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New books on physics and related sciences

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Dmitriev V G ***Nonlinear Optics and Phase Conjugation*** (Moscow: Fizmatlit, 2003) 256 pp. ISBN 5-9221-0361-X.

The fundamentals of the phase conjugation (PC) of the laser radiation using nonlinear-optics methods are covered in this monograph. The basic physical effects involved in and major features of PC are discussed for degenerate three-wave interaction in a quadratically nonlinear medium, degenerate four-wave interaction in cubically nonlinear media, and stimulated light scattering of various types (SRS, SBS, etc.). The necessary background in physical optics, including optical aberrations, possibilities of their PC-assisted compensation, and basic aspects of Fourier optics, are presented. Methods for determining the quality of PC are briefly described, a number of practical PC schemes are presented, and how PC effect was discovered is discussed in brief. The book is intended for specialists in the fields of laser physics, quantum electronics, optical and optoelectronic instrument making, and for 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/)

Erofeev V I, Kazhaev V V, Semerikova N P ***Waves in Rods: Dispersion, Dissipation, Nonlinearity*** (Moscow: Fizmatlit, 2002) 208 pp. ISBN 5-9221-0294-X.

This monograph outlines the wave-theoretical approach to the study of dynamic processes in one-dimensional elastic systems. Based on Hamilton – Ostrogradski's variational principle, equations for rods vibrating in the presence of geometric and physical nonlinearities are rewritten more accurately. Dispersion, dissipative, and nonlinear effects in the propagation of various types of elastic waves are analyzed in detail. The intended audience comprises practising specialists in the mechanics of deformable solids and those involved in physical and engineering acoustics, as well as 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/)

Fundamental and Applied Problems in the Theory of Vortices (Ed. by A V Borisov, I S Mamaev, M A Sokolovskiĭ) (Izhevsk: Institute for Computer Studies, 2003) 704 pp. ISBN 5-93972-275-X.

This collection contains works by Russian and foreign authors on the dynamics of vortex structures in fluids. The selected papers give the impression that this field is a dynamically developing branch of hydromechanics. For this purpose, both well-known results are reviewed and the authors' recent achievements presented. The first part concentrates on fresh ideas and presents the solutions of known problems in classical hydrodynamics; in the second part, the vortex problems of geophysical hydrodynamics are addressed. The book will be of interest and value to specialists in the field of dynamical systems and hydrodynamics, to teachers, and to undergraduates and postgraduates in related disciplines. The contents of the books are available on the Internet at URL: http://ics.org.ru/cgi/s.pl?command=books&lang=r. (Institute for Computer Studies Publ.: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: http://www.ics.org.ru/)

Kartashov É M ***Analytical Methods in the Theory of Heat Conduction of Solids*** 3rd ed. (Moscow: Vysshaya Shkola, 2001) 550 pp. ISBN 5-06-004091-7.

Analytical methods for solving the boundary value problems of the thermal conduction of solids are systematically examined in this manual. The characteristic features, peculiarities, range of applicability, and possible extensions of each method are discussed. The topical issues of the analytical theory are formulated. Compared to the second edition (1985), tables of integral transforms, dual integral equations, and summable double series are expanded; the thermal shock problem is considered, and transport equations for thermal memory materials and those with a finite speed of heat propagation are discussed. The manual is designed for students in higher technical education. It will also be useful for specialists in heat engineering, applied mathematics, and applied physics. (Vysshaya Shkola Publ.: 127994 Moscow, ul. Neglinnaya 29/14; tel. (7-095) 200-33-70; fax (7-095) 200-03-01; e-mail: info@v-shkola.ru; URL: http://www.v-shkola.ru/)

Physical and Chemical Processes in Gas Dynamics A Handbook Vol. 1. ***Dynamics of Chemical and Physical Processes in Gases and Plasmas*** Vol. 2. ***Physico-chemical Kinetics and Thermodynamics*** (Ed. by G G Chernyĭ, S A Losev) (Moscow: Nauchno-Izdatel'skiĭ Tsentr Mekhaniki, Vol. 1, 1995; Vol. 2, 2002) Vol. 1: 350 pp. ISBN 5-211-03660-3; Vol. 2: 368 pp. ISBN 5-211-03900-9.

The first volume of the computerized handbook *Physical and Chemical Processes in Gas Dynamics* contains information on models that describe collisional processes occurring in gases and plasmas and involving atoms, molecules, ions, and

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electrons. The processes covered include elastic scattering; energy exchange between colliding particles, with electronic, vibrational and rotational degrees of freedom being involved, as well as chemical and plasma-chemical reactions. Using computer implementation of the processes, calculations can be made of the quantities such as cross sections for elastic and inelastic collisions, and reaction and energy-exchange rate constants over a wide range of collision energies, gas temperatures, and other parameters. The second volume of the handbook contains information on key simulation results for gas and plasma processes: translational, rotational, and vibrational relaxation; the excitation and deactivation of atom, molecule, and ion electronic states, as well as chemical reactions and other processes in low-temperature plasma. Basic thermodynamic functions and relations are presented, some thermodynamic aspects of irreversible processes are considered, and equations of state for gases of various densities are discussed. This unique series of computerized handbooks is designed for research workers, practising engineers, higher education teachers, senior undergraduates, and postgraduates who do basic or applied research, plan and prepare field tests and experiments, prepare scientific and engineering recommendations; who wish to develop and improve test-benches and instrument designs, and for anyone who studies, teaches, or works to enhance his or her level of qualification in this field of science and technology. (Science and Publishing Center for Mechanics: 119899 Moscow, Michurinskiĭ prosp. 1; tel. (7-095) 967-76-13)

Bozhokin S V, Parshin D A ***Fractals and Multifractals*** (Izhevsk: RKhD, 2001) 128 pp. ISBN 5-93972-060-9.

This textbook provides a comprehensive account of the basic ideas that underlie fractal and multifractal geometry. Examples of various fractal structures can be found in many natural phenomena. The areas where fractal concepts are being successfully applied include the chaotic behavior of dynamical and dissipative nonlinear systems, the turbulent flow of a liquid, the non-uniform distribution of matter in the universe, cracks and dislocation clusters in solids, electric breakdown, diffusion and aggregation of particles, crystal growth, and so forth. Many interesting ideas of fractal geometry have found their application in economics (the analysis of exchange rate fluctuations), in biology (explanation of the morphological structure of various biological objects), and in solid-state physics (Anderson metal – insulator transitions and other properties of disordered systems). The textbook has been developed from the lectures the authors gave at various periods at the Physics and Mechanics Departments of St.-Petersburg State Technical University for fourth- and fifth-year students in biophysics, physics of metals, and solid-state spectroscopy. (Research and Publishing Center 'Regular and Chaotic Dynamics': 426034 Izhevsk, ul. Universitetskaya 1 — UdSU, RKhD; tel./fax (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://www.rcd.ru/)

Kuptsov A Kh ***Fourier Analysis of the Raman Scattering and Infrared Absorption Spectra of Polymers*** A Handbook (Moscow: Fizmatlit, 2001) 656 pp. ISBN 5-9221-0188-9.

This handbook provides information on the vibrational spectra of 581 organic, bio-organic, element-organic, and inorganic polymers and of a number of monomers and associated substances. Raman spectra and IR absorption spectra correspond to the intramolecular vibrations of atoms chemically bound into macromolecular structures. The term Fourier in the book's title is used because both types of spectra are obtained using Fourier spectrometers. For both types of spectra, the conditions of the same-sample, same-laboratory, same-instrumentation digital detection of like accuracy are secured. The handbook constitutes in fact a database in which four indices, a newly proposed polymer classification, easy linkage with other databases and possibly through CAS registry numbers facilitate the search for required information. The graphical and tabular data are preceded by an introductory section which explains the physical nature of Raman scattering of light and infrared absorption and describes the 'spectrum – structure' correlation underlying numerous successful applications of optical vibrational spectroscopy. The same section describes sample preparation and experimental conditions and gives numerous (77) references to original works on the Fourier spectroscopy of Raman scattering by polymers. Also given are references to previously issued handbooks, whose shortcomings (predominance of IR absorption spectra, no RS spectra) are corrected by the present publication. (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/)

Grabovskiĭ R I ***A Course in Physics*** (St.-Petersburg: Izd. Lan', 2002) 608 pp. ISBN 5-8114-0466-2.

This textbook covers the theoretical foundations of general physics as they are stipulated by the higher education syllabus. To make the book user-friendly, a simplified presentation style is adopted: the calculus apparatus is presented in the form of tabulated derivatives and integrals, and for some physical laws intentionally elementary derivations are given. (Lan' Publ.: 193029 St.-Petersburg, ul. Krupskoĭ 13; tel. (7-812) 567-85-78, (7-812) 567-14-45; tel./fax (7-812) 567-54-93; e-mail: root@ lanpbl.spb.ru; URL: http://www.lanpbl.spb.ru/)

Perelomov A M ***Integrable Systems of Classical Mechanics, and Lie Algebras*** (Izhevsk: RKhD, 2002) 238 pp. ISBN 5-93972-118-4.

The subject of this book is the theory of the integrable systems of classical mechanics, one of the most actively expanding areas of modern mathematical physics. The findings and methods of the last century are described in detail, as are the results obtained with the inverse scattering method in the last thirty years. Multiparticle systems of the Toda chain type are thoroughly examined. The book is intended mainly for theoretical physicists and mathematics specialists, as well as for undergraduate students in physics or mathematics university departments. (Research and Publishing Center 'Regular and Chaotic Dynamics': 426034 Izhevsk, ul. Universitetskaya 1 — UdSU, RKhD; tel./fax (7-3412) 50-02-95; e-mail: subscribe@ rcd.ru; URL: http://www.rcd.ru/)

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