

New books on physics and related sciences

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Zel'dovich Ya B, Ruzmaikin A A, Sokoloff D D *Magnetic Fields in Astrophysics* (Transl. from English) (Moscow–Izhevsk: Izd-vo RKhD–IKI, 2006) 384 pp. ISBN 5-93972-578-3.

This volume was written by a classic of Soviet science, one of the leaders of the Soviet atomic project, Academician Ya B Zel'dovich, in the final period of his creative life, in collaboration with his two colleagues A A Ruzmaikin and D D Sokoloff, who were still young at the time (Professor A A Ruzmaikin now works in California, USA, while Professor D D Sokoloff is at Moscow State University, Russia). The book was first published in English by the New York publisher Gordon and Breach in 1983. The authors introduced a number of new concepts in electrodynamics and magnetic hydrodynamics of cosmic environment: for instance, they describe the fast dynamo, give a topological interpretation of the conditions of fast magnetic field generation, and discuss the induction of magnetic fields in spiral galaxies and in convective stellar shells. This book, together with other monographs written at that period, formed the modern paradigm of treating magnetic fields in space. It has lost none of its significance in the years since its first publication, is widely cited in astrophysical publications, and is found on the shelves of practically every library with an astronomical orientation abroad. Alas, this book remained largely out of reach for the reader in this country. (Published by 'Regular and Chaotic Dynamics' Science Publications 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://shop.rcd.ru/>)

Ishkhanov B S, Kapitonov I M, Yudin N P *Particles and Atomic Nuclei* ('Classical University Textbook' Series) (Moscow: Izd-vo Editorial URSS, 2007) 584 pp. ISBN 978-5-382-00060-2.

This textbook covers the concluding chapters of the general physics course devoted to elementary particles and atomic nuclei. It was written on the basis of a course of lectures given to students of the Department of Physics of Moscow State University. The material in this volume strictly complies with the State Educational Standards. The contents and the order and form of presentation are original and correspond to the university style of teaching physics and to the traditions of the Department of Physics of Moscow State University. The presentation is based on contemporary factual results, and descriptions are given of fundamental physical experiments. Theoretical sections of the textbook are accompanied by solutions to problems and exercises, which lead to a more profound understanding of the study material. The presentation of the material begins with the most fundamental

constituents of matter — leptons and quarks — and climbs to larger and larger objects — hadrons and atomic nuclei. This chain ends with an analysis of cosmological aspects of particle and nuclear physics. The book is furnished with descriptions of the most important experiments and with a large number of examples. It contains meticulously updated factual data and can be used as a handbook. Necessary sections of quantum mechanics are also given. The book is intended for physics students, postgraduates, and research workers. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the Systems Analysis Institute, RAS; tel./fax (7-495) 135-44-23, 135-42-16; e-mail: urss@urss.ru; URL: <http://www.urss.ru/>)

Gusev A I *Nonstoichiometry and Chaos, Short-Range and Long-Range Order in Solids* (Moscow: Izd-vo Fizmatlit, 2007) 856 pp. 325 illustrations. 152 tables. Bibl.: 1587 titles. ISBN 5-9221-0609-2.

Encyclopedic monograph *Nonstoichiometry and Chaos, Short-Range and Long-Range Order in Solids* by A I Gusev is published as a volume in the 'Fundamental and Applications-Oriented Physics' Series. The main content of the book is a comprehensive discussion of nonstoichiometry, chaos, and ordering in solids. Nonstoichiometry caused by structural vacancies is a widespread condition in solid-phase compounds and creates preconditions for the ordered or disordered distribution of atoms and vacancies. Ordering and disordering are possible in any systems allowing substitution. These include the strongly nonstoichiometric compounds treated in this book (carbides, nitrides, oxides of transition metals, and related ternary implantation compounds), metal alloys, and substitution solid solutions. The current status of research in structural order–disorder phase transitions in nonstoichiometric compounds is outlined. Extensive experimental data on the structure and properties of disordered and ordered phases of nonstoichiometric compounds are presented, as is the relation between short-range and long-range orders in alloys being ordered, solid solutions, and nonstoichiometric compounds. The results of the symmetry analysis of order–disorder transformations are given in detail, the main techniques for computing phase equilibria in nonstoichiometric systems are described, and results of computation of equilibrium phase diagrams in systems being ordered are shown. An exhaustive analysis and interpretation of the effects of ordering on various properties of strongly nonstoichiometric compounds are also given. The monograph was written for researchers working with phase transitions in solids, in the physics and chemistry of solid states, and in theoretical materials science, as well as for undergraduate students and postgraduates in these disciplines. (Published by the company Fiziko-matematicheskaya literatura MAIK Nauka/Interperiodika: 117997 Moscow, ul. Profsoyuznaya 90; tel. (7-495) 334-74-21; fax (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>; 620041 Ekaterinburg, GSP-145, ul. Pervomais-

kaya 91, Institute for Solid State Chemistry, RAS Ural Branch; Gusev A I: tel. +7 (343) 374-73-06; fax +7 (343) 374-44-95; e-mail: gusev@ihim.uran.ru/)

Grinchenko V T, Matsypura V T, Snarsky A A *Introduction to Nonlinear Dynamics: Chaos and Fractals* 2nd ed. (Moscow: Izd-vo Editorial URSS, 2007) 264 pp. ISBN 978-5-382-00063-3.

This monograph outlines the introductory concepts of the phenomenon of dynamic chaos in nonlinear systems. The discovery of chaotic modes in nonlinear systems that are simulated by deterministic relations was one of the most important achievements of science in the second part of the 20th century. Initial information is given on fractal structures that are encountered in many natural phenomena; these are used to describe chaotic processes in nonlinear systems. The book may prove useful for a broad range of readers with an adequate background in physics and mathematics. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the Systems Analysis Institute, RAS; tel./fax (7-495) 135-44-23, 135-42-16; e-mail: urss@urss.ru; URL: <http://www.urss.ru/>)

Moskalev P V, Shitov V V *Mathematical Modeling of Porous Structures* (Moscow: Izd-vo Fizmatlit, 2007) 120 pp. ISBN 5-9221-0818-8.

This monograph deals with theoretical studies in numerical modeling the internal structure and processes of nonlinear filtration of homogeneous liquids in saturated capillary-porous media. Information is presented on the main phenomenological features of mass transfer processes, methods for evaluating efficient parameters, and the empirical characteristics of porous media. The authors discuss methods of modeling taking into account the formation of fractal spacetime structures and processes involving chaotic dynamics in macroscopically isotropic porous media. Certain analytical and numerical methods of solving boundary value problems of filtration theory are described for domains of different configurations. The book addresses research workers, postgraduates, and undergraduate students engaged in research concerned with modeling internal structures, filtration theory, or heat exchange in porous media. (Published by the company Fiziko-matematicheskaya literatura MAIK Nauka/Interperiodika: 117997 Moscow, ul. Profsoyuznaya 90; tel. (7-495) 334-74-21; fax (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Bendersky B Ya *Aero-, Hydro-, and Gas Dynamics: Course of Lectures with Brief Biographies of Scientists and Interesting Anecdotal Information* (Moscow–Izhevsk: Izd-vo RKhD–IKI, 2007) 496 pp. ISBN 5-93972-577-5.

The aim of this course of lectures is not only to present the main aspects of hydroaeromechanics in an accessible, compact, and consistent manner, but also to demonstrate some of its most important applications in engineering and to stimulate the reader to solving practical problems. This course encompasses the basics of aerohydrogasdynamics. A broad range of problems is discussed, such as the derivation of equations of motion of gases, models of liquid media, mathematical formulation of problems of establishing stable and transient

flow modes, the flow of liquids and gases at small and large Reynolds numbers, the gas-hydraulic analogy, transient modes of gas flow, hydrodynamic theory of lubrication, paradoxes of nonviscous and viscous flows, jets of ideal and viscous liquids, semiempirical theories of turbulence, heat exchange problems, etc. An approach is found that combines the traditional classical presentation of the fundamental science with elements of belles lettres. Various sections include more than 70 short biographical essays and portraits of outstanding and widely known scientists of this and other countries. Details are given of more than 30 historically recorded and biographical events in their lives that reflect not only their scientific merits and contributions to world science, but also their human qualities. Each chapter begins with epigraphs left by great thinkers and philosophers. This course of lectures is recommended for students studying the subject ‘Engines of aircrafts’ and specifically the ‘Rocket engines’ discipline, and may prove helpful for postgraduates and lecturers. An attempt is made at visually presenting the main technical concepts. The book is unique not only in the wise combination of the material presented, but also in the style of presentation, which is at the same time laconic and rich in content, in highlighting the most valuable ideas, and in supplying a wealth of examples. The book is addressed to teachers, postgraduates, and students of technical universities majoring in mechanics and machine building. (Published by ‘Regular and Chaotic Dynamics’ Science Publications 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/>)

Kunitsyn V E, Tereshchenko E D, Andreeva E S *Radiotomography of the Atmosphere* (Moscow: Izd-vo Fizmatlit, 2007) 336 pp. ISBN 5-9221-0795-2.

The book presents techniques elaborated for solving problems in radiotomography (RT) of the ionosphere, including the diffractive, beam, and statistical RT of the randomly inhomogeneous atmosphere. RT methods destined for monitoring electron concentration have been developed that make use of signals from both low-orbit navigation satellites (150/400 MHz) and from high-orbit systems of the GPS/GLONASS type. Examples are given of the reconstruction of localized inhomogeneities with diffractive RT techniques and of the spatial structure of fluctuation intensity in a randomly inhomogeneous ionosphere using statistical RT methods. Studies were carried out of both natural and anthropogenic perturbations of the ionospheric plasma, in particular, perturbations due to rocket launches, industrial explosions, and high-power short-wave radiation bursts. The book addresses physicists and engineers working in radiophysics, radio wave propagation, and the geophysics of the ionosphere, as well as undergraduate students and postgraduates majoring in radiophysics, geophysics, and radioelectronics disciplines at higher education institutions. (Published by the company Fiziko-matematicheskaya literatura MAIK Nauka/Interperiodika: 117997 Moscow, ul. Profsoyuznaya 90; tel. (7-495) 334-74-21; fax (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

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