Blanchet, A. Spallucci, B. Whiting

Mass and Motion in General Relativity

Our current perspective on gravitation has arisen over millennia, through falling apples, lift thought experiments and stars spiraling into black holes. In this volume, the world’s leading scientists offer a multifaceted approach to mass by giving a concise and introductory presentation into their particular research on gravity. The main theme is mass and its motion within general relativity and other theories of gravity, particularly for compact bodies. Within this framework, all articles are tied together coherently, covering post-Newtonian and related methods as well as the self-force approach to the analysis of motion in curved space-time, closing with an overview of the historical development and a snapshot on the actual state of the art. All contributions reflect the fundamental role of mass in physics, from issues related to Newton’s laws via the effect of self-force and radiation reactions within theories of gravitation to the role of the Higgs boson in modern physics. Precision measurements are described in detail, modified theories of gravity reproducing experimental data are investigated as alternatives to dark matter, and the fundamental problem of reconciling any theory of gravity with the physics of quantum fields is addressed. Auxiliary chapters set the framework for theoretical contributions within the wider context of experimental physics. The book is based upon the lectures of the CNRS School on Mass held in Orléans, France, in June 2008.

Due April 2010
2010. Approx. 600 p. (Fundamental Theories of Physics, 162)
978-90-481-3014-6 ► approx. 139,95 €

Forthcoming
I. Ciufolini, R.A. Matzner

General Relativity and John Archibald Wheeler

Observational and experimental data pertaining to gravity and cosmology are changing our view of the Universe. General relativity is a fundamental key for the understanding of these observations and its theory is undergoing a continuing enhancement of its intersection with observational and experimental data. These data include direct observations and experiments carried out in our solar system, among which there are direct gravitational wave astronomy, frame dragging and tests of gravitational theories from solar system and spacecraft observations. This book explores John Archibald Wheeler’s seminal and enduring contributions in relativistic astrophysics and includes: the General Theory of Relativity and Wheeler’s influence; recent developments in the confrontation of relativity with experiments; the theory describing gravitational radiation, and its detection in Earth-based and space-based interferometer detectors as well as in Earth-based bar detectors; the mathematical description of the initial value problem in relativity and applications to modeling gravitational wave sources via computational relativity; the phenomenon of frame dragging and its measurement by satellite observations. All of these areas were of direct interest to Professor John A. Wheeler and were seminal influenced by his ideas.

Due March 2010
2010. Approx. 490 p. 15 illus. in color. (Astrophysics and Space Science Library, 367)
978-90-481-3734-3 ► 119,95 €

Forthcoming
S. Matsarese, V. Gorini, U. Moschella

Dark Matter and Dark Energy

This book developed from a doctoral school sponsored by the Italian Society of General Relativity and Gravitation, and brings together contributions from leading international authorities in the field to provide a review of the developments in the study of dark matter and dark energy, as seen from both their cosmological and particle physics side. Studying the physical and astrophysical properties of the dark components of our Universe is a crucial step towards the ultimate goal of unveiling their nature. The book starts with a concise introduction to the standard cosmological model, as well as with a presentation of the theory of linear perturbations around a homogeneous and isotropic background. It covers the particle physics and cosmological aspects of dark matter and (dynamical) dark energy, including a discussion of how modified theories of gravity could provide a possible candidate for dark energy. A detailed presentation is also given of the possible ways of testing the theory in terms of cosmic microwave background, galaxy redshift surveys and weak gravitational lensing observations. A self-contained introduction to the techniques and most important results of numerical (e.g. N-body) simulations in cosmology is included.

Due January 2010
2010. IV, 450 p. (Astrophysics and Space Science Library, 370)
978-90-481-8684-6 ► approx. 129,95 €

Forthcoming
A.A. Ungar

Hyperbolic Triangle Centers

The Special Relativistic Approach

After A. Ungar had introduced vector algebra and Cartesian coordinates into hyperbolic geometry in his earlier books, along with novel applications in Einstein’s special theory of relativity, the purpose of his new book is to introduce hyperbolic barycentric coordinates, another important concept to embed Euclidean geometry into hyperbolic geometry. It will be demonstrated that, in full analogy to classical mechanics where barycentric coordinates are related to the Newtonian mass, barycentric coordinates are related to the Einsteinian relativistic mass in hyperbolic geometry. Contrary to general belief, Einstein’s relativistic mass hence meshes up extraordinarily well with Minkowski’s four-vector formalism of special relativity. In Euclidean geometry, barycentric coordinates can be used to determine various triangle centers. While there are many known Euclidean triangle centers, only few hyperbolic triangle centers are known, and none of the known hyperbolic triangle centers has been determined numerically with respect to its hyperbolic triangle vertices. In his recent research, the author set the ground for investigating hyperbolic triangle centers via hyperbolic barycentric coordinates, and one of the purposes of this book is to initiate a study of hyperbolic triangle centers in full analogy with the rich study of Euclidean triangle centers. Owing to its novelty, the book is aimed at a large audience: it can be enjoyed equally by upper-level undergraduates, graduate students, researchers and academics in geometry, abstract algebra, theoretical physics and astronomy. For a fruitful reading of this book, familiarity with Euclidean geometry is assumed. Mathematical physicists and theoretical physicists are likely to enjoy the study of Einstein’s special relativity in terms of its underlying hyperbolic geometry. Geometers may enjoy the hunt for new hyperbolic triangle centers and finally, astronomers may use hyperbolic barycentric coordinates in the velocity space of cosmology.

Due May 2010
2010. Approx. 400 p. (Fundamental Theories of Physics, 166)
978-90-481-8636-5 ► approx. 119,95 €
Beyond the Big Bang
Competing Scenarios for an Eternal Universe

The Big Bang model is now both theoretically and empirically well established, although it does not explain the mystery of the very beginning of our universe. Over recent years, however, new developments open up the exciting prospect of going “beyond” the Big Bang and even of finding a physical explanation for it. Surprisingly, the ancient idea of a past-eternal universe is being revived, but a variety of other fascinating new approaches -- from the Holographic Universe to Cosmic Natural Selection -- are also being pursued. This book provides an up-to-date overview of each of these competing scenarios with original contributions from the world’s leading researchers in cosmology, who describe their own work and results in a manner understandable even to non-specialists. “The stellar line-up of contributors to this volume are working at the cutting edge of cosmological research, and are poised to take our understanding of the universe beyond the big bang into an even stranger realm.” -- Paul Davies “This book provides a wonderful overview of current ideas on these ultimate cosmic questions, written by scientists working at the forefront of cosmological research.” -- Alex Vilenkin

More on www.springer.com/978-3-642-04828-9
Due February 2010
2010. X, 200 p. (Lecture Notes in Physics, 800)
978-3-642-04828-9 ▶ 59,95 €

Cosmology

Forthcoming
U. Messerschmidt

Dislocation Dynamics During Plastic Deformation

The book gives an overview of the dynamic behavior of dislocations and its relation to plastic deformation. It introduces the general properties of dislocations and treats the dislocation dynamics in some detail. Finally, examples are described of the processes in different classes of materials, i.e. semiconductors, ceramics, metals, intermetallic materials, and quasicrystals. The processes are illustrated by many electron micrographs of dislocations under stress and by an accompanying video DVD with clips taken dur-
Elementary Particles, Quantum Field Theory

The series Advances in the Physics of Particles and Nuclei (APPN) is devoted to the archiving, in printed high-quality book format, of the comprehensive, long shelf-life reviews published in The European Physical Journal A and C. APPN will be of benefit in particular to those librarians and research groups, who have chosen to have only electronic access to these journals. Occasionally, original material in review format and refereed by the series’ editorial board will also be included. This volume contains the following four reviews: C.E. DeTar and U.M. Heller: QCD Thermodynamics and Lattice Dynamics; C. Holstein: Hadronic Parity Violation and Effective Field Theory; M. Signore and D. Puy: Cosmic Microwave Background and First Molecules in the Early Universe; S. Bethke: The 2009 World Average of alphas.

More on www.springer.com/978-3-642-03176-2
Due January 2010
978-3-642-03176-2 ► 139,95 €

Extraterrestrial Physics, Space Sciences

Forthcoming
U.R. Christensen, A. Balogh, D. Breuer, K. Glässmeier

Planetary Magnetism

The articles in this volume cover, for the first time, all aspects of planetary magnetism, from the observations made by space missions to their interpretation in terms of the properties of all the planets in the solar system. Studies of dynamo-generated magnetic fields in Mercury, the Earth, the giant planets, as well as in Ganymede, one of Jupiter’s moons, are presented. Crustal magnetic field in Mars, the Moon and the Earth are described as well as magnetic fields induced in the solar system bodies. There are several articles dealing with dynamo theory and modelling and applications to the different planets.

Due January 2010
2010. Approx. 540 p. 195 illus., 110 in color. (Space Sciences Series of ISSI, 33)
978-1-4419-5900-3 ► approx. 119,95 €

Solar Neutrons and Related Phenomena

This book presents the first comprehensive compilation and review of the extensive body of experimental and theoretical material on solar neutrons and related phenomena published in the scientific literature over the last forty years. Phenomena related to solar neutrons are more specifically: the decay products of solar neutrons solar gamma rays generated in processes like nuclear reactions between solar energetic charged particles and matter of the solar atmosphere, as well as by the capture of solar neutrons by hydrogen atoms in the solar atmosphere the propagation of solar neutrons, solar gamma rays and other secondary particles through the solar photosphere, chromosphere and corona, as well as through interplanetary space and through the Earth’s atmosphere. Models and simulations of particle acceleration, interactions, and propagation processes show that observations of solar neutrons and gamma rays in space and in the Earth’s atmosphere yield essential and unique information on the source function of energetic solar particles, as well as on the chemical composition and density distribution of plasma in the solar atmosphere. The results described in the book may also be useful for astrophysical studies of other stars and different astrophysical objects, as well as for space weather problems. The book will serve as a reference work for researchers and students in solar physics, plasma, neutron, and gamma ray physics, as well as in cosmic ray physics, space science, geophysics and those researching space weather problems.

Due February 2010
978-90-481-3736-7 ► 149,95 €

Laser Technology and Physics, Photonics

Forthcoming
A. Miotello, P.M. Ossi

Laser-Surface Interactions for New Materials Production Tailoring Structure and Properties

The book grew from the lectures of the International School “Laser-surface interactions for new materials production: tailoring structure and properties” held in Venice (Italy) from 13 to 20 July, 2008. It is an updated overview concerning nanosecond and ultrashort laser-induced phenomena, and the related diagnostics. The principles of laser-surface interactions are discussed and the strong interplay between experimental and theoretical investigations highlighted. Material classes span from polymers to ceramics and metals, including piezoelectrics, ferroelectrics, biomaterials, glasses, functional coatings. Laser direct writing, lasers in cultural heritage and MAPLE are considered and computer modelling focuses on atomic-level simulations and on continuum models. More on www.springer.com/978-3-642-03306-3
Due January 2010
2010. XII, 362 p. 200 illus., 23 in color. (Springer Series in Materials Science, 130)
978-3-642-03306-3 ► 119,95 €

High Spectral Density Optical Communication Technologies

The latest hot topics of high-spectral density optical communication systems using digital coherent optical fibre communication technologies are covered by this book. History and meaning of a “renaissance” of the technology, requirements to the Peta-bit/s class “new generation network” are also covered in the first part of this book. The main topics treated are electronic and optical devices, digital signal processing including forward error correction, modulation formats as well
as transmission and application systems. The book serves as a reference to researchers and engineers.

More on www.springer.com/978-3-642-10418-3
Due February 2010
2010. Approx. 240 p. 130 illus., 10 in color. (Optical and Fiber Communications Reports, 6)
978-3-642-10418-3 ► approx. 99,95 €

**O. Svelto**

**Principles of Lasers**

This new Fifth Edition of Principles of Lasers incorporates corrections to the previous edition. The text's essential mission remains the same: to provide a wide-ranging yet unified description of laser behavior, physics, technology, and current applications. Dr. Svelto emphasizes the physical rather than the mathematical aspects of lasers, and presents the subject in the simplest terms compatible with a correct physical understanding. Praise for earlier editions: "Professor Svelto is himself a longtime laser pioneer and his text shows the breadth of his broad acquaintance with all aspects of the field ... Anyone mastering the contents of this book will be well prepared to understand advanced treatises and research papers in laser science and technology." (Arthur L. Schawlow, 1981 Nobel Laureate in Physics) "Already well established as a self-contained introduction to the physics and technology of lasers ... Professor Svelto's book, in this lucid translation by David Hanna, can be strongly recommended for self-study or teaching at the final-year undergraduate or first-year post-graduate levels." (Physics Bulletin) "A thorough understanding of this book in conjunction with one of the existing volumes on laser safety will go a long way in providing the health physicist with the understanding he needs ... Highly recommended." (Health Physics) "Introduces laser science and technology with the accessibility appropriate for the nonspecialist and the enthusiastic of the pioneer." (Laser Focus) "A very good introduction to laser theory and practice ... aimed at upper-level undergraduate students. It is logically organized and easy to read ... Most of the basic mathematical framework needed to understand this evolving field is presented. Every chapter contains a good set of problems, answers to some of which are given in the back." (Sci-Tech News) Orazio Svelto is professor of Physics at the Politecnico Institute of Milan. His research has covered a wide range of activity in the field of laser physics and photonics from the early beginnings (1962) of these disciplines. This activity includes ultrashort-pulse generation and applications, physics of laser resonators and techniques of mode selection, laser applications in biology and biomedicine, and physics of solid-state lasers. Professor Svelto is the author of more than 200 scientific papers and holds 3 patents; his research has been the subject of more than 60 invited papers at international conferences. He has served as a program chair of the IX International Quantum Electronics Conference (Amsterdam, 1976), general co-chair of the first CLEO-Europe Conference (Amsterdam, 1994) and program co-chair for 2002 International Quantum Electronics Conference (Moscow). He is the recipient of the Quantum Electronics Prize of the European Physical Society and the Charles H. Townes Award of the Optical Society of America. He is fellow of the OSA and of the IEEE and he is an elected member of the Italian "Accademia dei XL" and of the "Accademia Nazionale dei Lincei."

Due January 2010
2010. XXVI, 620 p. 292 illus.
978-1-4419-1301-2 ► 79,95 €

**Magnetism, Magnetic Materials**

**Forthcoming**

E. Beaurepaire, H. Bulou, F. Scheurer, J. Kappler

**Magnetism and Synchrotron Radiation**

New Trends

Advances in the synthesis of new materials with often complex, nano-scaled structures require increasingly sophisticated experimental techniques that can probe the electronic states, the atomic magnetic moments and the magnetic microstructures responsible for the properties of these materials. At the same time, progress in synchrotron radiation techniques has ensured that these light sources remain a key tool of investigation, e.g. synchrotron radiation sources of the third generation are able to support magnetic imaging on a sub-micrometer scale. With the Fifth Mittelwihr School on Magnetism and Synchrotron Radiation, the tradition of teaching the state-of-the-art on modern research developments continues and is expressed through the present set of extensive lectures provided in this volume. While primarily aimed at postgraduate students and newcomers to the field, this volume will also benefit researchers and lecturers actively working in the field.

More on www.springer.com/978-3-642-04497-7
Due January 2010
2010. XII, 450 p. (Springer Proceedings in Physics, 133)
978-3-642-04497-7 ► 189,95 €

**Forthcoming**

C. Lacroix, F. Mila, P. Mendels

**Introduction to Frustrated Magnetism**

Materials, Experiments, Theory

The field of Highly Frustrated Magnetism has developed and expanded considerably over the last 15 years. Originating with canonical geometric frustration of interactions, it today extends over other phenomena with many degrees of freedom, including magneto-elastic couplings, orbital degrees of freedom, dilution effects, and electron doping. It is also demonstrated that the concept of frustration impacts many other fields in physics beyond magnetism. This book represents a state-of-the-art review aimed at a broad audience with tutorial chapters and more topical ones, which encompass solid-state chemistry as well as experimental and theoretical physics.

More on www.springer.com/978-3-642-10588-3
Due April 2010
978-3-642-10588-3 ► approx. 149,95 €

**Domains in Ferroic Crystals and Thin Films**

Domains in Ferroic Crystals and Thin Films presents experimental findings and theoretical understanding of ferroic (non-magnetic) domains developed during the past 60 years. It addresses the situation by looking specifically at bulk crystals and thin films, with a particular focus on recently-developed microelectronic applications and methods for observation of domains with techniques such as scanning force microscopy, polarized light microscopy, scanning optical microscopy, electron microscopy, and surface decorating techniques. Domains in Ferroic Crystals and Thin Films covers a large area of material properties and effects connected with static and dynamic properties of domains, which are extremely relevant to materials referred to as ferroics. In most solid state physics books, one large group of ferroics is customarily covered: those in which magnetic properties play a dominant role. Numerous books are specifically devoted to magnetic ferroics and cover a wide spectrum of magnetic domain phenomena. In contrast, Domains in Ferroic Crystals and Thin Films concentrates on domain-related phenomena in nonmagnetic ferroics. These materials are still inadequately represented in solid state physics, and this volume fills that need.

More on www.springer.com/978-1-4419-1416-3
Due January 2010
978-1-4419-1416-3 ► approx. 154,90 €
Mathematical Methods in Physics

Forthcoming
K. Binder, D.W. Heermann

Monte Carlo Simulation in Statistical Physics
An Introduction

Monte Carlo Simulation in Statistical Physics deals with the computer simulation of many-body systems in condensed-matter physics and related fields of physics, chemistry and beyond, to traffic flows, stock market fluctuations, etc. Using random numbers generated by a computer, probability distributions are calculated, allowing the estimation of the thermodynamic properties of various systems. This book describes the theoretical background to several variants of these Monte Carlo methods and gives a systematic presentation from which newcomers can learn to perform such simulations and to analyze their results. The fifth edition covers Classical as well as Quantum Monte Carlo methods. Furthermore a new chapter on the sampling of free-energy landscapes has been added. To help students in their work a special web server has been installed to host programs and discussion groups (http://wwwcp.tphys.uni-heidelberg.de). Prof. Binder was awarded the Berni J. Alder CECAM Award for Computational Physics 2001 as well as the Boltzmann Medal in 2007.

More on www.springer.com/978-3-642-03162-5
Due January 2010

2010. Approx. 190 p. 70 illus. 978-3-642-03162-5 | 59,95 €

Generalized Gaussian Error Calculus

The proposed book Generalized Gaussian Error Calculus addresses for the first time since 200 years a rigorous, complete and self-consistent revision of the Gaussian error calculus. Since experimentalists realized that measurements in general are burdened by unknown systematic errors, the classical, widespread used evaluation procedures scrutinizing the consequences of random errors alone turned out to be obsolete. As a matter of course, the error calculus to be, treating random and unknown systematic errors side by side, should ensure the consistency and traceability of physical units, physical constants and physical quantities at large. The generalized Gaussian error calculus considers unknown systematic errors to spawn biased estimators. Beyond, random errors are asked to conform to the idea of what the author calls well-defined measuring conditions. The approach features the properties of a building kit: any overall uncertainty turns out to be the sum of a contribution due to random errors, to be taken from a confidence interval as put down by Student, and a contribution due to unknown systematic errors, as expressed by an appropriate worst case estimation.

More on www.springer.com/978-3-642-05093-0
Due January 2010

2010. XII, 380 p. (Lecture Notes in Physics, 798) 978-3-642-05093-0 | 69,95 €

Materials Science (general)

Advances in Macromolecules
Perspectives and Applications

Advances in Macromolecules demonstrates the recent advances in the research and development of macromolecules with particular emphasis on synthetic and naturally occurring polymeric materials. Many examples and figures are provided for the most investigated macromolecules in the fields of basic research and technological applications. The importance of macromolecular nanostructures in the breakthrough of science is extensively addressed from the point of view of synthesis routes, characterization (e.g. XPS and NEXAFS spectroscopy) and outstanding properties (e.g. second order non linear optical (NLO) properties). Fundamental advances in the field of biotechnology and biomedicine that include the involvement of macromolecules are also highlighted due to their future challenges and capacity for the improvement of health and nanotechnology. The reviewed, multidisciplinary topics of the book endeavour to stimulate scientists’ interest in this fascinating field of materials science. A concise but non-exhaustive overview of both new and classic noteworthy literature is addressed. The introduction to each chapter illustrates the basic concepts which are required for the understanding of the related subjects, with the aid of schemes, formulas and figures. This approach is dedicated to graduate students who are interested in the main issues that are the most exciting and challenging in macromolecular science.

More on www.springer.com/978-90-481-3191-4
Due February 2010


Generalized Gaussian Error Calculus

The proposed book Generalized Gaussian Error Calculus addresses for the first time since 200 years a rigorous, complete and self-consistent revision of the Gaussian error calculus. Since experimentalists realized that measurements in general are burdened by unknown systematic errors, the classical, widespread used evaluation procedures scrutinizing the consequences of random errors alone turned out to be obsolete. As a matter of course, the error calculus to be, treating random and unknown systematic errors side by side, should ensure the consistency and traceability of physical units, physical constants and physical quantities at large. The generalized Gaussian error calculus considers unknown systematic errors to spawn biased estimators. Beyond, random errors are asked to conform to the idea of what the author calls well-defined measuring conditions. The approach features the properties of a building kit: any overall uncertainty turns out to be the sum of a contribution due to random errors, to be taken from a confidence interval as put down by Student, and a contribution due to unknown systematic errors, as expressed by an appropriate worst case estimation.

More on www.springer.com/978-3-642-05093-0
Due January 2010

2010. XII, 380 p. (Lecture Notes in Physics, 798) 978-3-642-05093-0 | 69,95 €


**Measurement Science, Instrumentation**

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**Metallic Materials**

**Forthcoming**

C. Mei, J. Zhou, X. Peng, N. Zhou, P. Zhou

**Simulation and Optimization of Furnaces and Kilns for Nonferrous Metallurgical Engineering**

"Simulation and Optimization of Furnaces and Kilns for Nonferrous Metallurgical Engineering" is based on advanced theories and research methods for fluid flow, mass and heat transfer, and fuel combustion. It introduces a hologram simulation and optimization methods for fluid field, temperature field, concentration field, and electro-magnetic field in various kinds of furnaces and kilns. Practical examples and a detailed introduction to methods for simulation and optimization of complex systems are included as well. These new methods have brought significant economic benefits to the industries involved. The book is intended for researchers and technical experts in metallurgical engineering, materials engineering, power and thermal energy engineering, chemical engineering, and mechanical engineering. Chi Mei, Jiemin Zhou, Xiaooi Peng, Naijun Zhou and Ping Zhou are all professors at School of Energy Science and Engineering, Central South University, Changsha, Hunan Province, China.

More on [www.springer.com/978-3-642-00247-2](http://www.springer.com/978-3-642-00247-2)

Due February 2010

2010. Approx. 450 p. 132 illus. 978-3-642-00247-2 \(\text{\(\text{\textit{\textdegree}99,00 \text{\textct{\texteuro}}\)}}\)

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**Nanotechnology**

**Forthcoming**

B. Bhushan

**Scanning Probe Microscopy in Nanoscience and Nanotechnology**

This book presents the physical and technical foundation of the state of the art in applied scanning probe techniques. It constitutes a timely and comprehensive overview of SPM applications. The chapters in this volume relate to scanning probe microscopy techniques, characterization of various materials and structures and typical industrial applications, including topographic and dynamical surface studies of thin-film semiconductors, polymers, paper, ceramics, and magnetic and biological materials. The chapters are written by leading researchers and application scientists from all over the world and from various industries to provide a broader perspective. With a foreword by the co-inventor of AFM, Christoph Gerber.

More on [www.springer.com/978-3-642-03534-0](http://www.springer.com/978-3-642-03534-0)

Due January 2010

2010. Approx. 1170 p. 300 illus. (NanoScience and Technology.) 978-3-642-03534-0 \(\text{\(\text{\textit{\textdegree}169,95 \text{\textct{\texteuro}}\)}}\)

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**Forthcoming**

D. Heitmann

**Quantum Materials, Lateral Semiconductor Nanostructures, Hybrid Systems and Nanocrystals**

Semiconductor nanostructures are ideal systems to tailor the physical properties via quantum effects, utilizing special growth techniques, self-assembly, wet chemical processes or lithographic tools in combination with tuneable external electric and magnetic fields. Such systems are called "Quantum Materials". The electronic, photonic, and phononic properties of these systems are governed by size quantization and discrete energy levels. The charging is controlled by the Coulomb blockade. The spin can be manipulated by the geometrical structure, external gates and by integrating hybrid ferromagnetic emitters. This book reviews sophisticated preparation methods for quantum materials based on III-V and II-VI semiconductors and a wide variety of experimental techniques for the investigation of these interesting systems. It highlights selected experiments and theoretical concepts and gives such a state-of-the-art overview about the wide field of physics and chemistry that can be studied in these systems.

More on [www.springer.com/978-3-642-10552-4](http://www.springer.com/978-3-642-10552-4)

Due April 2010

2010. Approx. 450 p. 240 illus., 100 in color. (NanoScience and Technology.) 978-3-642-10552-4 \(\text{\(\text{\textit{\textdegree}119,95 \text{\textct{\texteuro}}\)}}\)

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**Forthcoming**

M. Hiramatsu, M. Hori

**Carbon Nanowalls**

**Synthesis and emerging applications**

Representing the first text to cover this exciting new area of research, this book will describe synthesis techniques of CNWs, their characterization and various expected applications using CNWs. Carbon-nanowalls (CNWs) can be described as two-dimensional graphite nanostructures with edges comprised of stacks of plane graphene sheets standing almost vertically on the substrate. These sheets form a wall structure with a high aspect ratio. The thickness of CNWs ranges from a few nm to a few tens of nm. The large surface area and sharp edges of CNWs may prove useful for a number of applications such as electrochemical devices, field electron emitters, storage materials for hydrogen gas, catalyst support. In particular, vertically standing CNWs with a high surface-to-
Nanotechnology

Forthcoming

T. Kijima

Inorganic and Metallic Nanotubular Materials
Recent Technologies and Applications

This book describes the synthesis, characterization and applications of inorganic and metallic nanotubular materials. It covers a wide variety of nanotubular materials excluding carbon nanotubes, ranging from metal oxides, sulfides and nitrides such as titanium oxide, tungsten sulfide, and boron nitride, as well as platinum and other noble-metals to unique nanotubes consisting of water, graphene or fullerene. Based on their structural and compositional characteristics, these nanotubular materials are of importance for their potential applications in electronic devices, photocatalysts, dye-sensitized solar cells, nanothermometers, electrodes for fuel cells and batteries, sensors, and reinforcing fillers for plastics, among others. Such materials are also having a great impact on future developments, including renewable-energy sources as well as highly efficient energy-conversion and energy-saving technologies. This book will be of particular interest to experts in the fields of nanotechnology, material science and inorganic and solid-state chemistry, as well as graduate students in chemistry and physics.

More on www.springer.com/978-3-642-04649-0
Due January 2010
2010. Approx. 410 p. 100 illus. (Lecture Notes in Physics, 795)
978-3-642-04649-0 ▶ 69,95 €

C. Massobrio, H. Bulou, C. Goyhenex

Atomic-Scale Modeling of Nanosystems and Nanostructured Materials

The book covers a variety of applications of modern atomic-scale modeling of materials in the area of nanoscience and nanostructured systems. By highlighting the most recent achievements obtained within a single institute, at the forefront of material science studies, the authors are able to provide a thorough description of properties at the nanoscale. The areas covered are structural determination, electronic excitation behaviors, clusters on surface morphology, spintronics and disordered materials. For each application, the basics of methodology are provided, allowing for a sound presentation of approaches such as density functional theory (of ground and excited states), electronic transport and molecular dynamics in its classical and first-principles forms. The book is a timely collection of theoretical nanoscience contributions fully in line with current experimental advances.

More on www.springer.com/978-3-642-04649-0
Due January 2010
2010. Approx. 290 p. 206 illus., 6 in color. (Nanostructure Science and Technology, )
978-1-4419-1423-1 ▶ 129,95 €

T. Osaka, M. Datta, Y. Shacham-Diamand

Electrochemical Nanotechnologies

Nanoprocessing by means of electrochemical techniques is finding increasing application in various areas such as microelectronics, sensors, materials science, and corrosion; it has also generated new fields of research to promote interaction between biology, medicine, and microelectronics. Such interactions have led to novel approaches to miniaturization and an increased ability to fabricate structures with high lateral and vertical resolution. Understanding processes for the fabrication of nanoscale films and structures is essential for the development of new precision nanofabrication techniques. This volume reviews nanotechnology applications in selected high technology areas with particular emphasis on near- and long-term advances in these fields. The chapters in the book are classified under four different headings: Nanotechnology for energy devices, Nanotechnology for magnetic storage devices, Nanotechnology for bio-chip applications, and Nanotechnology for MEMS/Packaging. This book is suitable for scientists, engineers, and graduate students in electrochemistry, nanotechnology, microelectronics, sensors, materials science, and corrosion science.

More on www.springer.com/978-1-4419-1055-4
Due February 2010
2010. XXVI, 560 p. 100 illus. 978-1-4419-1055-4 ▶ 169,95 €

M. Razeghi

Technology of Quantum Devices

Technology of Quantum Devices covers a wide range of topics in solid state physics, presenting an overview of areas like photonics, semiconductors and crystals. The book presents the most up-to-date developments in semiconductor physics and nano-engineering, with a particular focus on specific areas like compound semiconductors, crystal growth techniques and silicon and compound semiconductor device technology. The book uses a thorough set of sample problems, including the use of clear and detailed mathematical derivations in order to present clear, concise explanations for readers. Other important areas covered include semiconductor lasers, quantum tunneling transport, quantum well intersubband photodetectors and quantum dot photodetectors. Technology of Quantum Devices is a must-read for engineers, researchers and students working in the fields of electrical engineering, materials science or solid state electronic devices.

More on www.springer.com/978-1-4419-1055-4
Due February 2010
2010. XXVI, 560 p. 100 illus. 978-1-4419-1055-4 ▶ 169,95 €

E. Ruckenstein, M. Manciu

Nanodispersions
Interactions, Stability, and Dynamics

This book collects a number of papers on nanodispersion interactions, dynamics and stability by Eli Ruckenstein and his research group at The State University of New York at Buffalo. Each paper provides insight into nanotechnology and fills the growing need for a basic understanding of nanoparticle interactions and their role in the thermodynamic or kinetic stability of nanodispersions. They should appeal to those applying nanotechnology to chemistry, biophysics, mate-
Nanoscience

The goal of the book is to cover the interdisciplinary field of nanoscience beginning with the physical principles and extending to synthesis (chemistry), materials science, nanoelectronics, nanobiology, and nanomedicine -- in a concise manner but also taking into account the recent significant developments. Based on lecture courses given by the author at his university and other universities abroad, this volume features many figures reproduced from the original papers, which are selected in order to give a convenient and rapid insight into the various fields. The bibliography encompasses the most recent papers so the reader can find there reference to earlier work, and a subject index is included.

More on www.springer.com/978-3-642-10558-6
Due May 2010
2010. Approx. 800 p. 570 illus., 10 in color. (Nanoscience and Technology.)
978-3-642-10558-6 ▶ approx. 89,95 €

Forthcoming
H. Schaefer

Optical and Electronic Materials

Electronic, Photonic and MEMS Packaging is the perfect book for all biomedical engineers, industrial electronics packaging engineers, and those engaged in bio nanotechnology applications research.

Due January 2010
978-1-4419-0039-5 ▶ 199,95 €

Forthcoming
V. Anisimov, Y. Izyumov

Electronic Structure of Strongly Correlated Materials

Electronic structure and physical properties of strongly correlated materials containing elements with partially filled 3d, 4d, 4f and 5f electronic shells is analyzed by Dynamical Mean-Field Theory (DMFT). DMFT is the most universal and effective tool used for the theoretical investigation of electronic states with strong correlation effects. In the present book the basics of the method are given and its application to various material classes is shown. The book is aimed at a broad readership: theoretical physicists and experimentalists studying strongly correlated systems. It also serves as a handbook for students and all those who want to be acquainted with fast developing filed of condensed matter physics.

More on www.springer.com/978-3-642-04825-8
Due February 2010
978-3-642-04825-8 ▶ approx. 119,95 €

Forthcoming
P.Y. Yu, M. Cardona

Fundamentals of Semiconductors

This fourth edition of the well-established Fundamentals of Semiconductors serves to fill the gap between a general solid-state physics textbook and research articles by providing detailed explanations of the electronic, vibrational, transport, and optical properties of semiconductors. The approach is physical and intuitive rather than formal and pedantic. Theories are presented to explain experimental results. This textbook has been written with both students and researchers in mind. Its emphasis is on understanding the physical properties of Si and similar tetrahedrally coordinated semiconductors. The explanations are based on physical insights. Each chapter is enriched by an extensive collection of tables of material parameters, figures, and problems. Many of these problems “lead the student by the hand” to arrive at the results. The major changes made in the fourth edition include: an extensive appendix about the important and by now well-established deep center known as the DX center, additional problems and the solutions to over fifty of the problems at the end of the various chapters. Some of the solutions contain extensions via discussion about topics of current interest in the field of semiconductor physics, such as spin-orbit coupling and k-linear band dispersion.

More on www.springer.com/978-3-642-00709-5
Due January 2010
2010. Approx. 690 p. 250 illus. in color. (Graduate Texts in Physics.)
978-3-642-00709-5 ▶ approx. 59,95 €

Nano-Bio- Electronic, Photonic and MEMS Packaging

Nanotechnologies are frequently being applied to the biotechnology area, especially in nano material synthesis. Until recently, there has been little research into how to implement nano/bio materials at the device level. Nano-Bio- Electronic, Photonic and MEMS Packaging discusses how nanofabrication techniques can be used to customize packaging for nano devices with applications to biological and biomedical research and products. Covering such topics as nano bio sensing electronics, bio device packaging, NEMS for bio devices and much more, including: Offering a comprehensive overview of nano and bio packaging Discussing nano materials as power energy sources Analyzing nanotubes, superhydrophobic self-cleaning Lotus surfaces Covering nano chemistry for bio sensor / bio medical device packaging Nano-Bio-

The Large Hadron Collider

The Large Hadron Collider
Unraveling the Mysteries of the Universe

It may at first seem that the world of subatomic physics is far removed from our daily lives. Isn’t it all just a waste of time and taxpayers’ money? Hopefully, all who read this book will come to a different conclusion. Collider physics is all about our origins, and this aspect alone makes it worthy of our very best attention. The experiments conducted within the vast collider chambers are at the forefront of humanity’s quest to unravel the great tapestry that is the universe. Everything is connected. Within the macrocosm is the microcosm. By knowing how matter is structured, how atoms and elementary particles interact, and what forces control the interactions between the particles, we discover further clues as to why the universe is the way it is, and we uncover glimpses of how everything came into being. The Large Hadron Collider (LHC), in the process of coming online at CERN, is the world’s largest and most complex machine. It represents the pinnacle of human ingenuity, and its physical characteristics, costs, and workings astound us at every turn. We are literally humbled by the machine that has been produced through a grand international collaboration of scientists. This book is about what those scientists hope to discover with the LHC, for hopes do run high, and there is much at stake. Careers, reputations and prestigious science prizes will be realized, and possibly lost, in the wake of the results that the LHC will produce. And there are risks, real and imagined. The LHC will probe the very fabric of matter and it will help us understand the very weft and the weave of the universe.

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Particle Acceleration and Detection, Beam Physics

Forthcoming
M. Beech

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Particle and Nuclear Physics (general)

Forthcoming
A. Straessner

Electroweak Physics at LEP and LHC

During more than 10 years, the LEP accelerator and the LEP experiments have taken data for a large amount of measurements at the frontier of particle physics. The main outcome is a thorough and successful test of the Standard Model of electroweak interactions. The first part of this volume gives a short theoretical introduction and describes the most important physics results obtained at LEP. Emphasis is put on the properties of the electroweak gauge bosons, which was the main research field at LEP. Details on interesting other physics effects like Colour Reconnection and Bose-Einstein Correlations are discussed as well. A summary of the current electroweak measurements as the pillars of precision tests of the theoretical models is given. The analysis of electroweak data concludes the status of electroweak physics as known today. It allows a determination of unmeasured physics parameters of the Standard Model, like the mass of the Higgs boson, but constrains also physics beyond the Standard Model. The second part of this volume introduces the expected electroweak measurements as well as Higgs boson searches at the newly built LHC. After a description of the LHC collider and its experiments, the projected performance for an improved determination of electroweak observables is presented. The masses of the W boson and the top quark as well as the weak mixing angle are being focused on. One of the main goals of the LHC experiments is however the finding of the Standard Model Higgs boson or of new physics. The search for the Higgs boson and the future determination of its properties, like mass, spin and behaviour under CP transformation, are therefore summarized, pointing out interesting relations with the LEP results. If the LHC experiments meet the expectations presented here they will definitely shed light on one of the primary questions of today’s particle physics research: the origin of electroweak symmetry breaking and of the masses of the fundamental particles.

More on www.springer.com/978-3-642-05168-5
Due February 2010

Particle and Nuclear Physics (general)

Forthcoming
G.J. Barker

b-Quark Physics with the LEP Collider
The Development of Experimental Techniques for b-Quark Studies from Z-Decay

The book reviews the unexpected impact that the LEP experiments have had on the subject of b-quark physics. The emphasis is firmly on telling the story from an experimental viewpoint. Aspects of the detectors that were essential for the reconstruction of b-hadrons are highlighted, especially the role played by silicon strip detectors and particle identification methods. The importance of solving practical issues such as detector alignment and track reconstruction to fully realize the reconstruction potential of the detectors is demonstrated along with various examples of potential problems when these aspects are not well controlled. Barker details new ideas and analysis techniques that evolved during the years of LEP running so that the information is useful to new researchers or those putting together plans for future b-physics experiments. Highlights of the final b-physics results from the LEP collaborations are reviewed in the context of results from other experiments around the world and with respect to what we learn about the Standard Model of Particle Physics.

More on www.springer.com/978-3-642-05278-1
Due February 2010

1000 Solved Problems in Modern Physics

This book basically caters to the needs of undergraduates and graduates physics students in the area of modern physics, specially particle and nuclear physics. Lecturers/tutors may use it as a resource book. The contents of the book are based on the syllabi currently used in the undergraduate courses in USA, U.K., and other countries. The book is divided into 10 chapters, each chapter beginning with a brief but adequate summary and necessary formulas, tables and line diagrams followed by a variety of typical problems useful for assignments and exams. Detailed solutions are provided at the end of each chapter.

More on www.springer.com/978-3-642-04332-1
Due January 2010

Physics (general)

Forthcoming
G. Effenberg

Refractory Metal Systems

Volume 11 of group IV presents phase diagrams, crystallographic and thermodynamic data of ternary alloy systems. The subvolume E deals with refractory metal systems, with part 2 considering selected systems from B-Mo-Ni to C-Ta-Ti. At ambient pressure the equilibria of each individual ternary system are discussed as functions of temperature yielding spatial diagrams whose sections and projections are displayed. The phase equilibria are described in terms of liquidus, solidus and solvus projections, isothermal, vertical and quasibinary sections. Data on invariant equilibria are generally given in the form of tables and reaction schemes. The volume forms a comprehensive review and rigorous systematization of the presently available data. For each system the often conflicting literature and contradictory information has been thoroughly evaluated by a team of experts, MSiT, and can thus be presented in a standard format. Back to the year 1900 the literature has been reviewed, implying possible reinterpretations from today’s state of knowledge, and incorporated in the volume. The tables and diagrams are preceded by descriptive commenting texts.

More on www.springer.com/978-3-642-02699-7
Due January 2010

1000 Solved Problems in Modern Physics

This book basically caters to the needs of undergraduates and graduates physics students in the area of modern physics, specially particle and nuclear physics. Lecturers/tutors may use it as a resource book. The contents of the book are based on the syllabi currently used in the undergraduate courses in USA, U.K., and other countries. The book is divided into 10 chapters, each chapter beginning with a brief but adequate summary and necessary formulas, tables and line diagrams followed by a variety of typical problems useful for assignments and exams. Detailed solutions are provided at the end of each chapter.

More on www.springer.com/978-3-642-04332-1
Due January 2010

Compounds with 13 to 19 Carbon Atoms

Supplement to Subvolumes C, F and I

This index is a guide to organic compounds which have material constants of general interest described in the Landolt-Börnstein / New Series. In total in the subvolumes J, K, L and M, 23865 compounds with 83941 references to numerical data are recorded. Compiled are volumes containing nuclear magnetic resonance (NMR) and nuclear quadrupole resonance (NQR) data, acoustical and optical properties, structure and molecular constants, mechanical and thermodynamic constants as well as physical properties of liquid crystals. All new compounds are given with the drawing of the chemical structure, the molecular formula, chemical names, the Chemical Abstracts reg-
Forthcoming

Y.K. Sirenko, S. Ström

Modern Theory of Gratings
Resonant Scattering: Analysis Techniques and Phenomena

Diffraction gratings are one of the most popular objects of analysis in electromagnetic theory. The requirements of applied optics and microwave engineering lead to many new problems and challenges for the theory of diffraction gratings, which force us to search for new methods and tools for their resolution. In Modern Theory of Gratings, the authors present results of the electromagnetic theory of diffraction gratings that will constitute the base of further development of this theory, which meet the challenges provided by modern requirements of fundamental and applied science. This volume covers: spectral theory of gratings (Chapter 1) giving reliable grounds for physical analysis of space-frequency and space-time transformations of the electromagnetic field in open periodic resonators and waveguides; analytic-lytic regularization procedures (Chapter 2) that, in contradistinction to the traditional frequency-domain approaches, fit perfectly for the analysis of resonant wave scattering processes; parametric Fourier method and C-method (Chapter 3) oriented to the effective numerical analysis of transformation properties of periodic interfaces and multilayer conformal arrays; new rigorous methods for analysis of special-temporal transformations of electromagnetic field that are based on the construction and incorporation into the standard finite-difference computational schemes the so-called exact absorbing boundary conditions (Chapter 4); new solution variants to the homogenization problem (Chapter 5) – the central problem arising in the synthesis of metamaterials and metasurfaces; new physical and applied results (Chapters 2 to 5) about pulsed and monochromatic wave resonant scattering by periodic structures, including structures loaded on dielectric layers or chiral and left-hand medium layers, etc. Modern Theory of Gratings is intended for researchers and postgraduate students in computational electromagnetics and optics, theoretical and applied radio physics. The material is also suitable for undergraduate courses in physics, computational physics and applied mathematics.

More on www.springer.com/978-3-642-02889-2

Due January 2010

978-3-642-02889-2 ➤ 3.790,00 €

Forthcoming

C. Wohlfarth

PVT-Data and Miscellaneous Properties of Polymer Solutions

Polymers belong to an essential material group with many applications not only for polymer manufacturers but also in physics, chemistry, medicine and engineering techniques. The presented volume is the second part of a book series connecting a complete data collection with short but precise descriptions of the different quantities and their significances. The experimental determination of the physical quantities is given as well as the influence to other physical quantities. This volume helps to choose the best material for all kinds of applications also for those which are not mentioned in polymer material books. It is focused on polymers in solutions and is intended for scientists and researchers who work on practical problems in the polymer field and who are in the need of numerical data on polymer properties.

More on www.springer.com/978-3-642-02889-2

Due January 2010

978-3-642-02889-2 ➤ 3.790,00 €

Quantum Optics, Quantum Electronics, Nonlinear Optics

Forthcoming

A. Biswas, D. Milovic, M. Edwards

Mathematical Theory of Dispersion-Managed Optical Solitons

“Mathematical Theory of Dispersion-Managed Optical Solitons” discusses recent advances covering optical solitons, soliton perturbation, optical cross-talk, Gubitov-Turitsyn Equations, quasi-linear pulses, and higher order Gubitov-Turitsyn Equations. Focusing on a mathematical perspective, the book bridges the gap between concepts in engineering and mathematics, and gives an outlook to many new topics for further research. The book is intended for researchers and graduate students in Applied Mathematics, Physics and Engineering and also it will be of interest to those who are conducting research in non-linear fiber optics. Dr. Anjan Biswas is an Associate Professor at the Department of Applied Mathematics & Theoretical Physics, Delaware State University, Dover, DE, USA; Dr. Daniela Milovic is an Associate Professor at the Department of Telecommunications, Faculty of Electronic Engineering, University of Nis, Serbia; Dr. Matthew Edwards is the Dean of the School of Arts and Sciences at Alabama A & M University in Huntsville, AL, USA.

More on www.springer.com/978-3-642-10219-6

Due March 2010

2010. Approx. 350 p. 23 illus. (Nonlinear Physical Science, )
978-3-642-10219-6 ➤ approx. 159,00 €

Forthcoming

S.L. Chin

Femtosecond Laser Filamentation

Femtosecond Laser Filamentation gives a comprehensive review of the physics of propagation of intense femtosecond laser pulses in optical media (principally air) and the applications and challenges of this new technique. This book presents the modern understanding of the physics of femtosecond laser pulse propagation, including unusual new effects such as the self-transformation of the pulse into a white light laser pulse, intensity clamping, the physics of multiple filamentation and competition, and how filaments’ ability to melt glass leads to wave guide writing. The potential applications of laser filamentation in atmospheric sensing and the generation of other electromagnetic pulses from the UV to the radio frequency are treated, together with possible future challenges in the excitation of super-excited states of molecules. Exciting new phenomena such as filament induced ultrafast birefringence and the excitation of molecular rotational wave packets and their multiple revivals in air (gases) will also be discussed. This volume provides the most comprehensive and up-to-date discussion of these topics currently available. It will be of great interest to scientists and researchers using intense femtosecond laser pulses as well as to graduate students and researchers who wish to learn more about the field.

More on www.springer.com/978-1-4419-0687-8

Due January 2010

2010. XIV, 130 p. 63 illus. in color. (Springer Series on Atomic, Optical, and Plasma Physics, 55)
978-1-4419-0687-8 ➤ 99,95 €

Quantum Physics

Forthcoming

A.Y. Khrennikov

Ubiquitous Quantum Structure
From Psychology to Finance

Quantum-like structure is present practically everywhere. Quantum-like (QL) models, i.e. models based on the mathematical formalism of quantum mechanics and its generalizations can be successfully applied...
to cognitive science, psychology, genetics, economics, finances, and game theory. This book is not about quantum mechanics as a physical theory. The short review of quantum postulates is therefore mainly of historical value: quantum mechanics is just the first example of the successful application of non-Kolmogorov probabilities, the first step towards a contextual probabilistic description of natural, biological, psychological, social, economical or financial phenomena. A general contextual probabilistic model (Växjö model) is presented. It can be used for describing probabilities in both quantum and classical (statistical) mechanics as well as in the above mentioned phenomena. This model can be represented in a quantum-like way, namely, in complex and more general Hilbert spaces. In this way quantum probability is totally demystified: Born’s representation of quantum probabilities by complex probability amplitudes, wave functions, is simply a special representation of this type.

More on www.springer.com/978-3-642-05100-5

Forthcoming
C. Kollmitzer, M. Pivk

Applied Quantum Cryptography
Using the quantum properties of single photons to exchange binary keys between two partners for subsequent encryption of secret data is an absolutely novel technology. Only a few years ago quantum cryptography – or better: quantum key distribution – was the domain of basic research laboratories at universities. But during the last few years things changed. QKD left the laboratories and was picked up by more practical oriented teams that worked hard to develop a practically applicable technology out of the astonishing results of basic research. One major milestone towards a QKD technology was a large research and development project funded by the European Commission that aimed at combining quantum physics with complementary technologies that are necessary to create a technical solution: electronics, software, and network components were added within the project SECOQC (Development of a Global Network for Secure Communication based on Quantum Cryptography) that teamed up all expertise on European level to get a technology for future encryption. The practical application of QKD in a standard optical fibre network was demonstrated October 2008 in Vienna, giving a glimpse of the future of secure communication. Although many steps have still to be done in order to achieve a real mature technology, the corner stone for future secure communication is already laid. QKD will not be the Holy Grail of security; it will not be able to solve all problems for evermore. But QKD has the potential to replace one of the weakest parts of symmetric encryption: the exchange of the key. It can be proven that the key exchange process cannot be corrupted and that keys that are generated and exchanged quantum cryptographically will be secure for ever (as long as some additional conditions are kept). This book will show the state of the art of Quantum Cryptography and it will sketch how it can be implemented in standard communication infrastructure. The growing vulnerability of sensitive data requires new concepts and QKD will be a possible solution to overcome some of today’s limitations.

More on www.springer.com/978-3-642-04829-6

Due January 2010
2010. XII, 230 p. 80 illus., 5 in color. (Lecture Notes in Physics, 797)
978-3-642-04829-6 ▶ 59,95 €

Forthcoming
A. Wachter

Relativistic Quantum Mechanics
Which problems do arise within relativistic enhancements of the Schrödinger theory, especially if one adheres to the usual one-particle interpretation, and to what extent can these problems be overcome? And what is the physical necessity of quantum field theories? In many books, answers to these fundamental questions are given highly insufficiently by treating the relativistic quantum mechanical one-particle concept very superficially and instead introducing field quantization as soon as possible. By contrast, this monograph emphasizes relativistic quantum mechanics in the narrow sense: it extensively discusses relativistic one-particle concepts and reveals their problems and limitations, therefore motivating the necessity of quantized fields in a physically comprehensible way. The first chapters contain a detailed presentation and comparison of the Klein-Gordon and Dirac theory, always in view of the non-relativistic theory. In the third chapter, we consider relativistic scattering processes and develop the Feynman rules from propagator techniques. This is where the impossibility to get around a quantum field theoretical reasoning is discussed and basic quantum field theoretical concepts are introduced. This book addresses undergraduate and graduate physics students who are interested in a clearly arranged and structured presentation of relativistic quantum mechanics in the "narrow sense" and its connection to quantum field theories. Each section contains a short summary and exercises with solutions. A mathematical appendix rounds up this excellent introductory book on relativistic quantum mechanics.

More on www.springer.com/978-3-642-05410-5

Due February 2010
2010. XII, 300 p. (Lecture Notes in Physics, 799)
978-3-642-05410-5 ▶ 69,95 €

Solid State Physics

Forthcoming
K.W. Böer

Electro-Optical Effects to Visualize Scattering and Current Distributions in Semiconductors
The book describes the basic principles that relate to field and current inhomogeneities in semiconductors and their kinetics that occur in the regime of negative differential conductances of semiconductors. The book presents the related theory and experiment. It proceeds to give for the first time the experimental methods to observe directly these inhomogeneities within the semiconductor. It analyses in detail the different ranges in which such inhomogeneities occur, when they are stationary and when not and what technical and device application result. The accompanying film on the website demonstrates all related kinetic effects. Information on these effects was previously mostly available indirectly by interpretation of current-voltage characteristics, or by point contact probing along the surface, or by changes in the luminescence spectrum. The material is based on the original papers of the research team of the author, starting in the late 50’s and updated to incl. 2008.

More on www.springer.com/978-3-642-03439-8

Due January 2010
978-3-642-03439-8 ▶ 99,95 €
More on www.springer.com/978-3-540-95955-7

The Springer Handbook of Crystal Growth brings together the science and technology of growing crystals, defect characterization and techniques, and understanding the defect formation including defects modelling. This unique effort will provide users with fundamental understanding of crystal growth and defects with the latest instrumentation/techniques available both for crystal fabrication and defects. Understanding in this rapidly advancing field deals with three main areas: Crystal growth and defect formation, growth methods, and various techniques used in characterization.

More on www.springer.com/978-3-540-74182-4
Due February 2010
2010. Approx. 1200 p. 1251 illus. in color. With DVD. 978-3-540-74182-4 ▶ 349,00 €

Forthcoming
B. Pajot

**Semiconducting and Insulating Crystals**

Optical Absorption of Impurities and Defects: Volume 1: Hydrogen-like Centres

Semiconducting and Insulating Crystals details how absorption spectroscopy provides information on the nature, concentration, charge state and configuration of impurities in crystals and also on their kinetics and transformations under annealing. After an introduction of the bulk optical properties of semiconductors and insulators and of impurities in crystals, this book presents the physical bases necessary for the understanding of impurity spectra. The description of various set-ups and accessories used in absorption spectroscopy is followed by a presentation of experimental results on specific impurities and classes of impurities and their relation with those obtained by various computation and by other experimental techniques.

More on www.springer.com/978-3-540-95955-7
Due January 2010
2009. XIX, 474 p. 150 illus., 1 in color. (Springer Series in Solid-State Sciences, 158) 978-3-540-95955-7 ▶ 149,95 €

**Statistical Physics, Dynamical Systems and Complexity (general)**

Forthcoming
J.M. Amigó

**Permutation Complexity in Dynamical Systems**

Ordinal Patterns, Permutation Entropy and All That

The study of permutation complexity can be envisioned as a new kind of symbolic dynamics whose basic blocks are ordinal patterns, that is, permutations defined by the order relations among points in the orbits of dynamical systems. Since its inception in 2002 the concept of permutation entropy has sparked a new branch of research in particular regarding the time-series analysis of dynamical systems that capitalizes on the order structure of the state space. Indeed, on one hand ordinal patterns and periodic points are closely related, yet ordinal patterns are amenable to numerical methods, while periodicity is not. Another interesting feature is that since it can be shown that random (unconstrained) dynamics has no forbidden patterns with probability one, their existence can be used as a fingerprint to identify any deterministic origin of orbit generation. This book is primarily addressed to researchers working in the field of nonlinear dynamics and complex systems, yet will also be suitable for graduate students interested in these subjects. The presentation is a compromise between mathematical rigor and pedagogical approach. Accordingly, some of the more mathematical background needed for more in depth understanding has been shifted into the appendices.

More on www.springer.com/978-3-642-00188-8
Due January 2010
2010. Approx. 370 p. (Springer Series in Synergetics, 44) 978-3-642-00188-8 ▶ 129,95 €
Nonlinear Dynamics and Chaos: Advances and Perspectives

This book is a collection of contributions on various aspects of active frontier research in the field of dynamical systems and chaos. Each chapter examines a specific research topic and, in addition to reviewing recent results, also discusses future perspectives. The result is an invaluable snapshot of the state of the field by some of its most important researchers. The first contribution in this book, "How did you get into Chaos?", is actually a collection of personal accounts by a number of distinguished scientists on how they entered the field of chaos and dynamical systems, featuring comments and recollections by James Yorke, Harry Swinney, Floris Takens, Peter Grassberger, Edward Ott, Lou Pecora, Itamar Procaccia, Michael Berry, Giulio Casati, Valentin Afrimovich, Robert MacKay, and last but not least, Celso Grebogi, to whom this volume is dedicated.

More on www.springer.com/978-3-642-04628-5
Due February 2010
2010. Approx. 335 p. 40 illus. in color. (Understanding Complex Systems, )
978-3-642-04628-5 ▶ 99,95 €

Structural Materials

Forthcoming
E.J. Mittemeijer

Fundamentals of Materials Science

This book offers a fundamental treatise on the basis of materials science. The book is meant to be used in the beginning of a materials science and engineering study. Topics dealt with are “crystallography”, “lattice defects”, “microstructural analysis”, “phase equilibria and transformations” and “mechanical strength”. After the basic chapters, the coverage of topics occurs to an extent surpassing what can be offered in a freshman’s course. Therefore the book can be used throughout an entire undergraduate and even graduate study as a solid background against which specialized texts can be studied. The central issue of materials science is to develop models that provide the relation between the microstructure and the properties, which is the feature distinguishing materials science from merely solid state physics and solid state chemistry. This book conveys this message.

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Fundamentals of Materials Science

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This Thin Film Metal-Oxides provides an overview of the fundamentals of thin films, such as microstructure and select deposition techniques. Functional properties of thin films are discussed within the context of applications in electronics (dielectrics for transistors, memory devices) and energy (fuel cell membranes, solar cells and gas separation). Readers will find a detailed description of atomic deposition of metal oxide thin films, gate dielectrics in advanced transistor devices and thin film mesostructured oxides for solar energy conversion, from leading academic and industry researchers. Engineers and students involved with electronic materials and alternative energy will find Thin Film Metal-Oxides a useful reference.

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The Challenge of Complex Systems

This book gives a general, basic understanding of the mathematical structure “nonlinearity” that lies in the depths of complex systems. Analyzing the heterogeneity that the prefix “non” represents with respect to notions such as the linear space, integrability and scale hierarchy, “nonlinear science” is explained as a challenge of deconstruction of the modern sciences. This book is not a technical guide to teach mathematical tools of nonlinear analysis, nor a zoology of so-called nonlinear phenomena. By critically analyzing the structure of linear theories, and clarifying their limitation, this book makes the meaning of “nonlinear” (and, at the same time, of “linear”) precise and concrete. The core material is accessible to a much broader audience beyond specialists. It also includes notes that describe more advanced materials for extended studies which might be rather non-trivial for specialists in physics and mathematics.

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Counting Surfaces
Combinatorics, Matrix Models and Algebraic Geometry

The problem of enumerating maps (a map is a set of polygonal ‘countries’ on a world of a certain topology, not necessarily the plane or the sphere) is an important problem in mathematics and physics, and it has many applications ranging from statistical physics, geometry, particle physics, informatics, biology, etc. This problem has been studied by many communities of researchers, mostly combinatorists, probabilists, and physicists. In 1978+, physicists have invented a method called “matrix models” to address that problem, and many results have been obtained. Besides, another important problem in mathematics and physics (in particular string theory), is to count Riemann surfaces. Riemann surfaces of a given topology are parametrized by a finite number of real parameters (called moduli), and the moduli space is a finite dimensional compact manifold of complicated topology. The number of Riemann surfaces is the volume of that moduli space. More generally, an important problem in algebraic geometry is to characterize the moduli spaces, by computing not only their volumes, but also their intersection numbers.

The so-called Witten’s conjecture (which was first proved by Kontsevich), was the assertion that Riemann surfaces can be obtained as limits of polygonal surfaces (maps), made of a very large number of very small polygons. In other words, the number of maps in a certain limit, should give the intersection numbers of moduli spaces. In this book, we show how that limit takes place. The goal of this book is to explain the “matrix model” method, to show the main results obtained with it, and to compare it with methods used in combinatorics (bijective proofs, Tutte’s equations), or algebraic geometry (Mirzakhani’s recursions). The book intends to be self-contained and pedagogical, and will provide comprehensive proofs, several examples, and will give the general formula for the enumeration of maps on surfaces of any topology. In the end, the link with more general topics such as algebraic geometry, string theory, will be discussed, and in particular we give a proof of the Witten-Kontsevich conjecture.

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distributions stem. To calculate the free energy, the Gibbs method is applied to ideal and non-ideal gases, and also to a crystalline solid. Considerable attention is paid to the Fermi-Dirac and Bose-Einstein quantum statistics and its application to different quantum gases, and electron gas in both metals and semiconductors is considered in a nonequilibrium state. A separate chapter treats the statistical theory of thermodynamic properties of an electron gas in a quantizing magnetic field.

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