

## New books on physics and related sciences

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**Klyatskin V I** *Dynamics of Stochastic Systems* (Moscow: Fizmatlit, 2002) 240 pp. ISBN 5-9221-0248-6.

Based on the functional approach, the book formulates general methods for the statistical description and analysis of stochastic dynamical systems with fluctuating parameters, the systems whose behavior is given by ordinary and partial differential equations, boundary value problems, and integral equations. The book also examines asymptotic methods for handling stochastic dynamical systems (delta-correlated random field approximation, diffusion approximation). Examples of coherent phenomena in stochastic dynamical systems (such as particle and passive impurity clusterization in the random velocity field and plane wave localization in layered random media) are provided to illustrate general ideas of the theory. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

**Meilikhov E Z** *General Theory of Superconductors* (Moscow: Izd-vo MFTI and Fizmatlit, 2003) 83 pp. ISBN 5-7417-0226-0.

This manual provides an in-depth overview of various phenomena and processes revealing themselves in superconductors. The exposition uses simple physical models and allows many physical aspects of superconductivity to be shown up and treated without going beyond general physics. Among these are the thermodynamics of superconductivity, the magnetic properties of superconductors (London and London as well as Pippard equations, magnetic flux quantization, intermediate and mixed states in type-I and type-II superconductors), and the physical nature of superconductivity, including Cooper pairs, the energy spectrum gap, and critical parameters (temperature, magnetic field, and current density). It is intended for 3rd year undergraduates in physics disciplines, who study superconductivity within the framework of general physics and solid-state physics courses, as well as for senior undergraduate students and postgraduate students. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

**Grigor'ev V I, Grigor'eva E V, Rostovskii V S** *The Baroelectric Effect and the Electromagnetic Fields of Planets and Stars* 3rd ed. (Moscow: Fizmatlit, 2003) 192 pp. ISBN 5-9221-0391-1.

The electric and magnetic fields that planets and stars produce due to their own gravitational fields and the tidal influences

they experience are estimated based on the authors' theory of the baroelectric effect (charge redistribution due to nonuniform mechanical stresses present in a medium). The information contained in this book will be of interest to undergraduate and postgraduate students and research workers in physics-related disciplines, who are interested in gravitation problems. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

**Delone N B** *Nonlinear Optics* (Moscow: Fizmatlit, 2003) 64 pp. ISBN 5-9221-0428-4.

This book covers the physics of the interaction of high intensity light with matter. New effects that occur in the process are discussed, including Stark shifts of atomic energy levels, multiphonon processes, light-induced refraction, self-focusing of light, and so forth. It is shown that the fundamental laws of classical optics — Euclid's law of rectilinear propagation of light, independence of light beams, Einstein's photoeffect law, the Stokes rule, etc. — are only valid for low light intensities. This book introduces the senior pupils in schools with an advanced physics curriculum to the problems covered. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

**Pentin Yu A, Vilkov L V** *Physical Methods in Chemistry* (Moscow: Mir, 2003) 683 pp. ISBN 5-03-003470-6.

The textbook presents the general classification of physical methods and describes direct and inverse problems to whose solution they can be applied. The book gives the theoretical fundamentals, describes technical aspects of experimentation, and illustrates the use of mass spectroscopy, methods for determining electrical dipole moments, and methods of rotational, vibrational (IR and RS), and electron (UV) spectroscopy. Coverage also includes Mössbauer, photoelectron, and Auger spectroscopy, nuclear magnetic resonance (NMR) and electron paramagnetic resonance (EPR), nuclear quadrupole resonance, dispersion of optical rotation, circular dichroism, anomalous scattering of X-rays, as well as Kerr and Faraday effects. The potential of these methods in chemical studies is unveiled and the interrelations of the various methods are revealed; it is shown how the simultaneous application of several methods provides data on the physical parameters of molecules and on materials properties. This textbook should provide a valuable reference source for college students of chemistry, lecturers, and research workers, and for students at other natural science and engineering colleges and universities. (Mir Publ.: 107996, GSP-6, Moscow, 1st Rizhskii per. 2; tel.: (7-095) 286-83-88; URL: <http://www.mir-pubs.dol.ru/>)

**Controlling Molecular and Quantum Systems** (Ed. by L A Fradkov, O A Yakubovskii) (Moscow – Izhevsk: Institute for Computer Studies, 2003) 416 pp. ISBN 5-93972-287-3.

This collection introduces basic ideas, results, and problems concerning controlling processes in the microworld. It addresses what leading scientists abroad have achieved in such areas as femtosecond laser-assisted chemical reaction control, NMR-aided control of qubits, and the stochastic, optimal, and adaptive control of quantum systems. Possible ways to apply the results obtained to quantum computing, femtochemistry, NMR spectroscopy, etc., are outlined. The collection can be useful to research workers, faculty, and undergraduate and postgraduate students interested in theoretical and experimental studies at the intersection of physics, chemistry, mathematics, and cybernetics. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: <http://ics.org.ru/>)

**Gusev A I, Rempel' A A *Nanocrystalline Materials*** (Moscow: Fizmatlit, 2001) 224 pp. ISBN 5-9221-0075-0.

The book gives a systematic coverage of the state-of-the-art research in nanocrystalline materials. It summarizes experimental results on how the nanocrystalline state influences the microstructure and the mechanical, thermophysical, optical, and magnetic properties of metals, alloys, and solid phase materials. Major methods for fabricating isolated nanoparticles, ultrafine disperse powders, and compact nanocrystalline materials are discussed. The information contained in this book will be of interest to specialists in solid state physics, physical chemistry, solid state chemistry, and materials science, as well as to undergraduate and postgraduate students in related disciplines. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

**Anishchenko V S, Astakhov V V, Vadivasova T E, Neĭman A B, Strelkova G I, Shimanskiĭ-Gaĭer L *Nonlinear Effects in Chaotic and Stochastic Systems*** (Moscow – Izhevsk: Institute for Computer Studies, 2002) 544 pp. ISBN 5-93972-289-X.

This book synthesizes the fundamental work on the basics of nonlinear dynamics of chaotic and stochastic systems. It presents a comprehensive introduction to the theory of dynamical and stochastic systems, and provides a detailed analysis of current results, most of them due to the authors themselves. All chapters are designed in such a way that they can be studied independently of each other. In particular, each chapter has its own bibliography. All this allows the book to be used as a textbook for undergraduate and postgraduate students in physics and mathematics disciplines (Ch. 1) and for professionals in the nonlinear dynamics of deterministic (Ch. 2) and stochastic (Ch. 3) systems. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: <http://ics.org.ru/>)

**Khryunov A V *Fundamentals of Relativistic Physics*** (Moscow: Fizmatlit, 2003) 448 pp. ISBN 5-89155-089-X.

The book provides a systematic presentation of the mathematical apparatus and physical aspects of the special theory of relativity. Compared to previously published monographs, this book gives a more detailed account of such topics as integral theorems and integral transformations, relativistic kinetic theory, variational principles, etc. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

**Cherepanov O I *Numerical Solution of Several Quasi-Static Problems in Mesomechanics*** (Novosibirsk: Izd-vo SO RAN, 2003) 180 pp. ISBN 5-7692-0595-4.

Numerical methods for solving the mechanical problems in two and three dimensions are used to study the critical equilibrium states of composite shells, stress concentration and relaxation processes, as well as deformation localization and damage accumulation in mesovolumes of structurally nonuniform media subject to quasi-static loads and nonstationary thermal fields. A modification of the variational-difference method for calculating isothermal deformations in structurally nonuniform materials is presented, in which a composite model of a viscoelastic yielding medium is employed. To solve coupled thermoplasticity problems, a numerical model based on the variational equations of the incremental theory of plasticity and heat conduction is constructed. (SB RAS Publ.: 630090, P.O. Box 187, Novosibirsk, Morskoĭ prosp. 2; tel./fax (7-3832) 30-17-58; fax (7-3832) 33-37-55; e-mail: sprice@ad-sbras.nsc.ru; URL: <http://www.psb.ad-sbras.nsc.ru/>)

**Plokhotnikov K É *Mathematical Modeling and Computing Experiment: Methodology and Practice*** (Moscow: Éditorial URSS, 2003) 280 pp. ISBN 5-354-00521-3.

Due to the massive use of electronics and computing technology, mathematical modeling has currently gained widespread recognition. The method of mathematical modeling in its most sophisticated forms emerged in physics, or more precisely in mathematical physics, and then drifted to biology and social science disciplines. As it did so, marked transformations took place in the methodology of mathematical modeling, whose nature is discussed in the book. What is a mathematical model? How is it constructed? What is the role of a computing experiment? It is these and some other questions which are the subject matter of this book. The discussion of answers adopts the point of view of modern scientific methodology (including the systems approach) while relying on specific examples of constructing the models in such areas as spatial migration of plankton organisms, morphogenesis, crystallography, turbulence, meteorology, field theory, history, politics, and psychology (psychophysics). The targeted audience is wide, including undergraduates, postgraduates, mathematicians, physicists, and practising specialists in mathematical physics, as well as biologists, historians, and politicians relying on mathematical methods. (Éditorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the RAS Institute for Systems Analysis; tel./fax (7-095) 135-44-23, 135-42-46; e-mail: urss@urss.ru; URL: <http://urss.ru/>)  
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