

BOOKSHELF

Books received

Laser Control of Atoms and Molecules by Vladilen S Letokhov, Oxford University Press. Hardback ISBN 9780198528166 £55 (\$110).

The general term “laser control of atoms and molecules” covers a variety of problems, including the laser selection of atomic and molecular velocities for the purpose of Doppler-free spectroscopy; laser trapping and cooling of atoms; and laser control of atomic and molecular processes (ionization, dissociation) with a view to detecting single atoms and molecules and, in particular, separating isotopes and nuclear isomers. During the past decade, the principal problems have been successfully solved, many evolving in subsequent research worldwide. The aim of this book by one of the acknowledged experts in the field is to review these topics from a unified point of view, providing a resource for researchers in the various different fields.

Optical Trapping and Manipulation of Neutral Particles Using Lasers: a Reprint Volume with Commentaries by Arthur Ashkin, World Scientific. Hardback ISBN 9789810240578 £102 (\$187). Paperback ISBN 9789810240585 £58 (\$106).

This volume by the pioneer of optical trapping and “optical tweezers” contains selected papers and extensive commentaries on laser trapping and the manipulation of neutral particles using radiation pressure forces. These optical methods have had a revolutionary impact on the fields of atomic and molecular physics, biophysics and many aspects of nanotechnology. With his colleagues, Ashkin first demonstrated optical levitation, the trapping of atoms, and “tweezer” trapping and manipulation of living cells and biological particles. This extensive review should be of interest to researchers and students in atomic physics, molecular physics, biophysics and nanotechnology.

Classical Charged Particles (third edition) by Fritz Rohrlich, World Scientific. Hardback ISBN 9789812700049 £33 (\$58).

Originally written in 1964, this text is a study of the classical theory of charged particles. Many applications treat electrons as point particles, but there is nevertheless a widespread belief that the theory is beset with various difficulties, such as an infinite

electrostatic self-energy and an equation of motion that allows physically meaningless solutions. The classical theory of charged particles has meanwhile been largely ignored and left incomplete. Despite the efforts of great physicists such as Lorentz, Poincaré and Dirac, it is usually regarded as a “lost cause”. Thanks to more recent progress, however, the author has been able to resolve the various problems and to complete this unfinished theory successfully.

Principles of Phase Structures in Particle Physics by Hilegard Meyer-Ortmanns and Thomas Reisz, World Scientific. Hardback ISBN 9789810234416 £71 (\$131).

The phase structure of particle physics shows up in matter at extremely high densities and/or temperatures as reached in the early universe or in heavy-ion collisions in modern laboratory experiments. This book cover the various analytical and numerical tools needed to study this phase structure. These include convergent and asymptotic expansions in strong and weak couplings, dimensional reduction, renormalization group studies, gap equations, Monte Carlo simulations with and without fermions, finite-size and finite-mass scaling analyses, and the approach of effective actions as a supplement to first-principle calculations.

Relaxation Processes in Micromagnetics by Harry Suhl, Oxford University Press. Hardback ISBN 9780198528029 £49.95 (\$150).

Electrons in solids behave like microscopic bar magnets, and in certain solids these align to produce macroscopic magnetizations. This book deals with the dynamics of this magnetization field, which is intrinsically nonlinear. This is important in applications, particularly magnetic recording, which involves very large motion of the magnetization, well beyond the validity of linearized (small motion) approximations or their limited extensions. The author therefore emphasizes nonlinear solution methods but with only minimal use of numerical simulation. The book should be useful to physicists studying magnetic phenomena.

Mesoscopic Physics of Electrons and Photons by Eric Akkermans and Gilles Montambaux, Cambridge University Press. Hardback ISBN 9780521855129 £55 (\$99).

Quantum mesoscopic physics covers a

whole class of interference effects related to the propagation of waves in complex and random media, ranging from the behaviour of electrons in metals and semiconductors to the propagation of electromagnetic waves in suspensions such as colloids, and quantum systems like cold atomic gases. A solid introduction to the field, this book addresses the problem of coherent wave propagation in random media. With more than 200 figures, and exercises throughout, it will be useful for graduate students in physics, applied physics, acoustics and astrophysics.

The Power of α : Electron Elementary Particle Generation with α -Quantized Lifetimes and Masses by Malcolm H MacGregor, World Scientific. Hardback ISBN 9789812569615 £50 (\$93).

This book focuses on the most pressing unsolved problem in elementary particle physics – the mass generation of particles. It contains physics that is not included in the Standard Model as it is now formulated but at the same time is in conformity with its major results (i.e. isotopic spins and interactions). It differs from the Standard Model in the treatment of masses and pseudoscalar mesons, and in the role assigned to the coupling constant, α . Presented in a careful and phenomenological way, the material can easily be followed by all physicists, both experimental and theoretical, and also by interested workers in other fields.

Subatomic Physics (third edition) by Ernest M Henley & Alejandro Garcia, World Scientific. Hardback ISBN 9789812700568 £56 (\$98). Paperback ISBN 9789812700575 £33 (\$58).

This is the third and fully updated edition of a classic textbook, which provides an up-to-date and lucid introduction to both particle and nuclear physics. Topics are introduced with key experiments and their background, encouraging students to think and allow them to do back-of-the-envelope calculations in a diversity of situations. Suitable for experimental and theoretical physics students at the senior undergraduate and beginning graduate levels, the book covers earlier important experiments and concepts as well as topics of current interest, with extensive use of photographs and figures to convey concepts and experimental data.