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New books on physics and related sciences

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Mukhin K N, Sustavov A F, Tikhonov V N ***Nobel Level Physics in Russia*** (Moscow: Izdatel'stvo Fiziko-Matematicheskoi Literatury, 2006) 228 pp. ISBN 5-94052-125-8.

This book covers the creative work of major world-renowned Russian physics. It consists of two parts. The first part focuses on the work of ten Russian Nobel laureates in physics. The second part is about the last century's 'Nobel level' Russian physicists who for various reasons did not receive the prize. The book is intended for students in physics departments and for readers interested in physics and its history. (Fiziko-Matematicheskaya Literatura Publ.: 119071 Moscow V-71, Leninskii prosp. 15; tel.: (7-495) 952-49-25; fax: (7-495) 955-03-30; e-mail: fizmatlit@mtu-net.ru; URL: http://www.fizmatlit.narod.ru/)

Abrashkin A A, Yakubovich E I ***Vortex Dynamics in a Lagrangian Description*** (Moscow: Izd-vo Fizmatlit, 2006) 176 pp. ISBN 5-9221-0725-9.

Problems in the analytical dynamics of water waves and vortex formations in liquids are examined in terms of Lagrangian coordinates. All known examples of the Lagrangian description of fluid motions are reviewed. New approaches to the study of distributed vortex flows are suggested, which rely on using complex functions for plane motions and Jacobi matrices for three-dimensional ones. The classes of the exact solutions to the Euler equation are identified and analyzed, and their applications to specific types of motion (a single plane vortex, a pair of vortices, vortex cords in a rotating fluid, etc.) are considered. The method of modified Lagrangian coordinates is proposed as a tool for the study of water waves, on the basis of which a weakly nonlinear theory of water eddy waves is developed. Wave perturbations propagating along the surface of a shear flow; 3D vortex waves (3D Guyon waves); standing vortex waves, and wave packets in low-vorticity fluids are investigated for their properties. Equations of motion in Lagrangian coordinates for incompressible viscous fluid are derived in a new form. The book is intended for specialists in hydromechanics, theoretical physics, and mathematics, as well as for undergraduate and graduate students. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel.(7-495) 334-74-21; fax (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: http://www.maik.fml.ru/)

Dikareva R P ***An Introduction to Crystal Physics*** (Novosibirsk: Izd-vo NGTU, 2006) 238 pp. ISBN 5-7782-0707-7.

The book covers the fundamentals of classical crystallography, discusses mathematical methods for describing crystal structure, and presents information on the physical and chemical imperfections in semiconductor materials. Particular attention is given to crystals of the cubic system. One of the crystal orientation methods, that of light figures, is discussed. The properties of and methods for investigating various types of dislocations are described. The Appendix to the book contains problems (with example solutions) on topics discussed in the main sections of the manual. The book is designed for students in the discipline of microelectronics and solid state electronics and forms the basis for the subsequent course in solid state physics. (Novosibirsk State Technical University Publishing-Printing Complex: 630092, Novosibirsk, prosp. K. Marksa 20; tel./fax: (7-3832) 46-31-87; e-mail: office@publish.nstu.ru; URL: http://www.publish.nstu.ru/)

Latyshev A V, Aseev A L ***Monatomic Steps on a Silicon Surface*** (Novosibirsk: Izd-vo SO RAN, 2006) 242 pp. ISBN 5-7692-0856-2.

This book present results of an investigation into structural processes that occur on a silicon surface during sublimation, adsorption, homo- and heteroepitaxial growth, thermal annealing, and gaseous reactions and that were studied using *in-situ* ultrahigh vacuum reflection electron microscopy, a unique diagnostic method developed at the Institute of Semiconductor Physics of the Siberian Branch of the Russian Academy of Sciences. The book is addressed to physicists, specialists, and students in such fields as materials science, crystallization physics, molecular-beam epitaxy, atomic processes on solid surfaces, nanostructuring methods, nanodiagnostics, and the development of silicon nanotechnologies. (SB RAS Publ.: 630090, Novosibirsk, P.O.Box 187, Morskoi prosp. 2; tel. (7-3832) 30-84-66; fax (7-3832) 33-37-55; URL: http://www-psb.ad-sbras.nsc.ru/)

Starchenko I B ***Dynamic Chaos in Hydroacoustics*** (Moscow: Izd-vo Editorial URSS, 2007) 296 pp.

The dynamic chaos theory is covered as applied to hydroacoustic problems. The book discusses the classical and nonlinear dynamics of oscillatory systems and introduces the concepts of the phase plane, phase portrait, and stability of motion. It points out differences between classical and chaotic types of motion and describes the quantitative characteristics of chaos and methods for the processing and presentation of experimental chaotic data. Examples from hydroacoustics (bubble vibrations in fluid, cavitation, beam chaos, and nonlinear propagation of sound) are used to demonstrate acoustic chaos. In the Appendix, specialized software for processing experimental data by the methods of nonlinear dynamics is described. The book is designed as an extended textbook in the disciplines of acoustics, modern theory of vibrations and waves, the physics of open systems, etc. for research beginners, undergraduates, and postgraduates; it will also be useful to researchers interested in nonlinear

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dynamics and its applications in physics. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the RAS Institute for Systems Analysis; tel./fax (7-495) 135-44-23, 135-42-16, e-mail: urss@urss.ru; URL: http://www.urss.ru/)

Kravchenko V F, Rvachev V L *Logic Algebra, Atomic Functions and Wavelets in Physical Applications* (Moscow: Izd-vo Fizmatlit, 2006) 416 pp. ISBN 5-9221-0752-6.

This monograph covers methods of logic algebra and introduces the reader to the theories of R-functions (named after V L Rvachev) and those of atomic functions and wavelets. The first two chapters describe the logic-algebraic method of R-functions and give a number of examples of its application to boundary value problems. The third chapter examines the application of the theory of atomic functions to problems in modern radiophysics. The fourth chapter constructs a new class of WA systems of Kravchenko – Rvachev functions and describes its applications to detecting short-duration sign-alternating and superbroadband processes. The intended audience includes specialists interested in modern computational mathematics and its applications to boundary value problems, and digital signal and image processing; all those with an interest in modern radiophysics and electronics and in the mathematical modeling of physical processes, as well as undergraduate and postgraduate students majoring in applied and computational mathematics, applied physics and radiophysics. The RF Higher Education Methodology Association for Applied Mathematics and Physics recommends this book as a university textbook in the discipline of applied mathematics and physics. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel. (7-495) 334-74-21; fax (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: http://www.maik.fml.ru/)

Gladkii S L, Stepanov N A, Yasnitskii L N *Intellectual Modeling of Physical Problems* (Moscow-Izhevsk: Izd-vo RKhD, 2006) 200 pp. ISBN 5-93972-573-2.

A new approach to mathematical computer modeling, whose underlying method of solving boundary value problems leads to exact solutions, is developed in this book. What gives this approach topical interest is that software currently available for implementing numerical methods is unsatisfactory in terms of the accuracy and reliability of results, which is totally unacceptable in the 21st century given the increased number of accidents and catastrophes due to the inadequate design of special purpose objects and processes. The book demonstrates the possibility, in principle, of obtaining exact analytical solutions of boundary value problems by applying the ideas and methods of artificial intelligence. It explains the design principles of an intellectual system capable of imitating the activity of a professional mathematician in the process of solving a boundary value problem, with all his or her intuition and experience at his/her disposal. The theoretical fundamentals of the proposed approach are introduced and illustrated by the examples. Available at the website http://www.pspu.ru/regions/ is a demonstrating version of an intellectual system capable of exactly solving plane and axisymmetric boundary value problems in the theory of heat conduction, elasticity, and thermoelasticity. By mastering the demonstrating version and using it for their purposes, readers can develop skills in intellectual computer modeling. Though essentially a monograph, the book can be recommended as a textbook for undergraduates in applied mathematics, applied informatics, and mechanics, and is useful reading for postgraduate students, research workers, and practising engineers involved in mathematical computer modeling in natural science and technology. (Regular and Chaotic Dynamics Science and Publishing Center: 426034 Izhevsk, ul. Universitetskaya 1, Udmurt State University; tel.: (7-3412) 50-02-95, (7-495) 332-48-92; e-mail: subscribe@rcd.ru; URL: http://www.shop. rcd.ru/)

Kaliteevskii N I *Wave Optics* A textbook for engineering and university students (St.-Petersburg: Izd-vo Lan', 2006) 480 pp. ISBN 5-8114-0666-5.

Presented in this book are the fundamentals of the electromagnetic theory of light. The book gives proper attention to experiment and relies on the Maxwell equations to describe the properties of electromagnetic waves. Physical phenomena involving the interference and diffraction of light are examined in detail. Other topics covered include elements of crystal optics; the electron theory of dispersion; the fundamentals of the theory of relativity; elements of quantum optics; the properties of lasers, and the fundamentals of photon physics. The book is designed for engineering and university students in the discipline of optics. (Lan' Publ.: 193029 St.-Petersburg, ul. Krupskoi 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/)

Martirosov E G, Nikolaev D V, Rudnev S G *Human Body Composition Determination: Techniques and Methods* (Moscow: Izd-vo Nauka, 2006) 248 pp. ISBN 5-02-035624-7.

This monograph provides a review of current techniques and methods for the *in vivo* determination of the composition of the human body. Their range of applications covers a wide spectrum of fundamental and applied biomedical problems, including assessing physical development at the individual and population level; the diagnosis and treatment of obesity and osteoporosis; age-related changes in body composition; environmental adaptation, and professional selection. The book is intended for specialists in biology, anthropology, and medicine. (The Academy of Sciences Nauka Publishing Center: 117997 GSP-7 Moscow V-485, Profsoyuznaya ul. 90; tel. (7-495) 334-71-51; fax: (7-495) 420-22-20; e-mail: secret@naukaran.ru; URL:http//www.naukaran.ru/)

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