

New books on physics and related sciences

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Karlov N V, Kirichenko N A *Vibrations, Waves, and Structures* (Moscow: Fizmatlit, 2001) 496 pp. ISBN 5-9221-0205-2. RFBR project 01-02-30033.

This book provides a systematic presentation of the modern theory of vibrations and waves. The first part is an elementary introduction to the theory of vibrations. In the second part, the key concepts and methods of the theory of nonlinear dynamic systems are presented, and the stochastic nature of Hamiltonian and dissipative systems is examined. The third part is devoted to wave processes in linear and nonlinear systems. In commentaries and appendices, problems of nonlinear dynamics (in particular, wave propagation and the interaction of radiation and matter) are discussed and reference information is presented as well. The text is complemented by a number of problems for which detailed solutions are provided. The book is intended for undergraduate and post-graduate students and scientific workers interested in the theory of vibrations and its applications. (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-7421, 334-7620; e-mail: fmlsale@maik.ru; <http://www.fizmatlit.ru/>)

Kapitonov I M *An Introduction to Nuclear and Particle Physics* (Moscow: Éditorial URSS, 2002) 384 pp. ISBN 5-354-00058-0.

The concluding part of a general physics course, this book deals with atomic nuclei and elementary particles. The material is presented in the form of 15 lectures given by the author to students in the Moscow State University Physics Department. The closing lectures examine the cosmological aspects of the physics of particles and nuclei. The book contains the most up-to-date information and is provided with appendices. For university students in physical sciences. (Éditorial URSS Publ.: 117312 Moscow, Prosp. 60-letiya Oktyabrya 9, office 203 at the RAS Institute for System Analysis; tel./fax (7-095) 135-4423, 135-4246; e-mail: urss@urss.ru; <http://www.urss.ru/>)

Ishlinskii A Yu, Ivlev D D *Mathematical Theory of Plasticity* (Moscow: Fizmatlit, 2001) 704 pp. ISBN 5-9221-0141-2. RFBR project 01-01-14064.

This monograph is concerned with the mathematical theory of plasticity, a major branch of the mechanics of solids and a field where the authors themselves have produced results of fundamental theoretical and applied significance. The book discusses the derivation of general relations for the theory of ideal plasticity as well as for strain-hardening materials and for those with complex rheological properties. Some applications, e.g., to the technology of cold material working, and to the deformation and flow of plastic and viscoplastic materi-

als, are covered. Intended for scientific workers, engineers, and post-graduate and senior undergraduate students specializing in the mechanics of the inelastic deformation of bodies and structures. (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-7421, 334-7620; e-mail: fmlsale@maik.ru; <http://www.fizmatlit.ru/>)

Kholevo A S *Introduction to the Quantum Theory of Information* ('Modern Mathematical Physics: Problems and Methods' series, Issue No. 5) (Moscow: MTsNMO, 2002) 128 pp. ISBN 5-94057-017-8.

The fifth issue of the 'Modern Mathematical Physics: Problems and Methods' series examines the basic concepts and rigorous results of a new scientific discipline, namely, the quantum theory of information. The possibilities for quantum systems to transmit and transform information are illustrated by considering superdense encoding, quantum teleportation, and quantum algorithms. The entropy and information characteristics of the quantum systems are considered. The concept of a quantum communication channel and its classic and quantum transmission capacities are discussed in detail, as is the lockstep transfer of classic information. Several unsolved fundamental problems are formulated, whose solution is anticipated to contribute significantly to the quantum theory of information. As the lectures provide necessary background to classical information theory and present a detailed introduction to the statistical structure of quantum theory, only a basic knowledge of general mathematical disciplines is needed to understand the material. (Publishing House of the Moscow Center for Continuous Mathematical Education: 121002 Moscow, B. Vlas'evskii per. 11; tel.: (7-095) 241-7285; fax: (7-095) 291-6501; e-mail: biblio@mccme.ru; <http://www.mccme.ru/>)

Galkin V A *The Smoluchowski Equation* (Moscow: Fizmatlit, 2001) 336 pp. ISBN 5-9221-0208-7. RFBR project 01-01-14009.

The book covers the theory of problem correctness for the Smoluchowski equation modeling particle coagulation processes in dispersive media. Spatially uniform and nonuniform problems are considered. The global solvability and correctness theorems are proved for the Cauchy problem. The effects accompanying the transformation of the conservation relation to the dissipation relation are described, and their relationship to solutions with uneven singularities is demonstrated. Approximate problem solution methods are proposed, and their justification is provided. For the class of functional solutions, the book describes how correctness conditions can be obtained for Boltzmann type equations incorporating the classical Boltzmann equation of the kinetic theory of gases and the classical Smoluchowski equation of the kinetic theory of coagulation. For researchers, teachers, and post-graduate and undergraduate students concerned with mathematical modeling in physical kinetics, colloid chemistry, and biology. (Fizmatlit Publ.: 117864 Moscow,

ul. Profsoyuznaya 90; tel./fax: (7-095) 334-7421, 334-7620; e-mail: fmlsale@maik.ru; <http://www.fizmatlit.ru/>)

Lakhno V D *Clusters in Physics, Chemistry, Biology*. A university textbook (Izhevsk: RKhD, 2001) 256 pp. ISBN 5-93972-060-9. RFBR project 01-04-62012.

This book gives an account of the physics of clusters, a rapidly growing field at the intersection of molecular physics, atomic physics, condensed matter physics, the chemistry of atoms and molecules, molecular biology, and biochemistry. The importance and timeliness of an introduction to the field and the logical rigor and clear style of the text will undoubtedly guarantee a warm welcome from a wide range of readers. Numerous figures and diagrams as well as problems included in each chapter make the book a valuable guide to a broad interdisciplinary realm of knowledge. The book is a useful reference for specialists practising in different areas of science and an essential text for undergraduate and post-graduate students. (Science and Publishing Center 'Regular and Chaotic Dynamics': 426034 Izhevsk, ul. Universitetskaya 1; tel.: (7-3412) 78-39 33; <http://www.old.rcd.ru/>).

Goryachenko V D *Elements of the Vibration Theory* 2nd revised and enlarged ed. (Moscow: Vysshaya Shkola, 2002) 396 pp. ISBN 5-06-004166-2.

The book presents the basic concepts and methods of the nonlinear theory of dynamic systems, such as stability, qualitative phase-plane analysis, and methods for calculating self-excited vibrations and vibrations under periodic external forces. The presentation is illustrated with numerous examples. Out-of-classroom assignments are accompanied by relevant instructions and occasionally by detailed solutions. The original analyses of nuclear power engineering and ecological mathematical models illustrate the application of the theory, while at the same time being of interest in themselves and enriching the reader's fund of knowledge. The second edition (the first edition appeared in 1995) has been revised, and some new material has been added. For teachers and undergraduate and post-graduate students, as a text in introductory courses to the system dynamics, vibration theory, and mathematical modeling; also for researchers and engineers engaged in modeling dynamic systems in various fields of science and technology. (Vysshaya Shkola Publ.: 127994 Moscow, ul. Neglinnaya 29/14; tel.: (7-095) 200-3370; fax: (7-095) 200-0301; e-mail: info@v-shkola.ru; <http://www.v-shkola.ru/>)

Mityugov V V *Synthesis of Science* (Nizhniy Novgorod: IPF RAN Publ., 2002) 68 pp. Bibliography: 10 refs ISBN 5-8048-0032-9.

An up-to-date literary account of the history and development of thermodynamic, probabilistic, and quantum ideas. While in the first three sections (Theory of Heat, Theory of Probability, and Functional Analysis) there is little or no new information for a qualified physicist, some parallels may still interest him. The most fundamental results of the last decade concerning the immanent quantum nature of chance and of the second law of thermodynamics are covered in Sections 4 and 5. The presentation is mainly based on the analysis of simple physical models. As an aid to further study, a list of some original publications is given in the Appendix. The book is intended for scientific workers and post-graduate students

in physical and mathematical sciences as well as for inquisitive undergraduate students and committed teachers. (RAS Institute of Applied Physics Publ.: 603600 Nizhniy Novgorod, ul. Ul'yanova 46)

Goriletskii V I, Grinev B V, Zaslavskii B G, Smirnov N N, Suzdal' V S *Crystal Growth: Alkali Halides* (Khar'kov: Akta, 2002) 536 pp. ISBN 966-7021-37-8.

The monograph investigates a variety of problems relating to fabricating alkali halide crystals and, in particular, sodium-iodide- and cesium-iodide-based scintillators. On the one hand, it discusses such topics as the general principles for controlling the growth of crystals from a melt; the phase diagrams of mixed systems and their behavior at invariant (eutectic and peritectic) points; the finite change principle for equilibrium heterogeneous systems; the role of physicochemical and preparation factors in crystal growth; the classification and behavioral peculiarities of the nonconservative systems during crystal growth; general regularities for the methods of crystal growth from a melt; intensifying growth techniques and their application to growing large crystals, etc. On the other hand, the book covers a number of particular problems concerning the growth of alkali halide crystals, currently the best and most widespread scintillators. The authors hope that the book will appeal not only to specialists engaged in fabricating these particular crystals but also to crystal growth specialists in general. The book is a useful reference for newcomers in the field and a good textbook for undergraduate students. Practising specialists looking for a comprehensive approach to single-crystal growth technology will also be interested. (Akta Science Publ.: 61145 Ukraine, Khar'kov, ul. Novgorodskaya 1; e-mail: we@akta.com.ua; <http://www.acta.com.ua/>)

Asanov M O, Baranskii V A, Rasin V V *Discrete Mathematics: Graphs, Matrices, Algorithms* (Izhevsk: RKhD, 2001) 288 pp. ISBN 5-93972-076-5.

This book covers some major branches of the theory of graphs and matroids. It examines the discrete optimization algorithms most widely used by programmers dealing with grids and graphs. For undergraduate and post-graduate students in computer sciences, for practising programmers, and for all those wishing to familiarize themselves with the basics about discrete computational mathematics of today. (Science and Publishing Center 'Regular and Chaotic Dynamics': 426034 Izhevsk, ul. Universitetskaya 1; tel.: (7-3412) 78-39 33; <http://www.old.rcd.ru/>)

Martinson L K, Malov Yu I *Differential Equations of Mathematical Physics* ('Mathematics in a Technical University' series, Issue No. 12) (Moscow: N É Baumann MGTU Publ., 2002) 368 pp. ISBN 5-7038-1911-3.

The book examines the formulation of the problems of mathematical physics for partial differential equations and considers the basic analytical methods for their solution. For researchers, engineers, and undergraduate and post-graduate students in applied mathematics and mathematical modeling. (N É Baumann MGTU Publ.: 107005 Moscow, 2-ya Baumanskaya ul. 5; tel.: (7-095) 263-6045; fax: (7-095) 265-4298; e-mail: press@bmstu.ru; <http://www.press.bmstu.ru/>)

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