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New books on physics and related sciences

Ginzburg V L *About Science, Myself, and Others.* Papers and Talks 2nd enlarged ed. (Moscow: Izd. Fiziko-Matemati-cheskoĭ Literatury, 2001) 496 pp. ISBN 5-94052-030-8.

This book offers a series of papers written by Academician V L Ginzburg, some of which (15 papers) were included in the book's first edition of 1997, whereas the remaining 14 were published in different periodicals, several of them hard to access. Along with scientific papers on physics and the history of cosmic ray astrophysics and radio astronomy, the collection includes the author's recollections and essays on prominent scientists and their roles in science. Some of the papers address the development of society as a whole, and there is also extensive autobiographical material. The collection of articles complements the author's well-known book On Physics and Astrophysics, which ran through three Russian editions (Moscow: Nauka, 1985 and 1992; and Moscow: Byuro Kvantum, 1995) and was translated into English as The Physics of a Lifetime (Berlin: Springer-Verlag, 2001). For physicists and astrophysicists, school and college teachers of physics, engineers and researchers, and all those interested in how science and society progress. (Fiziko-Matematicheskaya Literatura Publ. regular mail address: 117071 Moscow, P.O. V-71, Leninskiĭ pr. 15)

Andreev B M, Zel'venskii Ya D, Katal'nikov S G *Heavy Hydrogen Isotopes in Nuclear Technology*. College textbook 2nd revised and enlarged ed. (Moscow: IzdAT, 2000) 344 pp. Bibliography: 28 refs. ISBN 5-86656-105-0.

This book examines hydrogen isotope separation for the purposes of producing deuterium (heavy water) and extracting and concentrating tritium from the aqueous and gaseous flows at nuclear fuel cycle plants. The monograph not only reviews present knowledge and proximate problems concerning nuclear power engineering but also discusses prospects for controlled thermonuclear fusion. Updated from its first edition (Moscow: Energoatomizdat, 1987), the book sucked in the latest data and technological solutions and how existing technologies were being reassessed due to the technological and economic developments in Russia and abroad. Much attention is given to the reliability and safety of nuclear installations and to environmental control over the radioactive wastes of a hydrogen isotope - tritium. Three old chapters were excluded, and other parts were pruned of outdated descriptive matter only of historical interest. The book draws from Russian and international scientific literature, the research by the authors (or with their participation) and from the authors' many years of teaching courses at the Technology of Isotopes and Extrapure Substances Chair in the Physicochemical Engineering Department at the D I Mendeleev Moscow Chemical Engineering Institute.

Uspekhi Fizicheskikh Nauk **171** (10) 1149–1152 (2001) Translated by E G Strel'chenko DOI: 10.1070/PU2001v044n10ABEH001095

For college students concerned with the physical and chemical aspects of nuclear engineering and interested in the conservation of the environment against radioactive contamination. [Atomic Science and Technology Publishing (IzdAT) of the International Association of Unions 'Chernobyl'-Atom' regular mail address: 123182 Moscow, ul. Zhivopisnaya 46; tel.: (7-095) 190-9097]

Almazov-Dolzhenko K I The Noise Figure and its Measurement at Microwave Frequencies (Ed. by Academician N D Devyatkov) (Moscow: Nauchnyĭ Mir, 2000) 240 pp. Bibliography: 202 refs. ISBN 5-89176-084-3.

This monograph presents a generalization of the results of research into the problem in hand performed for many years by the author and his GNPP 'Istok' team as well as many other participants. It systematically examines basic problems related to the sensitivity assessment of microwave amplifiers and receivers and discusses the standardization of conditions for measuring the 'noise figure' (K_n) , 'noise temperature' (T_a) , and the set of the mismatched-channel noise parameters of an amplifier (for the noise parameters, no information is given beyond that necessary for understanding measurementrelated problems). Some aspects and methods of noise signal measurement are addressed as are basic techniques for measuring K_n and T_a in amplifiers and receivers. Coverage also includes the method of 'two noise generators' as a tool for measuring the amplification factor (K_a) ; instruments for measuring the noise parameters of amplifying and receiving microwave devices; the 'generalized structural scheme' of the $K_{\rm n}$ -meter, calculations using this scheme, and requirements on the individual elements of the K_n -meter. Typical domestic and foreign models of K_n -meters are described, and reference material is given on the noise generators and microwave units which have been developed at the GNPP 'Istok' and can be used in K_n -meter design for any portion of the microwave frequency range. The book is intended for professionals engaged in the design and development of electronic devices and microwave measuring instruments and may also be useful to students being taught in the appropriate disciplines. (Nauchnyĭ Mir Publ. regular mail address: 119890 Moscow, ul. Znamenka 11/11; tel. (7-095) 291-2847; e-mail: naumir@ben.irex.ru)

Shmidt V V Introduction to the Physics of Superconductors 2nd ed. revised and augmented by V V Ryazanov and M V Feigel'man (Moscow: MTsNMO, 2000) xiv+402 pp. Bibliography: 198 refs. ISBN 5-900916-68-5 RFBR project 99-02-30008.

This book is based on a lecture course delivered by the author at the Moscow Institute of Steel and Alloys over a period of several years. The first edition was published in 1982 (Moscow: Nauka). In 1997, an English translation (with minor additions relating to high-temperature superconductors) was also published [Schmidt V V *The Physics of* Superconductors: Introduction to Fundamentals and Applications (New York: Springer-Verlag, 1997)].

The book addresses current knowledge about superconductivity. The material is generally presented in order of increasing complexity, starting from basic experimental facts and a thermodynamic description of the phenomenon in hand. The author then outlines the linear electrodynamics of superconductors, which is based on the London phenomenological equations, and goes on to the Ginzburg-Landau theory which uses the simplest ideas about the quantum nature of superconductivity. He next discusses the consequences of the GL theory and the fundamentals of fluctuation effects in low-dimensional superconductors. The chapter on weak superconductivity (the Josephson effect) concludes with a description of superconducting quantum interferometers (squids) and other practical applications of Josephson junctions. The basic physics of type II superconductors, including effects characteristic of high-temperature superconductors, are also expounded (in the following chapter) within the framework of the GL phenomenological theory. A separate chapter covers the physics of superconductors starting from the Bardeen-Cooper-Schrieffer microscopic theory and its extension to Cooper pairing with nontrivial symmetry. The last chapter concerns the fundamentals of the theory of nonequilibrium phenomena in superconductors and mesoscopic superconducting structures. The physical interpretation of the phenomena discussed is emphasized throughout the material presented. The book requires a college-level knowledge about classical electrodynamics and quantum mechanics and assumes a minimum background in the quantum theory of metals. (Publishing House of the Moscow Continuous Mathematical Education Centre regular mail address: 121002 Moscow, B Vlas'evskiĭ per. 11)

Bakulin V N, Obraztsov I F, Potopakhin V A Nonlinear Dynamics of Multilayer Shells: Intense Thermal Force Loads and Concentrated Energy Flows (Moscow: Nauka – Fizmatlit, 1998) 464 pp. Bibliography: 394 refs. RFBR project 96-01-14182. ISBN 5-02-015132-7.

This book covers methods, procedures, and new results of the computational and experimental studies on multilayered shells subject to dynamic thermal force load in the lessstudied form of concentrated energy flows. An effective approach to the problem is to derive nonlinear dynamic three- and two-dimensional equations and then to solve them using the generalized discrete orthogonalization method combined with the Hubolt finite-difference scheme and with the Fourier series, Bubnov-Galerkin, and Striklin methods. Coverage includes the analysis and comparison of the new numerical and experimental (in particular, holographic) results illuminating the behavior, thermally stressed state and strength properties of a layered shell subject to dynamical thermal force loads and to electron and proton flows. For research scientists, engineers, technicians, teachers, and undergraduate and post-graduate students involved in the calculation, design, and testing of structures. (RAS Fiziko-Matematicheskaya Literatura Publ. regular mail address: 117071 Moscow, P.O. V-71, Leninskii prospekt 15)

Belikovich V V, Benediktov E A, Tolmacheva A V, Bakhmet'eva N V Ionospheric Studies Using Artificial Periodic Inhomogeneities (Nizhniĭ Novgorod: IPF RAN Publ., 1999) 156 pp. Bibliography: 116 refs. ISBN 5-201-09314-0. RFBR project 99-05-78032.

The monograph introduces a new radiophysical method for remotely sensing ionospheric plasma and the atmosphere by creating artificial periodic inhomogeneities (APIs) in ionospheric plasma in the field of a powerful standing radio wave. The API short radio pulse ranging and detection of the returned signals allow one to determine a whole series of most important plasma parameters at various ionospheric altitudes, such as the electron density profile from region D to the layer F maximum (including the interlayer cavity); the temperature and density of the atmosphere; vertical plasma velocities and the vertical turbulence velocity component at E altitudes, and the temperatures of the electronic and ionic components in region F. The book explores the basic physics of API formation in various ionospheric layers, presents methods of API-based measurements of ionospheric and atmospheric parameters, and discusses experimental results obtained with this method. The material is presented by a group of authors who directly participated in the development and application of the method in hand. It summarizes more than 20 years of API research, including the API-assisted diagnostics of ionospheric plasma and the atmosphere. The book will be useful to geophysicists, radiophysicists, and undergraduate and post-graduate students who study the upper atmosphere and the ionosphere and are interested in the propagation of radio waves in ionospheric and laboratory plasmas. (RAS Institute of Applied Physics Publ. regular mail address: 603600 N Novgorod, ul. Ul'yanova 46)

Kormil'tsev V V, Ratushnyak A N Geophysical Field Modeling Using Three-Dimensional Vector Integral Equations 2nd revised ed. (Ekaterinburg: UrO RAN Publ., 2000) 98 pp. Bibliography: 61 refs. ISBN 5-7691-0997-1. RFBR project.

This book addresses three-dimensional vector integral equations for electric potential, pressure, temperature, and concentration gradients, and magnetic field strength in a magnetic material for the case of a homogeneous half-space containing a number of physically inhomogeneous threedimensional bodies. Integral equations for cross and mixed effects such as electrical potentials for material flow and diffusion, electroosmotic pressure, and heat transfer in a filtering medium are also derived. For complex geological structures, the examples of calculations of a number of quantities are provided, including the electric and magnetic fields of a current, a magnetic field in a strongly magnetized body, electroosmotic pressure gradients, Darcy flow velocity (in particular, for a moving interface between two immiscible liquids and for the nonstationary filtration of a compressible fluid), electric and magnetic fields for a Darcy flow, and temperature fields and heat fluxes in the presence of an additional convective transfer. For those who study and apply geophysics and geophysical survey methods. (Institute of Geophysics, RAS Ural Branch regular mail address: 620016 Ekaterinburg, ul. Amundsena 100)

Reznitskiĭ L A *Energetics of Oxide Crystals* 2nd revised and enlarged ed. (Moscow: Dialog-MGU, 2000) 171 pp. Bibliography: 283 refs. ISBN 5-89209-549-5.

Since the first, low-circulation 1998 edition, which was sold out in 1999, the author has been continuing his experimental, computational, and bibliographic research on the crystal energetics of oxides. The result of this work took the form of the second edition. The book discusses the thermodynamic properties of complex oxides in the context of the dominant role of the oxygen coordination polyhedron. It establishes correlations between the thermochemical properties and polyhedral structure of oxides and examines the application of the correlations to the approximate calculation of the formation enthalpies, free energies, and entropies of the compounds. A consistent system of values for the enthalpy, free energy, and the entropy of the change of cation coordination in an oxygen environment is developed. Major factors affecting the thermochemical stabilization of complex oxides relative to simple oxides are identified for various oxide structural types. The results of the research on the temperature stabilization of amorphous oxides and their solid solutions are generalized, and structural and energy criteria for selecting inhibitors to stabilize the amorphous state of a material are established. The book demonstrates how changes in the energetics of coordination polyhedra can be employed in treating the effect of impurities on the properties of catalysts, and also discusses the importance of calorimetric and structural studies for the development of energy-saving technologies and the production of oxide materials for various applications. Oxides serve as reference materials in calculating exergies for most chemical elements, whose elemental values are then used to obtain exergies for substances employed in industrial processes. The exergy magnitudes available are summarized and their periodic variations with the chemical element are established for the first time. For specialists and undergraduate and post-graduate students in inorganic chemistry, thermodynamics, and crystal energetics. (Dialog-MGU Inc. Publ. contact information: tel. (7-095) 939-3890; tel/fax (7-095) 939-3891)

Pontryagin L S *Ordinary Differential Equations* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2001) 400 pp. ISBN 5-93972-053-6.

This book is based on a set of lectures given by the author in the Mathematics Department at Moscow State University over a period of several years. The material of this book was selected by considering the most interesting applications which the theory of ordinary differential equations finds in technology and in the theory of automatic control. Advanced-level problems discussed at university seminars are also included. Accessibility and a large number of examples is a feature of the book. The reader audience involves students in mechanics, mathematics, physics, and engineering. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; site on http://rcd.ru)

Lipov Yu M *Thermal Design of a Boiler* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2001) 176 pp. ISBN 5-93972-046-3.

This manual provides a methodology and standard reference data necessary for the design and checking calculation of medium- and large-productivity boilers working with solid, gaseous, and liquid fuel set on fire. The methodology is based on a standard calculation method and uses generalized dependences and the reduced thermal characteristics summarized in the book. Illustrative computations and algorithms for computer calculations of surfaces are presented. Appropriate for a university-level heat engineering course and for technical school students. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; site on http://rcd.ru)

Borisov A V, Mamaev I S *Dynamics of Solids* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2001) 384 pp. ISBN 5-93972-055-2.

This book examines basic forms of equations of motion of a solid body, including motion in potential fields and in a liquid (Kirchhoff equations), as well as bodies with liquid-filled cavities. It discusses conditions for lowering the order of these equations and for the existence of cyclic variables. The book presents virtually all integrable equations currently known and explores methods for their explicit integration. In exploring the subject, computer methods are intensely used to get a clear picture of the motion studied. The results presented in the book are mostly those of the authors' original research. For undergraduate and post-graduate students in mechanics, mathematics, and physics as well as for specialists in mathematical physics and dynamical systems. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; site on http://rcd.ru)

Golod P I, Klimyk A U Mathematical Foundations of the Theory of Symmetries (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2001) 528 pp. ISBN 5-93972-052-8.

This book is intended to introduce the methods used in the theory of groups and Lie algebras, finite and discrete groups, and in the theory of other algebraic structures that furnish the current mathematical apparatus of the theory of symmetries in physics and that are widely used in quantum field theory, the theory of the atomic nucleus and the elementary particles, in solid-state theory, and in quantum chemistry. The book covers the basic principles of affine algebras and their representations and introduces the theory of representations of quantum groups and algebras. For researchers in theoretical and mathematical physics and for undergraduate and post-graduate students in physics and mathematics. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; site on http://rcd.ru)

Yakovlev V I *Prehistory of Analytical Mechanics* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2001) 328 pp. ISBN 5-93972-063-3.

The monograph traces the development of the basic concepts, principles, laws, and problems of classical mechanics up to the middle of the 18th century. For historians of physical and mathematical sciences, and for college teachers and students. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; site on http://rcd.ru)

Khriplovich I B *General Theory of Relativity* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2001) 120 pp.

Based on a lecture course delivered by the author at Novosibirsk State University, the text-book examines the fundamentals of the general theory of relativity and discusses various experiments confirming the theory. While the book is written in a concise manner, some aspects are discussed in fairly great detail and exercise problems for self-study are featured. For professionals and for undergraduate students in physics and mathematics. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; site on http://rcd.ru)

Kravchenko A F *Physical Principles of Functional Electronics* Manual (Ed.-in-Chief I G Neizvestnyĭ) (Novosibirsk: Novosibirsk State University Publ., 2000) 444 pp. Bibliography: 81 refs. ISBN 5-7615-0489-8.

This book provides an authoritative examination of various physical processes in solids on the basis of which a wide variety of functional data-conversion devices of modern electronic engineering are being created. It summarizes the latest advances in this field, achieved by workers in Russia and abroad. It also assesses the limiting physical parameters of functional devices, analyzes yet-unsolved problems, and discusses the most promising lines of research in the field of functional electronics — that is, electronics based on the excitation, control, and detection of dynamical inhomogeneities in active media. For various functional devices (optoelectronic, magnetic, magnetooptic, superconducting, acoustoelectric, etc.), some aspects of their operation in highestperformance regimes are discussed. The book was supported by the Russian Federation's 1997–2000 'State Support for the Higher Education-Basic Science Integration' specialpurpose program. The textbook is intended for senior students in physics specialities as well as for students working for a master's degree and post-graduate students in information science, electronic engineering, and the automation of physical and technological processes. Recommended by the RF Ministry of Education as a textbook for undergraduate students in electronic engineering, radio engineering, and communication. (Novosibirsk State University Publ. regular mail address: 630058 Novosibirsk, ul. Russkaya 35)

Parvulyusov Yu B, Rodionov S A, Soldatov V P, Shekhonin A A, Yakushenkov Yu G *Design of Optoelectronic Devices* Textbook. 2nd revised and enlarged edition (Ed. by Yu G Yakushenkov) (Moscow: Logos, 2000) 488 pp. Bibliography: 40 refs. ISBN 5-88439-144-7.

Topics in this book include general aspects, methodology and stages in the design of optoelectronic devices; methods for calculating and selecting the basic parameters of such devices, and methods for calculating and designing their basic elements. Particular attention is given to the layout, testing, and metrological certification aspects of optoelectronic devices. A large number of model calculations and designs are presented. The book was supported by the Russian Federation's 1997-2000 'State Support for the Higher Education-Basic Science Integration' special-purpose program. Recommended by the RF Ministry of Education as a textbook for undergraduate students in optical engineering and optoelectronic instruments and systems. It is also a valuable resource for a wide range of specialists engaged in optical instrument making. (Logos Publ. Inc. regular mail address: 105318 Moscow, Izmaĭlovskoe sh. 4)

Beleĭcheva T G *Optical Channel Waveguides: Mathematical Modeling and Investigation* Monograph (Vladivostok: Admiral G I Nevel'skiĭ Far-East State Marine Academy, 2000) 183 pp. Bibliography: 189 refs. ISBN 5-8343-0011-1.

This monograph provides theoretical analysis of light propagation processes in optical channel waveguides which are the basic elements of integrated-optical devices for handling and transferring information. Waveguide characteristics are studied using mathematical modeling and numerical simulation methods. The book is the first to develop mathematical and computational models and computer codes for determining the spectrum and electromagnetic fields for the directed modes of a channel waveguide with anisotropy and two-dimensional inhomogeneity in its cross section. A new method for determining the complete spectrum and electromagnetic fields for the channel waveguide modes is also proposed, and (mainly for the waveguide structure of the LiNbO₃:Ti Z section) the dependence of the optical characteristics of a waveguide on its technological and geometrical parameters is discussed. The book is designed for specialists in integrated optics and computational mathematics and should also interest college teachers and undergraduate and post-graduate students in related specialities. (Admiral G I Nevel'skiĭ Far-East State Marine Academy Publ. regular mail address: 690059 Vladivostok, ul. Verkhneportovaya 50a)

Compiled by E V Zakharova