

BOOKSHELF

Books received

Order, Disorder and Criticality: Advanced Problems of Phase Transition Theory (Volume 2) edited by Yuri Holovatch, World Scientific. Hardback ISBN 9789812707673 £46 (\$85).

This is the second volume of review papers on advanced problems of phase transitions and critical phenomena, following the success of the first volume in 2004. Broadly, it aims to demonstrate that there is still a good deal of work to be done in phase transition theory, both at the fundamental level and with respect to applications. Topics include critical behaviour as explained by the non-perturbative renormalization group; critical dynamics; a space-time approach to phase transitions; self-organized criticality; and exactly solvable models of phase transitions in strongly correlated systems. Like the first volume, this one is based on the review lectures that were given in Lviv (Ukraine) at the Ising Lectures – a traditional annual workshop on phase transitions and critical phenomena that brings together scientists in the field working with university students and others interested in the subject.

The Physics of Warm Nuclei: with Analogies to Mesoscopic Systems by Helmut Hofmann, OUP Series: Oxford Studies in Nuclear Physics, Volume 25. Hardback ISBN 9780198504016 £65 (\$130).

This book offers a comprehensive survey of basic elements of nuclear dynamics at low energies and discusses their similarities to mesoscopic systems. It addresses systems with finite excitations of their internal degrees of freedom so that their collective motion exhibits features typical of transport processes in small and isolated systems. The importance of quantum aspects is examined with respect to both the microscopic damping mechanism and the nature of the transport equations, and a critical discussion of the use of thermal concepts is included. The book is considerably self-contained and presents existing models, theories and theoretical tools, from both nuclear physics and other fields, which are relevant to an understanding of the observed physical phenomena.

A Primer on the Physics of the Cosmic Microwave Background by Massimo Giovannini, World Scientific. Hardback ISBN

9789812791429 £48 (\$89).

In the past 15 years, various areas of high-energy physics, astrophysics and theoretical physics have converged on the study of cosmology. Today, therefore, any graduate student in these disciplines needs a reasonably self-contained introduction to the cosmic microwave background (CMB). This book presents the essential theoretical tools necessary to acquire a modern working knowledge of CMB physics. The style, falling somewhere between a monograph and a set of lecture notes, is pedagogical and the author uses the typical approach of theoretical physics to explain the main problems in detail, while also touching on the main assumptions and derivations of a fascinating subject.

Terrestrial Neutron-Induced Soft Errors in Advanced Memory Devices by Takashi Nakamura, Mamoru Baba, Eishi Ibe, Yasuo Yahagi and Hideaki Kameyama, World Scientific. Hardback ISBN 9789812778819 £56 (\$98).

Terrestrial neutron-induced soft errors in semiconductor memory devices are currently a major concern in reliability issues. Understanding the mechanism and quantifying soft-error rates are primarily crucial for the design and quality assurance of semiconductor memory devices. This book covers relevant up-to-date topics in terrestrial neutron-induced soft errors and aims to provide succinct knowledge on these soft errors by presenting several valuable and unique features. It should be of interest to students and researchers in radiation effects, nuclear and accelerator physics and cosmic-ray physics; and to engineers involved in reliability, the design/quality assurance of semiconductor devices and IT systems.

An Introduction to the Physics of Particle Accelerators (2nd edition) by Mario Conte and William W MacKay, World Scientific. Hardback ISBN 9789812779601 £86 (\$46). Paperback ISBN 9789812779618 £29 (\$55).

This text offers a concise and coherent introduction to the physics of particle accelerators, with attention being paid to the design of an accelerator for use as an experimental tool. In this edition, new chapters on the spin dynamics of polarized beams, as well as instrumentation

and measurements, are included with a discussion of frequency spectra and Schottky signals. The additional material also covers quadratic Lie groups and integration, highlighting new techniques using Cayley transforms, detailed estimation of collider luminosities and new problems. Graduates and advanced undergraduates in physics will find this book a useful resource.

Many-Body Theory Exposed: Propagator Description of Quantum Mechanics in Many-Body Systems (2nd edition) by Willem H Dickhoff and Dimitri Van Neck, World Scientific. Hardback ISBN 9789812813794 £56 (\$98). Paperback ISBN 9789812813800 £39 (\$75).

This comprehensive textbook on the quantum mechanics of identical particles includes a wealth of valuable experimental data, particularly in recent results from direct-knockout reactions directly related to the single-particle propagator in many-body theory. The comparison with data is incorporated from the start, making the abstract concept of propagators both vivid and accessible. Results of numerical calculations using propagators (or Green's) functions are also presented. This edition contains an extensive presentation of finite temperature propagators and covers the technique to extract the self-energy from experimental data as developed in the dispersive optical model. While the majority of books on many-body theory deal with the subject from the viewpoint of condensed-matter physics, this one also emphasizes finite systems and should be of considerable interest to researchers in nuclear, atomic and molecular physics.

Atomic Physics: an Exploration through Problems and Solutions (2nd edition) by Dmitry Budker, Derek F Kimball and David P DeMille, OUP. Hardback ISBN 9780199532421 £55 (\$110). Paperback ISBN 9780199532414 £27.50 (\$55).

This book provides a bridge between the basic principles of physics learned as an undergraduate, and the skills and knowledge required for the advanced study and research in the field of atomic physics. The text is organized as a collection of problems, hints, detailed solutions and in-depth tutorials. This enables the reader to open the book at any page and get a solid

introduction to subjects on the cutting edge of atomic physics, such as frequency-comb metrology, tests of fundamental symmetries with atoms, atom trapping and cooling, and Bose–Einstein condensates. It includes problems and tutorials on important basics that are approached from the perspective of experimentalists: formal calculations are avoided where possible in favour of “back-of-the-envelope” estimates, symmetry arguments and physical analogies. This edition contains more than 10 new problems, and it includes important updates, revisions and corrections.

Equilibrium and Non-equilibrium

Statistical Mechanics by Carolyn M Van Vliet, World Scientific. Hardback ISBN 9789812704771 £75 (\$138). Paperback ISBN 9789812704788 £42 (\$78).

This book encompasses our current understanding of the ensemble approach to many-body physics, phase transitions and other thermal phenomena, as well as

the quantum foundations of linear response theory, kinetic equations and stochastic processes. The historical methods of J Willard Gibbs and Ludwig Boltzmann, applied to the quantum description rather than phase space, are featured. The tools for computations in the microcanonical, canonical and grand-canonical ensembles are carefully developed and then applied to a variety of classical and standard quantum situations. In the second part, dealing with non-equilibrium processes, the emphasis is on the quantum foundations of Markovian behaviour and irreversibility via the Pauli–Van Hove master equation. Written as a standard text for graduate students it will also serve the specialist researcher. Some more elementary topics have been included to make the book self-contained.

Stochastic Resonance: from Suprathreshold Stochastic Resonance to Stochastic Signal Quantization by Mark D McDonnell, Nigel G Stocks, Charles E M Pearce and Derek Abbott,

Cambridge University Press. Hardback ISBN 9780521882620 £80 (\$160). E-book format ISBN 9780511426582 \$128.

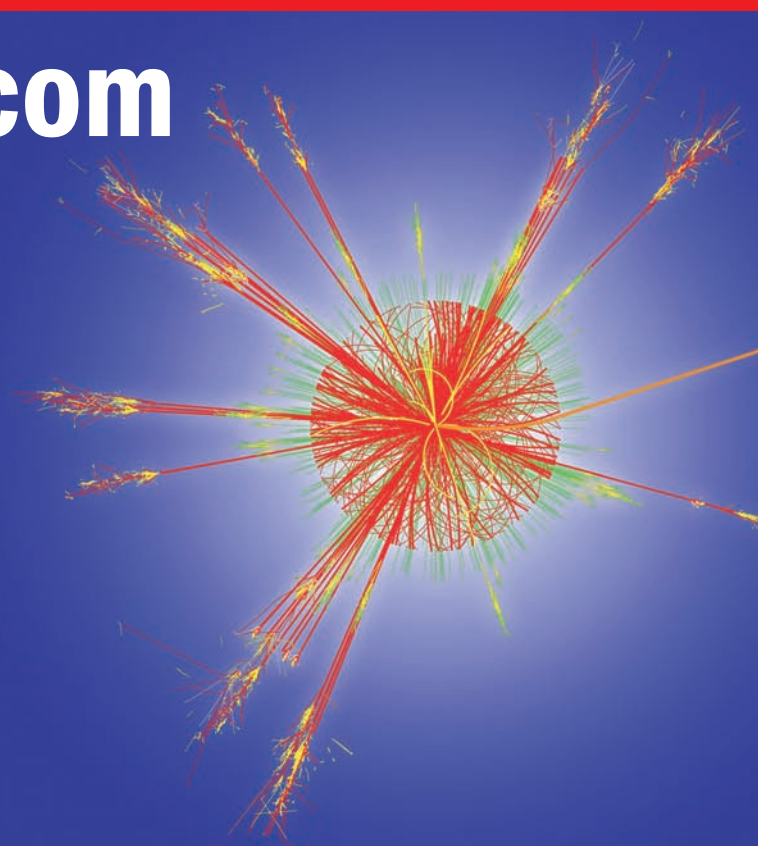
The stochastic resonance phenomenon has been observed in many forms of system and debated by scientists for 30 years. Applications incorporating aspects of stochastic resonance have yet to prove revolutionary in fields such as distributed sensor networks, nanoelectronics and biomedical prosthetics. The initial chapters review the basics of stochastic resonance and outline some of the controversies and debates that surround it. The book continues to discuss stochastic quantization in a model where all threshold devices are not necessarily identical but are still independently noisy. It also considers various constraints and trade-offs in the performance of stochastic quantizers. Each chapter ends with a review that summarizes the main points and open questions to guide researchers into finding new research directions.

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