New and Forthcoming Condensed Matter Physics and Statistical Physics Flyer

Featured Books

Spin Glass Theory and Far Beyond

Replica Symmetry Breaking After 40 Years

edited by **Patrick Charbonneau** *(Duke University, USA)*, **Enzo Marinari** *(Sapienza University of Rome, Italy)*, **Marc Mézard** *(Bocconi University, Italy)*, **Giorgio Parisi** *(Sapienza University of Rome, Italy)*, **Federico Ricci-Tersenghi** *(Sapienza University of Rome, Italy)*, **Gabriele Sicuro** *(King's College London, UK)* & **Francesco Zamponi** *(École Normale Supérieure, France)*

This book presents an encyclopaedic overview of the broad range of these applications. More than 30 contributions are compiled, written by many of the leading researchers who have contributed to these developments over the last few decades. Some timely and cutting-edge applications are also discussed. This collection serves well as an introduction and summary of disordered and glassy systems for advanced undergraduates, graduate students and practitioners interested in the topic.

740pp	Aug 2023
978-981-127-391-9	US$198 £180
978-981-127-392-6(ebook)	US$317 £290

Electrode and Corrosion Physics

by **Anthony T Paxton** *(Imperial College London, UK & King's College London, UK)*

This textbook fills a gap in providing a course of learning from first principles for the student, researcher and industrialist who has an undergraduate-level education in physics but only high school chemistry. The author will take you through simple electrochemical cells and the rigorous description of the many confusing "potentials" that arise across their interfaces, to what can and cannot be measured in an experiment. The first three quarters of the book are rather general, highlights being the electrochemical series and the Nernst and Butler – Volmer equations. This all lies at the heart of the science of corrosion, fuel cells and batteries. The last quarter of the book is dedicated solely to corrosion, applying the thermodynamic and kinetic groundwork laid earlier to help the reader clearly understand the two principal tools of corrosion scientists and engineers: the Evans and Pourbaix diagrams.

288pp	Jun 2024
978-1-80061-548-9	US$98 £90
978-1-80061-549-6(ebook)	US$157 £142

Field Theory of Condensed Matter and Ultracold Gases

By (author): **Nicolas Dupuis** *(CNRS, France & Sorbonne Université, France)*

This book provides a pedagogical introduction to the concepts and methods of quantum field theory necessary for the study of condensed matter and ultracold atomic gases. After a thorough discussion of the basic methods of field theory and many-body physics (functional integrals, perturbation theory, Feynman diagrams, correlation functions and linear response theory, symmetries and their consequences, etc.), the book covers a wide range of topics, from electron gas and Fermi-liquid theory to superfluidity and superconductivity, magnetic instabilities in electron systems, and dynamical mean-field theory of Mott transition. The focus is on the study of model Hamiltonians, where the microscopic physics and characteristic energy scales are encoded into a few effective parameters, rather than first-principle methods which start from a realistic Hamiltonian at the microscopic level and then make material-specific predictions. The reader is expected to be familiar with elementary quantum mechanics and statistical physics, and some acquaintance with condensed-matter physics and ultracold gases may also be useful. No prior knowledge of field theory or many-body problem is required.

688pp	Jul 2023
978-1-80061-390-4	US$178 £165
978-1-80061-391-1 (ebook)	US$285 £260

# Condensed Matter Physics and Statistical Physics
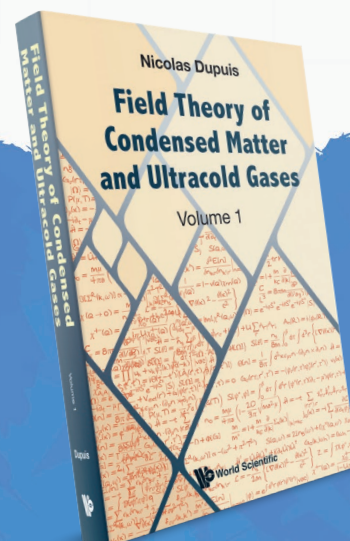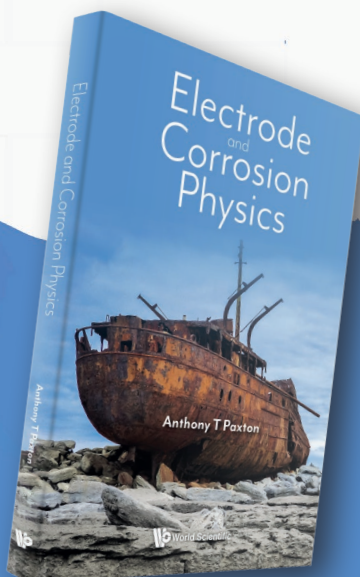
World Scientific Series in 20th Century Physics - Vol 47

Superconductivity and Beyond
Selected Papers of Alexei Abrikosov

edited by **Andrey Varlamov** (*Institute of Superconductivity and Innovative Materials of the Italian Research Council (CNR-SPIN), Italy*), **Alexander Buzdin** (*University of Bordeaux, France*)

This book is a compilation of the best papers of the Nobel Laureate Alexei Abrikosov, presenting a scientific overview of Abrikosov's life work in superconductivity. It also includes some biographical material and recollections of colleagues and friends.

In addition to Abrikosov's famous paper in which he predicted the existence of superconducting vortices, which won him the Nobel Prize, the book also contains many of his other groundbreaking papers on superconductivity, condensed matter theory, and quantum field theory. Reading these articles will help the reader gain an insight into the great physicist's way of thinking and creative thought process. Any level of interested reader, from undergraduates to active research scientists, can benefit.

| 304pp	Jun 2024	
978-981-129-178-4	US$108	£100
978-981-129-179-1(ebook)	US$173	£160
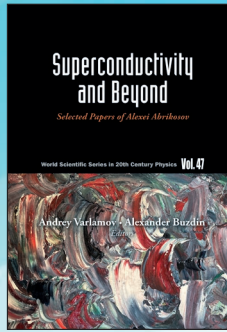
Nonequilibrium Quantum Transport Theory of Spinful and Topological Systems
A New Perspective and Foundation for Topotronics

by **Felix A Buot** (*University of San Carlos, Cebu, Philippines*)

This book employs nonequilibrium quantum transport, based on the use of mixed Hilbert space representations and real time quantum superfield transport theory, to explain various topological phases of systems with entangled chiral degrees of freedom. It presents an entirely new perspective on topological systems, entanglement-induced localization and delocalization, integer quantum Hall effect (IQHE), fractional quantum Hall effect (FQHE), and its respective spectral zones in the Hofstadter butterfly spectrum. A simple and powerful, intuitive, and wide-ranging perspective on chiral transport dynamics.

596pp	May 2024	
978-981-126-471-9	US$168	£155
978-981-126-472-6(ebook)	US$269	£250
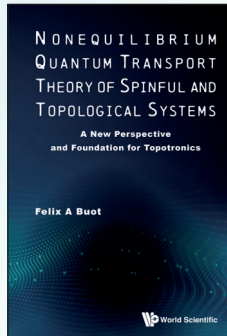
Problems and Solutions on Solid State Physics, Relativity and Miscellaneous Topics

Edited by: **Swee Cheng Lim, Choy Heng Lai** (*National University of Singapore, Singapore*), **Leong Chuan Kwek** (*Nanyang Technological University, Singapore & National University of Singapore, Singapore*)

This volume is a comprehensive compilation of carefully selected questions at the PhD qualifying exam level, including many actual questions from Columbia University, University of Chicago, MIT, State University of New York at Buffalo, Princeton University, University of Wisconsin and the University of California at Berkeley over a twenty-year period. Featuring a division into the three parts which form the title, topics covered in this book include the crystal structure, superconductivity, general relativity, special relativity, and measurements, among many others.
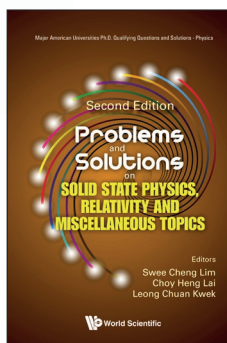
This latest edition has been updated. New problems and solutions have been added, while the original problems are modernized, excluding outdated questions and emphasizing those that rely on calculations. The problems range from fundamental to advanced in a wide range of topics, easily enhancing the student's knowledge through workable exercises. Simple-to-solve problems play a useful role as a first check of the student's level of knowledge whereas difficult problems will challenge the student's capacity on finding solutions.

Readership: Lecturers, postgraduates and advanced undergraduates in physics, especially in solid state physics, relativity, and general topics in physics.

340pp	Mar 2024	
978-981-12-9149-4	US$158	£145
978-981-12-9150-0 (ebook)	US$253	£230

Hydrodynamic Scales of Integrable Many-Body Systems

By (author): **Herbert Spohn** (*Technical University of Munich, Germany*)

This book provides a broad introduction to integrable systems with many degrees of freedom. Within a much larger orbit, discussed are models such as the classical Toda lattice, Calogero fluid, and Ablowitz-Ladik discretized nonlinear Schrödinger equation. On the quantum mechanical side, featured are the Lieb-Liniger delta-Bose gas and the quantum Toda lattice. As a genuinely novel twist, the study deals with random initial data described by generalized Gibbs ensembles with parameters of slow spatial variation. This is the hydrodynamic scale, in spirit similar to the ballistic Euler scale of nonintegrable simple fluids. While integrable microscopic particle models are very diverse, the central theme of this book is to elucidate their structural similarity on hydrodynamic scales.

| 256pp	Feb 2024	
978-981-12-8352-9	US$98	£90
978-981-12-8353-6 (ebook)	US$157	£145
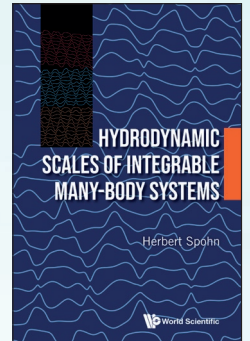
Mathematical Theory of Elasticity and Generalized Dynamics of Quasicrystals and Its Applications

by **Tian-You Fan** (*Beijing Institute of Technology, China*), **Xian-Fang Li** (*Central South University, China*), **Xiao-Hong Sun** (*Zheng Zhou University, China*), **Ming-Jun Huang** (*South China University of Technology, China*) & **Yu-Chu Liu** (*South China University of Technology, China*)

This book gives a detailed description on mathematical theory of elasticity and generalized dynamics of solid quasicrystals and its applications. It is the first and only monograph in the scope of quasicrystals since first published in 1999 in China and worldwide. It combines the mechanical and physical behavior of quasicrystals and mathematical physics, which may help graduate students and researchers in the fields of new materials, condensed matter physics, applied mathematics and engineering science.

| 636pp	Jan 2024	
978-981-127-909-6	US$168	£155
978-981-127-910-2(ebook)	US$269	£250
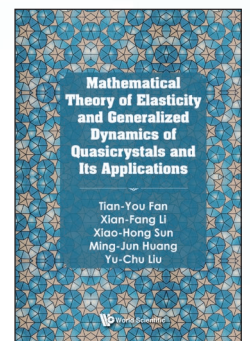
Series on the Foundations of Natural Science and Technology - Vol 17

Quantum Capacitance in Quantized Transistors

by **Kamakhya Prasad Ghatak** *(University of Engineering and Management, India)*, **Jayita Pal** *(Meghnad Saha Institute of Technology, India)*

This first-of-its-kind book book solely deals with the Quantum Capacitance (QC) In Quantized Transistors and we have considered the quantum capacitances in 2D MOSFETs (QMOSFET) of non-linear optical, ternary, quaternary, III-V compounds, II-VI, IV-VI, stressed Kane type, Ge, Gap, Bismuth telluride, Gallium Antimonide and their 1D NWFETs (NWFET) counter parts. It contains hundred open research problems which form the integral part of the text and are useful for both PhD aspirants and researchers.

888pp   Mar 2024
978-981-127-939-3   US$188   £175
978-981-127-940-9(ebook)   US$301   £275
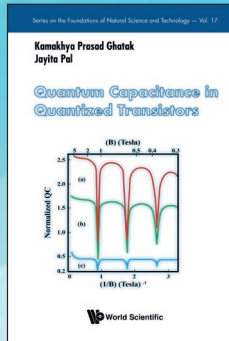
Chemical Modifications of Graphene-Like Materials

by **Nguyen Thanh Tien** *(Can Tho University, Vietnam)*, **Thi Dieu Hien Nguyen** *(National Cheng Kung University, Taiwan)*, **Vo Khuong Dien** *(National Cheng Kung University, Taiwan)*, **Wen-Dung Hsu** *(National Cheng Kung University, Taiwan)*, **Shih-Yang Lin** *(National Cheng Kung University, Taiwan)*, **Yu-Ming Wang** *(National Cheng Kung University, Taiwan)* & **Ming-Fa Lin** *(National Cheng Kung University, Taiwan)*

This book covers many graphene-related systems, such as, 1D – 3D related systems, layered graphenes, and other 2D materials. It presents a delicate first-principles calculations, experimental examinations for essential properties. It includes comprehensive theoretical results for fundamental and applied sciences, provides reliable and complete results in diversified many-body properties, and proposes potential applications for graphene-based electronic, optical, and plasmonic devices.

604pp   Jan 2024
978-981-126-793-2   US$178   £165
978-981-126-794-9(ebook)   US$285   £260
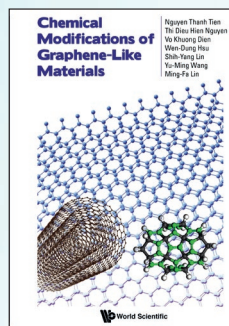
Second Harmonic and Sum-Frequency Spectroscopy

By (author): **Yuen-Ron Shen** *(University of California, Berkeley, USA)*

This book is an updated version of an earlier book on the same subject, but it puts more emphasis on physical concepts and description. It underscores recent advances of sum-frequency spectroscopy at the technical front as well as over its wide range of applications, with the author's perspective in each area. Most chapters end with a section of summary and prospects that hopefully can help stimulate interest to further develop the technique and explore possibilities of applying the technique.

400pp   Feb 2023
978-981-12-6227-2   US$148   £135
978-981-12-6228-9 (ebook)   US$237   £220
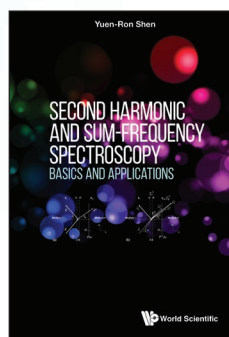
Wet Granular Matter

By (author): **Stephan Herminghaus** *(Max Planck Institute for Dynamics and Self-Organisation, Germany)*

This is a monograph written for the young and advanced researcher who is entering the field of wet granular matter, keen to understand the basic physical principles governing this state of soft matter. It treats wet granulates as a ternary system consisting of the grains, a primary, and a secondary fluid. After generally addressing wetting phenomena and outlining the basic facts on dry granular systems, a chapter on basic mechanisms and their effects is dedicated to every region of the ternary phase diagram. Effects of grain shape and roughness are considered as well. Rather than addressing engineering aspects like existing books on this topic do, this book aims to provide a generalized framework suitable for those who want to understand these systems on a more fundamental basis. It spans a wide scope of questions, ranging from possible general principles behind the emergence of structure and pattern, to the interpretation of geological outcrop features we encounter in nature.

344pp   Sep 2023
978-981-12-8225-6   US$128   £120
978-981-12-8226-3 (ebook)   US$205   £190
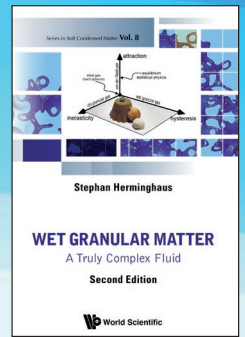
Topologically Ordered Zigzag Nanoribbon

By (author): **S-R Eric Yang** *(Korea University, South Korea)*

This is the first graduate level textbook of topologically ordered phases with emphasis on graphene zigzag nanoribbons. It also explains common properties of several other topologically ordered phases as well as the e/2 fractional charge quantization and spin-charge separation of an electron.

564pp   Mar 2023
978-981-12-6189-3   US$168   £155
978-981-12-6190-9 (ebook)   US$269   £245
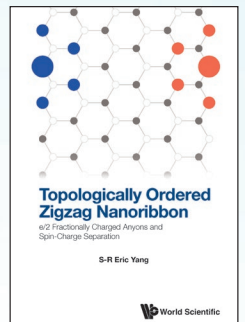
Lectures on Symmetry-Assisted Computation

By (author): **D Pescia** *(ETH Zurich, Switzerland)*

Scientific problems have an internal "beauty", called, referred to, precisely speaking, as their "symmetry". The symmetry arises, often, from the fact that the scientific problem refers to an object (a molecule, a crystal) and the object itself has some "symmetry" elements, but in more abstract situations, such as those arising in particle physics and quantum technologies, symmetry is often the only known (and relevant!) fact about the problem. The scope of these Lecture Notes is to educate how to recognize the symmetry of a scientific problem and how to use symmetry to understand, manipulate and, finally, solve it. The principle guiding these Lecture Notes is that "learning by doing" is the only way that young students can later become productive in science, business and industry. The lecture Notes have, essentially, two components. The first one reports the content of a set of lectures, held at ETH Zurich at the master and PhD level, frequented mainly by students from the department of Physics, Chemistry and Material Science. The lectures were accompanied by a set of student projects on various scientific subjects related to symmetry. These projects ended with a manuscript, worked out by the students themselves and edited into the second component of these Lecture Notes.

648pp   Dec 2023
978-981-12-8011-5   US$148   £135
978-981-12-8012-2 (ebook)   US$237   £220
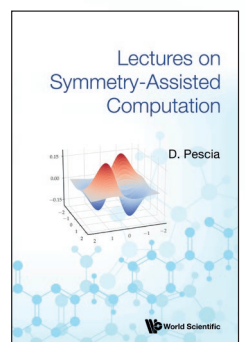
Electrical and Geometrical Properties of Organic Monolayers

by **Mitsumasa Iwamoto** *(Tokyo Institute of Technology, Japan)*, **Tetsuya Yamamoto** *(Hokkaido University, Japan)* & **Zhong-Can Ou-Yang** *(Chinese Academy of Science, China)*

This book addresses the physical mechanisms that stabilize various shapes of domains in monolayers by using dielectric physics, electrostatics, and the physics of liquid crystals. The approach using mathematical differential geometry method makes this book unique among the literatures of monolayers.

250pp   Jan 2025
978-981-4602-97-6   US$106   £100
978-981-4602-98-3(ebook)   US$170   £155

Discontinuous Phase Transitions in Condensed Matter

By (author): **Vladimir Dmitriev** *(ESRF, France)*

This book introduces a density-wave approach to phase transitions which results in a unified, symmetry-based, model-free theory of the weak crystallization of molecular mixtures to liquid-crystalline mesophases, strongly discontinuous crystallization from molten metals and alloys to conventional, fully segregated crystals, to aperiodic, quasi-crystalline structures. Assembly of aperiodic closed virus capsids with non-crystallographic symmetry also falls into the domain of applicability of the density-wave approach. It also considers the applicability domains of the symmetry-based approach in physics of low-dimensional systems. It includes comparisons of stability of different surface superstructures and metal monoatomic coverage structures on the surface of single-crystalline substrates.
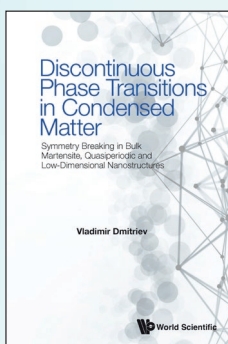
468pp   Jan 2023
978-1-80061-291-4   US$158   £145
978-1-80061-292-1 (ebook)   US$253   £235

Rich Quasiparticle Properties in Layered Graphene-related Systems

by **Chiun-Yan Lin** *(National Cheng Kung University, Taiwan)*, **Ching-Hong Ho** *(National Cheng Kung University, Taiwan)*, **Hsien-Ching Chung** *(National Cheng Kung University, Taiwan)*, **Lu-Yao Wang** *(National Cheng Kung University, Taiwan)*, **Chih-Wei Chiu** *(National Cheng Kung University, Taiwan)* & **Ming-Fa Lin** *(National Cheng Kung University, Taiwan)*
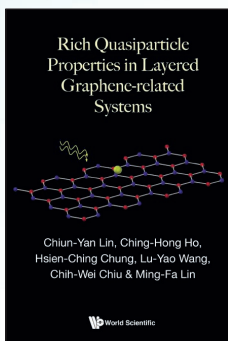
This comprehensive book delves into the fascinating world of quasiparticle properties of graphene-related materials. It covers a wide range of research topics, including long-range Coulomb interactions, dynamic charge density waves, Friedel oscillations and plasmon excitations, as well as optical reflection and transmission spectra of thin films. The calculated results are consistent with the present experimental observations, establishing it as a valuable resource for individuals interested in the quasiparticle properties of novel materials.

428pp   Jan 2024
978-981-127-778-8   US$148   £135
978-981-127-779-5(ebook)   US$237   £220

Journals

Modern Physics Letters B
https://www.worldscientific.com/worldscinet/mplb
Impact Factor: 1.8

MPLB is a peer reviewed, hybrid open-access journal which provides a channel for fast circulation of the most important and latest research findings in Condensed Matter Physics, Statistical Physics, as well as Atomic, Molecular and Optical Physics. It publishes original articles and short reports with length limitation. A strong emphasis is placed on topics of current interest such as cold atoms and molecules, new topological materials and phases, and novel low-dimensional materials.
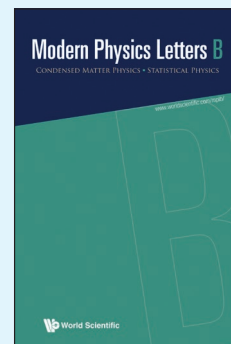
The journal also contains a Brief Reviews section with the purpose of publishing short papers on the latest experimental findings and current important theoretical developments.
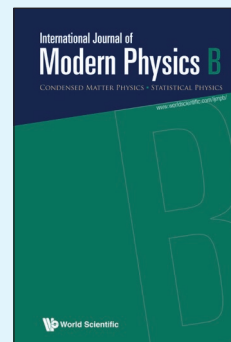
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International Journal of Modern Physics B
https://www.worldscientific.com/worldscinet/ijmpb
Impact Factor: 2.6

Launched in 1987, the International Journal of Modern Physics B covers the most important aspects and the latest developments in Condensed Matter Physics, Statistical Physics, as well as Atomic, Molecular and Optical Physics. A strong emphasis is placed on topics of current interest, such as cold atoms and molecules, new topological materials and phases, and novel low dimensional materials. One unique feature of this journal is its review section which contains articles with permanent research value besides the state-of-the-art research work in the relevant subject areas.

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