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New books on physics and related sciences

100 Years of Quantum Theory: History, Physics, Philosophy Proceedings of the International Conference (Ed.-in-Chief E A Mamchur) (Moscow: NIA-Priroda, 2002) 230 pp. ISBN 5-7844-0071-1.

This publication constitutes the proceedings of the International Conference devoted to the hundredth anniversary of quantum theory, held in Moscow in December 2000. The book examines the historical, theoretical, philosophical and methodical aspects of the formation and development of the theory. It substantiates the idea that quantum-relativistic physics marks the advent of a new type of scientific rationality. Special attention is given to the interpretations of quantum theory and to the analysis of its fundamental concepts such as probability, causality, objectivity, reality, and time. Some new problems raised by the emerging field of quantum cosmology are also discussed. The book is aimed at all those interested in the problems and issues of modern science. (Publishing & Printing Complex NIA-Priroda: 107019 Moscow, Staromonetnyĭ per. 31; tel./fax: (7-095) 951-28-12)

Ginzburg V L *About Science, Myself, and Others* Selected papers and talks, 3rd enlarged ed. (Moscow: Izd-vo Fiziko-Matematicheskoĭ Literatury, 2003) 544 pp. ISBN 5-94052-061-8.

This book contains the selected papers by V L Ginzburg, some of which (15 in number) were published in the first edition (1997), 14 more in the second edition (2001), and 4 only in the present edition. Most of the papers have been published earlier, but are sometimes hard to access. For some of the papers, a commentary is provided. Along with scientific papers on physics and those on the history of cosmic ray astrophysics and radio astronomy, the author's personal reminiscences are included in this collection as are his essays on the life, career, and contributions of a number of prominent scientists. Several papers address the development of society as a whole, and there is also extensive autobiographical material in the book. This publication complements the author's well-known book On Physics and Astrophysics which ran through three Russian editions and was translated into English [translation of the first edition: Physics and Astrophysics: A Selection of Key Problems (Oxford: Pergamon Press, 1985)]; the extensively revised and enlarged translation of the 3rd edition: The Physics of a Lifetime: Reflections on the Problems and Personalities of 20th Century Physics (Berlin: Springer-Verlag, 2001)]. For physicists and astrophysicists, secondary- and higher-school physics teachers, engineers and research workers, and for

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readers interested in how science and society develop. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prospekt 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

Elyutin P V, Krivchenkov V D Nonrelativistic Quantum Mechanics in Problems (Moscow: Fizmatlit, 2001) 302 pp. ISBN 5-9221-0077-7.

This book examines the physical foundations and mathematical apparatus of nonrelativistic quantum mechanics. Special attention is given to computational — in particular, approximate — methods. Besides a large number of worked examples within the text, the book includes more than 200 problems for home studies. For university students seeking a degree through physics courses. (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-74-21, 334-76-20; e-mail: fmlsale@maik.ru; URL: http://www.fizmatlit.ru/)

Anishchenko V S *ABC of Nonlinear Dynamics* (Izhevsk: RKhD, 2002) 144 pp. ISBN 5-93972-116-8.

This tutorial was developed from the author's nine lectures written within the "Soros professors" program. The lectures address the fundamental principles of the nonlinear dynamics of systems with a finite number of degrees of freedom. The concepts of a dynamical system, stability and bifurcation, deterministic chaos, synchronization, and stochastic resonance are considered and analyzed. Coverage also includes problems in diagnostics and the reconstruction of dynamical systems from experimental data. The tutorial is aimed at undergraduate students (in particular, those working on a thesis) and post-graduate students in natural sciences ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel.: (7-3412) 50-02-95; URL: http://www.old.rcd.ru/)

Blyumenfel'd L A Solvable and Non-Solvable Problems in Biological Physics (Moscow: Editorial URSS, 2002) 160 pp. ISBN 5-354-00121-8.

This book analyzes a number of fundamental problems in biophysics, a science covering the subject area of living systems. It assumes no previous special training in biology or physics; indeed, some of the book's chapters provide the basics of those areas of physics, biophysics, and biochemistry which are relevant to the problems discussed in the book. The first part of the monograph gives a brief history of biological physics, considers the basic concepts and laws of thermodynamics and statistical physics, and describes the grand paradoxes of physics, paradoxes whose analysis is of fundamental significance for understanding some of the main biophysics problems. The second part addresses the analysis of some 'solvable' biophysics problems relevant to ascertain-

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ing the molecular mechanisms of fermentative catalysis and to those of energy conversion in a living cell; it also discusses superweak interactions affecting biochemical, physiological, and physicochemical processes. In the third part, two problems in the science of living matter, whose solution requires the introduction of new, improvable laws and new principles, are examined. These 'insolvable' biophysics problems are, in the author's opinion, the problem of the initial stages of progressive biological evolution and that of individual consciousness. The book will be valuable for a wide range of readers, including research workers, lecturers, undergraduate and post-graduate students and all those interested in the problems touching upon biophysics and related areas of natural sciences. (Editorial 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:// www.urss.ru/)

Trubetskov D I, Mchedlova E S, Krasichkov L V *Introduction to the Theory of Self-Organization of Open Systems* ('Modern Theory of Vibrations and Waves' series) (Moscow: Izd-vo Fiziko-Matematicheskoĭ Literatury, 2002) 200 pp. ISBN 5-94052-052-9.

This book is an introduction to the theory of formation of structures in highly nonequilibrium systems. It offers a unified approach to self-organization in open systems from the standpoint of thermodynamics and the theory of formation of dissipative structures. The book contains a classification of structures that arise in open systems, and presents a large number of examples of self-organization processes in thermodynamics, hydrodynamics, biophysics, chemistry, ecology, and sociology. For each of the case considered, the authors provide a theoretical analysis and make a comparison between the model results and the dynamics of a real system. This publication was supported by the special-purpose federal program 'State Support for the Integration of Higher Education and Basic Science'. For undergraduate and postgraduate students in physics, engineering, and mathematics; it can also be of use as an authoritative guide to biologists, chemists, ecologists, and other specialists interested in selforganization phenomena in nonlinear, nonequilibrium systems. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prospekt 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

Koronovskii A A, Trubetskov D I Nonlinear Dynamics in Action: How the Ideas of Nonlinear Dynamics Penetrate Ecology, Economics, and Social Sciences 2nd ed. (Saratov: Izd-vo GosUNTs 'Kolledzh', 2002) 324 pp. ISBN 5-94409-019-7.

This book is a collection of the lectures delivered by the authors to various audiences at different times. It discusses the application of the ideas, methods, and apparatus of nonlinear dynamics to describing the processes occurring in biological, economical, and social systems. Special attention is given to the question of to what degree the results thus obtained correspond to the processes proceeding in real systems. The first edition of the book was published in 1995. The book is intended for research workers, senior under-

graduate and post-graduate students in natural sciences and humanities, who are interested in the application of the ideas and methods of nonlinear dynamics to biology, sociology, medicine, and economics. (GosUNTs 'Kolledzh' Publ.: 410026 Saratov, ul. Astrakhanskaya 83; e-mail: and@cas.ssu.runnet.ru)

Petrashen' M I, Trifonov E D Application of Group Theory in Quantum Mechanics 4th ed. (Moscow: Editorial URSS, 2002) 280 pp. ISBN 5-8360-0480-3.

This monograph acquaints the reader with the basic essentials of the theory of finite and continuous groups and with the applications of the theory of group representations to the problems in quantum mechanics. The applications considered pertain to such areas of quantum mechanics as the theory of atom, quantum chemistry, solid state theory, and relativistic quantum mechanics. The book also covers a number of problems which are either ignored or treated in insufficient detail in other monographs. These include primarily the symmetry properties of the Schrödinger wave function, the 'complementary' degeneration in a Coulomb field, and some aspects of solid state theory. The book is designed primarily for undergraduate students seeking a degree through courses in physics departments. It will also be an important resource for research workers - physicists and chemists who wish to develop practical skills in order to use group-theoretical methods in their studies. (Editorial 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://www.urss.ru/)

Instantons, Strings, and Conformal Field Theory (Ed. by A A Belavin) (Moscow: Fizmatlit, 2002) 448 pp. ISBN 5-9221-0303-2. RFBR project 02-01-14115.

This book is a collection of 24 papers which address problems in modern quantum field theory (conformal symmetry of critical phenomena, factorized scattering in two-dimensional theories, instantons and monopoles in gauge theories, and the interaction of relativistic strings) and analyzes its mathematical foundations (algebraic topology, the theory of representations of infinite-dimensional Lie algebras, theory of quantum groups, etc.) The contributed papers were published in the scientific literature in 1970s – 1990s. (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-74-21, 334-76-20; e-mail: fmlsale@maik.ru; URL: http:// www.fizmatlit.ru/)

Batygin V V, Toptygin I N *A Problem Book in Electrodynamics* 4th ed. (Izhevsk: RKhD, 2002) 640 pp. ISBN 5-93972-155-9.

Included in this collection are about 900 problems which illustrate various areas of classical electrodynamics and the special relativity. The problems range widely both in content and complexity. Along with problems which illustrate the basic concepts and laws of electrodynamics and which relate to the obligatory course of basic electrodynamics, the collection includes a large number of more difficult problems, which help the reader in studying more fundamental aspects of electrodynamics. The collection is intended primarily for students in physics; it is designed in accordance with the existing electrodynamics programs, and may be used as a tutorial for any higher-education institutions. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel./fax: (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://www.rcd.ru)

Vstovskii G V, Kolmakov A G, Bunin I Zh Introduction to the Multifractal Parametrization of Materials Structures (Izhevsk: RKhD, 2001) 116 pp. ISBN 5-93972-085-4.

This work provides up-to-date information on the quantitative parametrization of materials structures by means of fractal and multifractal representations, examines the fundamentals of the self-similarity of natural structures, and introduces the concepts of fractal dimensionality and regular fractals. Theoretical schemes are illustrated with examples of regular fractal model structures and natural stochastically fractal structures. The book focuses on the basic techniques for quantitative structure parametrization using regular fractal concepts and shows their shortcomings and limitations which make it necessary to employ multifractal representations. It presents the basic ideas of multifractal formalism and describes in detail the methodology of multifractal parametrization of materials structures. A computer program for the multifractal quantitative processing of materials structure images is presented. The use of multifractal parametrization is illustrated with specific applications to the most common structures known in materials science: grain, phase, and porous structures as well as structures that develop on fracture surfaces, and topographic structures occurring on materials surfaces. The publication is aimed at research workers and practising engineers who want to improve their understanding of the subject, as well as for undergraduate and post-graduate students in disciplines related to metallurgy and materials science. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel./fax: (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://www.rcd.ru)

Lotov K *Physics of Continua* (Izhevsk: RKhD, 2002) 144 pp. ISBN 5-93972-111-7.

This book represents the concise exposition of a course in the mechanics and physics of continua, which was given by the author in a physics department of the university. The course covers the foundations of the electrodynamics of continuous media, hydrodynamics, and elasticity theory. For teachers as well as undergraduate and post-graduate students in physics at a university. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel./ fax: (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://www.rcd.ru)

Novokshenov V Yu An Introduction to the Theory of Solitons (Izhevsk: RKhD, 2002) 96 pp. ISBN 5-93972-100-1.

This book portrays the main ideas of the modern theory of nonlinear equations of mathematical physics and presents methods for the exact integration of these equations, based on the spectral properties of some linear differential operators. The book considers numerous applications to problems in hydrodynamics, nonlinear optics, and quantum mechanics. Brief historical remarks are included, and current findings relating to this subject are reviewed. The material is arranged into lectures for senior students in the discipline 010200 'Applied Mathematics'. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel./fax: (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://www.rcd.ru)

Belyaev V V Viscosity of Nematic Liquid Crystals (Moscow: Fizmatlit, 2002) 224 pp. ISBN 5-9221-0232-X.

The hydrodynamic properties of anisotropic liquids (nematic liquid crystals) are examined systematically for the first time. The book presents methods for measuring anisotropic viscosities. It describes the experimental dependences of the viscosity of a nematic liquid crystal on all the thermodynamic parameters (p, V, T) and compares these dependences with currently available empirical approaches and with static and dynamic molecular theories. Calculating methods capable of very accurately predicting the value of viscosity are proposed. The temperature dependence of viscosity for liquid-crystal materials and mixtures is considered. The composition of modern liquid-crystal materials for optoelectronics is analyzed in detail from the point of view of creating mixtures with optimal viscosity and a required speed of operation. For research workers, experimenters and theoreticians alike, concerned with solid-state physics, the physics of the liquid state of matter, hydrodynamics, physical chemistry, and organic chemistry, as well as for undergraduate and post-graduate students in relevant disciplines. (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./ fax: (7-095) 334-74-21, 334-76-20; e-mail: fmlsale@maik.ru; URL: http:// www.fizmatlit.ru/)

Yakovlev V I *The Prehistory of Analytical Mechanics* (Izhevsk: RKhD, 2001) 328 pp. ISBN 5-93972-063-3.

This book examines the development of the basic concepts, principles, laws, and problems of classical mechanics until the middle of the 18th century. Particular attention is given to the contribution that Descartes, Huygens, Newton, Leibniz, the Bernoulli brothers, and the French scientists of the first half of the 18th century (Varignon, Maupertuis, Bouge, Clairaut, D'Alembert) made to mechanics. The book will be of interest and value to all those concerned with the history of science and can be used in the teaching and studying of the courses of theoretical mechanics and the history of mechanics and physics. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel./fax: (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http:// www.rcd.ru)

Trofimova T I *Physics: 500 Basic Laws and Formulas* Handbook (Moscow: Vysshaya Shkola, 2001) 64 pp. ISBN 5-06-003741-X.

This book systematizes basic laws and formulas which are drawn from all areas of classical and modern physics and whose knowledge is a requirement for a university or college physics course. It is designed primarily to help the reader to rapidly locate a desired physical law or formula. The handbook will appeal to the students preparing for a colloquium, a seminar, or an exam. Can be of use to engineers and technicians, as well as to college and high-school students. (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/)

Riznichenko G Yu Lectures on Mathematical Models in Biology Part 1 (Izhevsk: RKhD, 2002) 232 pp. ISBN 5-93972-093-5.

This book is the first part of lectures on the mathematical modeling of biological processes and is devoted to the description of the evolution of biological systems in time. The book's twelve lectures cover classification and peculiarities of modeling of living systems; basics of the mathematical apparatus applied to building the dynamic models in biology; base models of population growth and species interaction, and models of multistationary, vibrational, and quasi-stochastic biological processes at various levels. Special attention is given to the important biomodeling concept of time hierarchy and to modern ideas about fractals and dynamic chaos. The lectures are intended for undergraduate and post-graduate students, as well as for specialists who require a basic understanding of modern mathematical modeling in biology. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya 1, UdGU, RKhD; tel./fax: (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://www.rcd.ru)

Bakhvalov N S, Zhidkov N P, Kobel'kov G M Numerical Methods 2nd enlarged ed. (St.-Petersburg-Moscow: Laboratoriya Bazovykh Znaniĭ, Fizmatlit, 2001) 632 pp. ISBN 5-93208-043-4.

This book is a revised version of *Numerical Methods*, a tutorial the same authors published in 1987. The authors have added material on the solution of systems of linear equations with ill-conditioned matrices, the solution of the Cauchy problem for systems of stiff ordinary differential equations, the approximation of functions, and the conjugate gradient method. The exposition of the optimal linear iteration process has been changed, and the multigrid iteration method — one of the methods that is currently being most widely used for solving grid boundary value problems — is considered. ("Laboratoriya Bazovykh Znanii" Publ.: tel.: (7-095) 955-03-98, 955-04-29; e-mail: lbz@aha.ru)

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