N. Balkan, University of Essex, UK; M. Xavier, INSA, Toulouse, France (Eds)

**Semiconductor Modeling Techniques**

This book describes the key theoretical techniques for semiconductor research to quantitatively calculate and simulate the properties. It presents particular techniques to study novel semiconduc-
tor materials, such as 2D heterostructures, quantum wires, quantum dots and nitrogen containing III-V alloys. The book is aimed primarily at newcomers working in the field of semiconductor physics to give guidance in theory and experiment. The theoretical techniques for electronic and optoelectronic devices are explained in detail.

**Features**
- Provides valuable guidance to researchers about theoretical methods in semiconductor physics
- Gives important information for research of electronic and optoelectronic devices
- Displays examples from cutting edge research

**Contents**
Introduction to semiconductor heterostructures.
- Finite element method and applications in semiconductors.
- Theory of electronic transport in nanostructures.
- Electronic-phonon interactions.
- Nonlinear effects at high electric fields.
- Band structure engineering for optoelectronic devices.
- Tight-binding/pseudo-potential calculations.
- Theory and modelling of vertical cavity devices.
- Fundamental theory of lasers and SOAs.

**Fields of interests**
Semiconductors; Optical and Electronic Materials; Electronics and Microelectronics; Instrumentation

**Target groups**
Research

**Discount group**
P

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R. Bernardes, J. Cunha-Vaz, University of Coimbra, Portugal (Eds)

**Optical Coherence Tomography**

**A Clinical and Technical Update**

Optical Coherence Tomography represents the ultimate noninvasive ocular imaging technique although being in the field for over two-decades. This book encompasses both medical and technical developments and recent achievements. Here, the authors cover the field of application from the anterior to the posterior ocular segments (Part I) and present a comprehensive review on the development of OCT. Important developments towards clinical applications are covered in Part II, ranging from the adaptive optics to the integration on a slit-lamp, and passing through new structural and functional information extraction from OCT data. The book is intended to be informative, coherent and comprehensive for both the medical and technical communities and aims at easing the communication between the two fields and bridging the gap between the two scientific communities.

**Features**
- Clinical update through the use of OCT imaging technique
- Novel approach to imaging functional information through OCT
- Top clinical and technical researcher contributed text

**Contents**
Part I - Major Clinical Application - Present Status.
- Diabetic Macular Edema.
- Ischemia.
- OCT and Visual Acuity.
- Age-related Macular Degeneration - Drusen & Geographic Atrophy.
- Glaucoma.
- Anterior Segment.
- Part II - Perspectives and Developments.
- Segmentation.
- Polarization Sensitivity.
- Laser Doppler.
- Adaptive Optics.
- Combined OCT and Slit-Lamp.

**Fields of interests**
Medical and Radiation Physics; Ophthalmology; Optics, Optoelectronics, Plasmonics and Optical Devices

**Target groups**
Research

**Discount group**
P

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B. Bhushan, The Ohio State University, Columbus, OH, USA

**Biomimetics Inspired Surfaces**

**For Superhydrophobicity/Self-Cleaning, and Controlled Adhesion**

This book presents an overview of the general field of biomimetics - lessons from nature. It presents various examples of biomimetics, including roughness-induced superomniphobic surfaces which provide functionality of commercial interest.

**Features**
- Presents the field of biomimetics didactically
- Displays the commercial interest in applying biomimetics
- Discusses in detail the important effects: lotus effect, shark skin effect, rose petal effect
- Explains learning from nature for technology

**Contents**
Preface.
- Introduction.
- Modeling of Contact Angle for a Liquid in Contact with a Rough Surface.
- Part I: Lotus Effect.
- How to Make Hierarchical Surfaces.
- Self-Cleaning and Low Adhesion.
- Part II: Rose Petal Effect.
- Characterization of Rose Petals and Fabrication and Characterization of Superhydrophobic Surfaces with High and Low Adhesion.
- Part III: Shark Skin Effect.
- Shark-Skin Surfaces for Fluid Drag Reduction in Turbulent Flow.
- Fabrication and Characterization of Biomimetic Structures for Fluid Drag Reduction.
- Modeling, Fabrication, and Characterization of Oleophobic/phobic Surfaces.

**Fields of interests**
Biophysics and Biological Physics; Surface and Interface Science, Thin Films; Nanotechnology

**Target groups**
Research

**Discount group**
P

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Complex Hamiltonian Dynamics

This book introduces and explores modern developments in the well-established field of Hamiltonian dynamical systems. It focuses on high degree-of-freedom systems and the transitional regimes between regular and chaotic motion. The role of nonlinear normal modes is highlighted. Novel powerful numerical methods are used to study localization phenomena and distinguish sized. Novel powerful numerical methods are used to study localization phenomena and distinguish order from strongly and weakly chaotic regimes.

Features
- Introductory, self-contained and pedagogical presentation
- Covers recent topics, e.g. one-dimensional
- Hamiltonian lattices, high degree-of-freedom
- Hamiltonian systems
- Unique balance between mathematical rigor, physical insights and concrete applications

Contents

Fields of interests
Statistical Physics, Dynamical Systems and Complexity; Complexity; Information and Communication, Circuits

Target groups
Graduate

Discount group
P

Study of the Inclusive Beauty Production at CMS and Construction and Commissioning of the CMS Pixel Barrel Detector

This thesis describes one of the first measurements made at CERN’s Large Hadron Collider, the world’s largest and highest-energy particle collider. The method of analysis described in the first part is applied to the first CMS collision data collected after the LHC startup in 2010 and leads to the first experimental result for the inclusive b cross section using semileptonic decays at a center of mass energy of 7 TeV. The second part of the thesis describes the building and testing of the barrel pixel detector; the author herself played an important role in its construction, commissioning and first exploitation.

Features
- Selected by the CERN CMS-Collaboration Award Committee as the best thesis of 2010
- Describes both pioneering data analysis and equally pioneering experimental contributions to particle detection
- Valuable as an overview of the CMS experiment at CERN

Contents
The CMS Experiment at the LHC.- Heavy Flavor Physics.- Study of the Inclusive Beauty Production.- Results of First Collisions at √s = 900 GeV and √s = 2.36 TeV.- Preliminary Results of First Collisions at √s = 7 TeV.- The CMS Pixel Barrel Detector.- Construction and Commissioning of the CMS Pixel Barrel Detector.- Conclusion and Outlook.

Fields of interests
Elementary Particles, Quantum Field Theory; Particle Acceleration and Detection, Beam Physics

Target groups
Research

Discount group
P

Fifty Years of Quasars

From Early Observations and Ideas to Future Research

The 50th anniversary of the discovery of quasars in 1963 presents an interesting opportunity to ask questions about the current state of quasar research. Formatted as a series of interviews with noted researchers in the field, each of them asked to address a specific set of questions covering topics selected by the editors, this book deals with the historical development of quasar research and discusses how advances in instrumentation and computational capabilities have benefitted quasar astronomy and have changed our basic understanding of quasars. In the last part of the book the interviews address the current topic of the role of quasars in galaxy evolution.

Features
- There is no similar book discussion
- Will be suited for both students, advanced amateur astronomers, as well professional astronomers
- The book will give a first-hand historical account of quasar discovery
- The book will provide an up-to-date account of our knowledge on quasars

Contents
An introduction to fifty years of research on quasars.- Quasars in the life of astronomers.- Quasars: the observational perspectives.- Quasars classes and their relationships.- From observations to physical parameters.- Models of quasars.- Quasars in the Cosmic Environment.- The future of quasar studies.- Fifty years of quasars: current impressions and future perspectives.

Fields of interest
Astronomy, Astrophysics and Cosmology

Target groups
Graduate

Discount group
P
Young Sun, Early Earth and the Origins of Life

Lessons for Astrobiology

- How did the Sun come into existence? - How was the Earth formed? - How long has Earth been the way it is now, with its combination of oceans and continents? - How do you define "life"? - How did the first life forms emerge? - What conditions made it possible for living things to evolve?

Features

► A first colourful introduction into Astrobiology ► Provides the reader with a much deeper understanding of the formation of planets and the origin of life ► Illustrates the geological history of planet Earth in the context of the emergence of life ► Colourful presentation of the origins of the solar system, the Earth and life on Earth ► Comprehensible yet scientifically profound ► Enhanced by an appendix comprising a glossary, bibliography of further reading and a summary of the Origins of Earth and life in 7 boxes

Contents


Fields of interests

Astrobiology; Biogeosciences; Evolutionary Biology

Target groups

Lower undergraduate

Discount group

P

T. Gold
S. Mitton, St. Edmund’s College, Cambridge, UK (Ed)
Taking the Back off the Watch
A Personal Memoir

Thomas Gold (1920-2004) had a curious mind that liked to solve problems. He was one of the most remarkable astrophysicists in the second half of the twentieth century, and he attracted controversy throughout his career. Based on a full-length autobiography left behind by Thomas Gold, this book was edited by the astrophysicist and historian of science, Simon Mitton (University of Cambridge). The book is a retrospective on Gold’s remarkable life.

Features

► Enthralling life story of one of the most remarkable astrophysicists of the second half of the twentieth century who explained pulsars as rotating neutron stars ► With intriguing anecdotes revealing Gold’s scientific curiosity and deep understanding of physics ► Carefully edited by the author of the biography of Sir Fred Hoyle ► With a Foreword by Freeman Dyson ► Published under the auspices of the Royal Astronomical Society ► Illustrated with photographs, many never previously published

Contents


Fields of interests

Astronomy, Astrophysics and Cosmology; History of Science; Mineral Resources

Target groups

Research

Discount group

P

Available

Jointly published with the Royal Astronomical Society

2012. X, 270 p. 22 illus., 1 in color. (Astrophysics and Space Science Library, Volume 381) Hardcover

► $129.00
ISBN 978-3-642-27587-6

S. Hofmann, Max-Planck-Institut Stuttgart, Germany
Auger- and X-Ray Photoelectron Spectroscopy in Materials Science

A User-Oriented Guide

To anyone who is interested in surface chemical analysis of materials on the nanometer scale, this book is prepared to give appropriate information. Based on typical application examples in materials science, a concise approach to all aspects of quantitative analysis of surfaces and thin films with AES and XPS is provided. Starting from basic principles which are step by step developed into practically useful equations, extensive guidance is given to graduate students as well as to experienced researchers. Key chapters are those on quantitative surface analysis and on quantitative depth profiling, including recent developments in topics such as surface excitation parameter and backscattering correction factor. Basic relations are derived for emission and excitation angle dependencies in the analysis of bulk material and of fractional nano-layer structures, and for both smooth and rough surfaces. It is shown how to optimize the analytical strategy, signal-to-noise ratio, certainty and detection limit.

Feature

► This is the most comprehensive book available on this widely used analytical technique

Contents

Outline of the Technique/Brief Description. - Theoretical Background. - Instrumentation. - Practical Surface Analysis with AES. - Data Evaluation/Quantification. - Problem Solving with AES (Examples).

Fields of interests

Solid State Physics; Spectroscopy and Microscopy; Surfaces and Interfaces, Thin Films

Target groups

Research

Discount group

P

Available

2012. XXII, 506 p. 262 illus., 26 in color. (Springer Series in Surface Sciences, Volume 49) Hardcover

► approx. $129.00
ISBN 978-3-642-27380-3

Available

2012. 300 p. 250 illus. in color. Softcover

► $69.95
ISBN 978-3-642-22551-2
On Gauge Fixing Aspects of the Infrared Behavior of Yang-Mills Green Functions

Quarks are the main constituents of protons and neutrons and hence are important building blocks of all the matter that surrounds us. However, quarks have the intriguing property that they never appear as isolated single particles but only in bound states. This phenomenon is called confinement and has been a central research topic of elementary particle physics for the last few decades. In order to find the mechanism that forbids the existence of free quarks many approaches and ideas are being followed, but by now it has become clear that they are not mutually exclusive but illuminate the problem from different perspectives.

Features
- Winner of the prestigious Viktor Hess Prize of the Austrian Physical Society
- Develops a computer program for deriving complex Dyson-Schwinger equations
- Important theoretical contribution to our understanding of quark confinement

Contents

Fields of interests
Elementary Particles, Quantum Field Theory; Theoretical, Mathematical and Computational Physics; Mathematical Physics

Target groups
Research

Discount group
P

On Gauge Fixing Aspects of the Infrared Behavior of Yang-Mills Green Functions

I. M. Khalatnikov, Russian Academy of Sciences, Moscow, Russia

From the Atomic Bomb to the Landau Institute

Autobiography. Top Non-Secret

The book is an expanded autobiography of the famous theoretical physicist Isaak Khalatnikov. He worked together with L.D. Landau at the Institute for Physical Problems lead by P.L. Kapitza. He is the co-author of L.D. Landau in a number of important works. They worked together in the frame of the so-called Nuclear Bomb Project. After the death of L.D. Landau, I.M.

Features
- Historically interesting book on the development of Soviet and Russian science
- Presents the background of the Soviet nuclear bomb program in the cold war age
- Gives many interesting insights into the development of superconductivity and superfluidity
- Interesting information on his close collaboration with the Nobel laureates Landau and Ginzburg
- Presents the history and development of the Landau Institute
- Written by the most experienced and best informed person among the few living Russian scientists in the environment of Landau
- Book about the internal conditions of Soviet society, way of operating of the Soviet authorities and ways for scientists to interact with them many stories of the book never published before and considered as "top secret"

Contents
THE BEGINNING.- THE WAR.- A SPECIAL PROBLEM IN THE INSTITUTE OF PHYSICAL PROBLEMS.- MY TEACHER.- THE INSTITUTE.- WINDOW TO THE WORLD.- TODAY.

Fields of interests
History and Philosophical Foundations of Physics; Physics, general; Strongly Correlated Systems, Superconductivity

Target groups
Research

Discount group
P

Nanodust in the Solar System: Discoveries and Interpretations

Nanodust and nanometer-sized structures are important components of many objects in space. Nanodust is observed in evolved stars, young stellar objects, protoplanetary disks, and dust debris disks. Within the solar system, nanodust is observed with in-situ experiments from spacecraft. Nanometer-sized substructures are found in the collected cometary and interplanetary dust particles and in meteorites. Understanding the growth and destruction of dust, its internal evolution, as well as the optical properties and the detection of nanoparticles is of fundamental importance for astrophysical research. This book provides a focused description of the current state of research and experimental results concerning nanodust in the solar system. It addresses three major questions: What is nanodust?

Features
- Topic of fundamental importance for astrophysical research
- Written as a self-contained and complete presentation, beyond the usual format of review articles
- Combines space observations, laboratory research and theory

Contents

Target groups
Extraterrestrial Physics, Space Sciences; Astrophysics and Astroparticles; Condensed Matter Physics

Discount group
P
Acoustic Scanning Probe Microscopy

The combination of atomic force microscopy with ultrasonic methods allows the nearfield detection of acoustic signals. The nondestructive characterization and nanoscale quantitative mapping of surface adhesion and stiffness or friction is possible. The aim of this book is to provide a comprehensive review of different scanning probe acoustic techniques, including AFAM, UAFM, SNFUH, UFM, SMM and torsional tapping modes. Basic theoretical explanations are given to understand not only the probe dynamics but also the dynamics of tip surface contacts.

Features
▶ Presents the new analytical technique of acoustic scanning probe microscopy ▶ Delivers a comprehensive presentation of all related technical aspects ▶ Compares the advantages of this new technique with other established scanning probe techniques

Contents

Fields of interests
Laser Technology, Photonics; Nanotechnology and Microengineering; Acoustics

Target groups
Research

Discount group
P

Renormalization Group and Effective Field Theory Approaches to Many-Body Systems

There have been many recent and important developments based on effective field theory and the renormalization group in atomic, condensed matter, nuclear and high-energy physics. These powerful and versatile methods provide novel approaches to study complex and strongly interacting many-body systems in a controlled manner. The six extensive lectures gathered in this volume combine selected introductory and interdisciplinary presentations focused on recent applications of effective field theory and the renormalization group to many-body problems in such diverse fields as BEC, DFT, extreme matter, Fermi-liquid theory and gauge theories.

Features
▶ Edited and authored by leading researchers in the field ▶ Tutorial approach suitable for graduate students  ▶ Can be used both for self-study and additional reading for advanced courses

Contents

Fields of interests
Mathematical Methods in Physics; Nuclear Physics, Heavy Ions, Hadrons; Quantum Gases and Condensates

Target groups
Graduate

Discount group
P

Field Theoretic Method in Phase Transformations

The main subject of the book is the continuum, field theoretic method of study of phase transformations in material systems. The method, also known as “phase field”, allows one to analyze different stages of transformations on the unified platform. It has received significant attention in the materials science community recently due to many successes in solving or illuminating important problems. The book will address fundamentals of the method starting from the classical theories of phase transitions, the most important theoretical and computational results, and some of the most advanced recent applications.

Features
▶ Describes the novel and very popular method of theoretical and computational study of phase transformations and materials processing in condensed and soft matter  ▶ Discusses the foundations of the method along with the advanced results in a single volume  ▶ Serves as a primer in the area of phase transformations and as a guide for a seasoned researcher

Contents

Fields of interests
Condensed Matter Physics; Theoretical, Mathematical and Computational Physics; Materials Science, general

Target groups
Professional/practitioner

Discount group
P