

New books on physics and related sciences

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Romanovskii Yu M, Stepanova N V, Chernavskii D S *Mathematical Modeling in Biophysics. An Introduction to Theoretical Biophysics* 2nd enlarged ed. (Moscow–Izhevsk: IKI, 2004) 472 pp. ISBN 5-93972-359-4.

This book focuses on biological processes, describing the basic principles of their mathematical modeling and examining methods for their study. It discusses both point models representing the behavior of spatially uniform processes and models describing such phenomena as the formation of 3D structures, wave propagation in an active medium, and synchronization of nonlinear oscillators. Topics covered include the origin of life and the evolution of species; tissue differentiation and morphogenesis; microorganism cultivation and engineering microbiology; dynamics of immune reactions, and, finally, the thermodynamics of open systems and its role in the description of biological processes. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@ics.org.ru; URL: <http://ics.org.ru/>)

Potapov A A *Fractals in Radiophysics and Radar: The Topological Aspects of Sampling* A monograph 2nd ed. revised and augmented (Moscow: Universitetskaya Kniga, 2005) 848 pp. Bibliography: 1017 refs. ISBN 5-98699-015-3.

This monograph provides an authoritative review of the current state of a new and explosively developing area in deterministic chaos theory — the application of fractals theory to radiophysics and radar and the creation of new fractal-based information technologies with which practical radar problems can be solved. It introduces the reader to the theory of fractals. Topics covered include diffusion processes in fractal spaces, a description of fractal surfaces, methods of solving wave diffraction problems on fractal surfaces and in fractal media, self-similarity of turbulence, lightning, rains, clouds, atmospheric aerosols, complex systems, 3D geological systems in remote sensing, lines of attack on the problems of unconventional fractal image processing at various signal-to-noise ratios and detecting low-contrast objects, and, finally, some approaches to fractal modeling in space radiophysics and cosmology. The author's interdisciplinary approach integrates ideas from the fields of fractal geometry, fractional integrodifferentiation, and fractional dimensionalities. A fair amount of coverage is given to nondifferentiable functions and sets. Separate chapters discuss modern fractal antennas together with their design methods and review results of investigations into development of new information technologies using texture and fractal measures based on the principles of nonlinear dynamics. An updated and revised list of the most promising research areas is presented. Primarily designed for physicists and mathemati-

cians interested in the topic, the book can also be used in higher education programs offering graduate diplomas and master's degrees in the disciplines Nos 511600 (Applied Mathematics and Physics) and 511500 (Radiophysics). What sets this monograph apart from analogous other books of Russian and foreign authors on fractals is the focus on important applied problems. By and large, this is the first book on this topic, either in Russia or internationally, to provide this broad coverage of problems related to the application of fractal analysis in radiophysics and radar. The book will provide an essential guide to identifying problems holding promise for further development of new research directions in physics and mathematics. (Logos Publ. Inc.: 105318 Moscow, Izmailovskoe shosse 4; e-mail: universitas@mail.com; URL: <http://logosbook.ru>)

Zhdanov V M *Secrets of Isotope Separation* (Moscow: Izd. MIFI, 2004) 140 pp. ISBN 5-7262-0495-6.

The book provides a historical account of the discovery of chemical isotopes, examines their role in harnessing atomic energy, and discusses the basic molecular-kinetic methods of their separation. Drawing on recently declassified and published materials on both the Manhattan project and its Soviet counterpart, it pays special attention to the historical development of methods and production units for separating uranium isotopes. Much of the book's material is a popular-level introduction to the physical fundamentals of the isotope separation techniques reviewed — an approach, the author hopes, which will give better insight into specifically what views and ideas the scientists, technologists, designers, and engineers used to develop these methods to practical application and so to create, in our and some other developed countries, the modern isotope industry based on what can safely be considered a novel, science-consuming technology of 21st century. Written in a popular-scientific style, the edition is intended for teachers and students at high schools and technically oriented lycees and for first-year students in higher technical education who are interested in how atomic science and engineering are moving ahead. (Internet-store 'Fizmatkniga': <http://www.fizmatkniga.ru/>)

Blokhintsev D I *Fundamentals of Quantum Mechanics* 7th ed. (St.-Petersburg: Izd. Lan', 2004) 672 pp. ISBN 5-8114-0554-5.

The basic idea of the book is to provide a correct understanding of the physical fundamentals of quantum mechanics together with its mathematical apparatus and to illustrate its application in various branches of physics. The changes in the previous editions were as follows: the book has been enlarged and revised to take account of advances in the theory; it gives a more thorough presentation of the theory of measurements in the quantum domain; greater emphasis is placed on problems of causality in quantum mechanics; it presents an expanded discussion of diffraction scattering and the optical

particle model; an introduction to the analytical properties of the scattering matrix and to the Regge poles is provided; Feynman's path-integral formulation of quantum mechanics is briefly reviewed, and it presents an analysis of a simple problem in nonlinear optics. Reprinted many times and in many languages, the book continues to be popular. It is intended mainly for students in physics and research workers. (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/)

Strelkov S P *Mechanics* A textbook. 4th reprinted ed. (St.-Petersburg: Izd. Lan', 2005) 560 pp. ISBN 5-8114-0622-3.

Now nearly 50 years in print and translated into English, French, Spanish, and other languages, this book remains a valuable physics textbook for university and teacher training courses. It was first published in 1956, based on Professor Strelkov's many years of delivering lectures, conducting seminars and practical training in the Physics Department at Moscow State University, and was subsequently updated by the author in 1965 and 1975 to take account of the science and technology developments that had been made. The new edition of this now hard-to-find book fills a gap in the textbook literature of classical physics. In presenting the basic laws of nature, the book admirably blends physical insight with mathematical rigor. In this book, the inductive approach characteristic of a general course is closely tied to the deductive reasoning of theoretical physics. Each part of the book, along with clearly formulated laws and principles, includes simple and straightforward examples to illustrate physical concepts and give an idea of their advancing. The intended audience is students at universities and higher technical education institutions. (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/)

Gun'ko Yu F, Norin A V, Filippov B V *Electromagnetic Gas Dynamics of Plasma* A textbook (St.-Petersburg: Izd. SPbSU, 2003) 176 pp. ISBN 5-288-02785-3.

This textbook introduces basic concepts and major transport equations in plasma gas dynamics. The particular emphasis is on the formulation and solution of boundary value problems. The electromagnetic equations of plasma gas dynamics are derived based on macroscopic balance equations. The closure problem of the general system of transport equations is addressed, and the characteristic parameters of flow regimes are discussed. The book highlights the magnetogasdynamic approximation and provides some exact solutions for magnetic gas dynamics equations governing laboratory and space plasmas. Problems covering flows around bodies and the propagation of perturbations and shock waves in plasma are included. The book is designed for students in mathematics and mechanics departments majoring in the Mechanics of Liquids, Gases, and Plasma discipline. (SPb State University Publ.: 199034 St.-Petersburg, Universitetskaya nab. 7/9; tel. (7-812) 328-77-63; fax (7-812) 328-44-22; e-mail: books@dk2478.spb.edu; URL: http://unipress.ru/)

Igoshin F F, Samarskii Yu A, Tsipenyuk Yu M *Laboratory Practical Works in General Physics* In 3 volumes. Vol. 3

Quantum Physics A college/university textbook 2nd ed. revised and enlarged (Dolgoprudnyi, Moscow region: Fizmatkniga, 2005) 432 pp. ISBN 5-89155-127-6.

The book covers laboratory exercises in nuclear and quantum physics within third-year General Physics course of the Moscow Institute of Physics and Technology (MFTI). The exercises are grouped under themes, each theme being provided with a theoretical introduction. For each exercise, more theory on the particular effect under study is given, the experimental facility is described, and the assignment to be performed is detailed; occasionally, recommendations on how best to process and present the results are provided. The large number of exercises contained in the text enables the instructors to select them based on the student's academic progress and personal preferences. The book is provided with detailed reference material and can be used as a textbook supplement to help the readers to gain their real understanding of physics. It is primarily intended to serve as a college/university textbook in the disciplines of physics, engineering, and related fields. (IKF 'Fizmatkniga' Publ.: 141700, Moscow region, Dolgoprudnyi, Institutskii per. 9; tel. (7-095) 408-76-81, (7-095) 409-93-28; URL: http://www.fizmatkniga.ru)

Berdovskii G A, Kondrat'ev A S, Chouderi A D R *Physical Principles of Mathematical Modeling* An undergraduate level textbook (Moscow: Izd. Akademiya, 2005) 320 pp. ISBN 5-7695-1838-3.

The textbook covers typical physics topics introductory to the mathematical modeling of real processes, namely, deciding on the level of description based on the hierarchical analysis of the system's time scales; investigating the ability of environmental experiments to determine the structure of physical and mathematical models; determining why and under what conditions *a priori* simplified models prove to be effective, and analyzing the origin and role of paradoxes in the study of such models. Intended for students in physics and mathematics disciplines, this book will also be useful to faculty and research workers in mathematical modeling. (Publishing Center 'Akademiya': 117342 Moscow, ul. Butlerova 17B; office 223; tel. (7-095) 330-10-92)

Trukhin V I, Pokazeev K V, Kunitsyn V E *General and Ecological Geophysics* (Moscow: Fizmatlit, 2005) 576 pp. ISBN 5-9221-0541-8.

This manual is intended for those studying the fundamentals of global geophysics and ecology. It explains the basic concepts of solid Earth, hydrosphere and atmosphere, and ecology. Topics discussed in the book include the global ecological crisis and major ecological problems of global geophysics (global warming, world ocean pollution, the ozone crisis, and geophysical phenomena leading to natural disasters like tsunamis, hurricanes, earthquakes, etc.) In preparing this edition, the authors drew on the material they lectured on in the Department of Physics at M V Lomonosov Moscow State University. The book is intended for undergraduate students being trained in fundamental natural sciences, in particular, in physics, geophysics and planetary physics, ecological physics, and physics problems of medicine and will also be an essential guide for anyone interested in the origin, evolution, and structure of the Earth and in the role of

ecology in securing its stable development. (Fizmatlit Publ.: 117997 Moscow, Profsoyuznaya ul. 90; tel. (7-095) 334-74-21, fax (7-095) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Compiled by *E V Zakharova*
(e-mail: zaharova@ufn.ru)