

## New books on physics and related sciences

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**Kolesnichenko A V, Marov M Ya** *Turbulence in Multicomponent Media* (Moscow: MAIK 'Nauka', 1998) 336 pp. Bibliography: 365 refs. ISBN 5-7846-0023-0. RFBR project 97-02-30049.

This book provides a systematic presentation of the state of the art in the invariant modeling of fully developed turbulent flows of multicomponent, chemically reacting gases and its application to upper planetary atmospheres. Special emphasis is placed on the interference of chemical kinetics and turbulent mixing, and on the development of a method for calculating turbulent exchange coefficients for stratified shear flows in a semiempirical way based on evolution transport equations for the second moments of pulsed thermohydrodynamic parameters. The natural-medium multicomponent turbulence models developed by the authors are illustrated with calculating examples describing kinetic and heat-and-mass-transfer processes in upper planetary atmospheres. About twenty years of the authors' work at the M V Keldysh Institute of Applied Mathematics went into this volume. The basic concepts and approaches used in the field have previously been reflected in a whole series of original works as well as in the authors' book *An Introduction to Planetary Aeronomy* (Moscow: Nauka, 1987), with a separate chapter on multicomponent turbulence. For researchers in astrophysics, geophysics, aeronomy and for those engaged in the exploration of the planets in the solar system, and also for undergraduate and post-graduate students in related disciplines. (MAIK 'Nauka' regular mail address: 117864 Moscow, ul. Profsoyuznaya 90)

**Kozhevnikov V N** *Perturbation of Atmospheric Flows around Mountains* (Moscow: Nauchnyi Mir, 1999) 160 pp. Bibliography: 104 refs. ISBN 5-89176-059-2. RFBR project 98-05-78128.

This book is devoted to the study of atmospheric flows around mountains. The results presented in the book were obtained from either theoretical models or direct field measurements. In the course of the theoretical studies, a number of new problems of nonlinear hydrothermodynamics of stratified fluid were solved. Experimental data were gained by measuring cloud cover characteristics and using standard radiosonde observations. As a result, the fundamental properties of the phenomenon were ascertained and expressed in a quantitative form as functions of such variables as the mountain altitude and shape, on-going flow parameters, and the degree to which the unboundedness of the atmosphere in the vertical direction is accounted for. Among the specific findings discovered in this way are large closed vortices with a horizontal axis, quasi-wave effects, an appreciable wave resistance, vertical wave energy flows, and

perturbations propagating up to high altitudes and all the way to stratospheric ozone layer. Specific examples are presented which show that based on the theoretical and experimental information collected by the author, many problems in science and practice can be successfully solved. (Nauchnyi Mir Publ. regular mail address: 119890 Moscow, ul. Znamenka 11/11; tel. (7-095) 291-2847; e-mail: nau-mir@ben.irex.ru)

**Evstigneev V A, Kas'yanov V N** *Explanatory Dictionary of Graph Theory in Informatics and Programming* (Ed. by L S Mel'nikov) (Novosibirsk: Nauka — Siberian Branch RAS Company, 1999) 291 pp. Bibliography: 59 refs. ISBN 5-02-031530-3.

A winner of the 1998 Siberian Branch RAS Scientific Publications Award, this volume is the first to compile the most popular terms pertaining to the theory of graphs and its applications in informatics and programming. Each entry gives the term in both Russian and English, followed by its description and accessible references. The preliminary, three-volume version of the dictionary was published by Novosibirsk State University in 1995–1996 and is currently available, constantly updated, on the Internet at <http://pco.iis.nsk.su/grapp>. The dictionary will be of interest to a wide variety of professionals — primarily systems and application programmers — who use graph-theoretical methods in their work. It is also an important reference source for CAD specialists, VLSI designers, etc. (RAS Siberian publishing, printing, and book-trade company 'Nauka' regular mail address: 630077 Novosibirsk, ul. Stanislavskogo 25)

**Suvorov É V** *Current Methods for Probing Real Crystal Structures: Physical Foundations* (Chernogolovka: IPKhF RAN Publ., 1999) 232 pp. Bibliography: 282 refs. ISBN 5-201-10400-2.

This textbook is the embodiment of several years of experience that the author has amassed as a lecturer in the subject at Chernogolovka's two institutions: the Physics Department of the MSU Moscow Region Branch and the Branch of the Physical Chemistry Department of the Moscow Institute of Steel and Alloys. The book covers the physical principles involved in the experimental investigation of the real structure and composition of materials and provides the basis for further depth study of various aspects of modern experimental physics. The central focus of the book is to introduce the reader to X-ray, electron, and neutron diffraction methods. Topics covered include a whole gamut of X-ray-based crystal perfection determination techniques, high-resolution electron microscopy, scanning electron microscopy, and electron probe microanalysis. The book can be useful for undergraduate students as well as for physics experimenters seeking for a wider arsenal of experimental methods in their crystal defect studies. Probation researchers,

post-graduate students, and engineers considering using new methods in the study of real crystal structures will also benefit from this textbook, prepared with the financial support of the Federal Special-Purpose ‘Integration’ Program (project 2.1-AO 118/99 ‘Development of M V Lomonosov MSU’s Chernogolovka Scientific Centre’s Moscow Region branch’).

**Physics of Combustion and Explosion** Collection of scientific papers (Ed. by V N Lobanov) (Sarov: RFYaTs-VNIIEF Publ., 1999) 249 pp. ISBN 5-85165-391-4.

This collection of papers by researchers from the All-Russian Research Institute of Experimental Physics presents results on the initiation of primary and secondary explosive and pyrotechnical materials; describes critical excitation and development conditions for the combustion of pyrotechnic agents and detonation of explosives; offers recommendations on the enhancement of the torch igniter power and how to secure an electrical igniter – current source self-disconnection, and demonstrates the effect of an igniter of oxidizing and reducing media on the incandescent bridge burnout. Other topics addressed include the peculiarities of combustion of gas-free compositions and methods for measuring combustion characteristics such as gaseous phase pressure across the pyrotechnic agent burning front, the displacement of igniter and sample material in the process of gas-free combustion, parameters of the self-sustained oscillation mode of combustion, etc. The collection is intended for specialists engaged in the development of initiation techniques for explosives, powders, pyrotechnic agents, and various types of fireworks. It will also be an important resource for students and post-graduate students specializing in the physics of combustion and explosion. (RFYaTs-VNIIEF Publishing & Printing Complex regular mail address: 607190 Sarov, Nizhniy Novgorod region)

**Diffraction and Propagation of Electromagnetic and Acoustic Waves** Interdepartmental collection of scientific papers (Exec. ed. D S Lukin) (Moscow: MFTI Publ., 1999) 176 pp. ISBN 5-7417-0128-0.

This collection presents the results of the experimental and theoretical studies conducted by the staff members of scientific bodies, teachers, post-graduate students, and undergraduate students at Russia’s major academic and scientific institutions such as MFTI, M V Lomonosov MSU, NNGU, MGIET, etc. The book covers a wide range of topics, including the theory of diffraction, antenna technologies, propagation of radio waves in the Earth’s ionosphere, physical phenomena in plasma, applied electrodynamics, mathematical physics, and the theory of catastrophes. Some of the studies were conducted under grants from RFBR (No. 98-02-16712), from the Federal Special-Purpose ‘Integration’ Program (project No. A0116) or from intercollege scientific programs. The collection of papers is recommended for specialists in the theory of diffraction and wave propagation, in the wave theory of catastrophes, and geophysics, as well as for undergraduate and post-graduate students in radiophysics, geophysics, and mathematical physics. (Automated ‘Fiztekhnopoligraf’ publishing systems department regular mail address: 141700, Dolgoprudnyy, Moscow region, Institutskiy per. 9)

**Noise and Degradation Processes in Semiconductor Devices: Metrology, Diagnostics, and Technology** (Moscow: A S Popov MNTORÉS Publ., MEI, 2000) 426 pp.

This book is a collection of 75 papers and short reports presented and discussed at the annual Scientific and Technical Seminar ‘Noise and Degradation Processes in Semiconductor Devices’, which was held in Moscow from November 29–December 3, 1999. It covers a wide range of topics, including the theoretical and experimental study of low-frequency noise in materials and in devices fabricated from them; long-term stability of device characteristics; diagnostic methods for semiconductor devices and integrated circuits, and the improvement of component fabrication technologies. New methods for the investigation of fluctuations in electronic systems — the fractal and wavelet analyses — are presented, and noise and degradation processes in biological systems are partially investigated. Intended for researchers, engineers, and post-graduate students concerned with noise and degradation processes in semiconductor devices, the book should also interest college and university teachers and students and all those involved in the design and fabrication of electronic components. (A S Popov MNTORÉS Publ. contact information: tel. (7-095) 921-1616; fax (7-095) 924-6214; e-mail: psm@glasnet.ru)

**Condensed Matter Physics. Proceedings of the 33rd PIYaF Winter School** (Gatchina: PIYaF RAN Publ., 1999) 113 pp. ISBN 5-86763-019-6.

The traditional 33rd PIYaF Winter School was held at the Petersburg Institute of Nuclear Physics’s premises in Gatchina, Leningrad region, Russia on March 22–26, 1999. The school was organized in three sections: condensed matter physics, the physics and technology of charged particle accelerators, and the  $\mu$ SR seminar. In the CMP section, about 60 people took part. The collection opens with S V Maleev’s lecture ‘Pseudodipolar interaction in exchange-frustrated antiferromagnets’. The subject matter of S M Dunaevskiy’s (PIYaF) talk is the physics of the manganites. An original approach to interpreting thin-crystal structures in terms of the ion–ion Coulomb interaction is suggested in the lecture by Professor S Sh Shil’shtein of the RRC ‘Kurchatov Institute’. In the lecture by S L Ginzburg of the PIYaF, the topical problem of self-organized criticality is discussed in connection with the penetration of a magnetic field into granulated superconductors. Professor P N D’yachkov (IONKh, Moscow) gave a talk on the quantum chemistry of the fullerenes and nanotubes. The CMP section was supported by GNTF’s ‘Neutron Studies of Condensed Matter’ and ‘Superconductivity’ programs, by the leading scientific school program 96-15-96775, RFBR projects 98-02-17632, 99-02-17545, 99-02-17273, and by INTAS-97-1342, with a financial support from the Russian Ministry of Science under the ‘Neutron Studies of Condensed Matter’ program. (RAS PIYaF Press regular mail address: 188350 Gatchina, Leningrad region, Orlova Roshcha)

**Dollezhal’ N A At the Origins of the Handmade World (Memoirs of a Designer)** (The Creators of the Nuclear Age Series) 2nd enlarged edition (Moscow: GUP NIKIET, 1999) 256 pp. ISBN 5-86324-014-8.

Nikolaï Antonovich Dollezhal' describes the specifics of the designer's work, discusses creativity problems in science and technology, and traces the road that led him to atomic power engineering. The book reveals some little-known pages from the history of Soviet power, atomic power, and chemical engineering, contains the author's recollections of his cooperation with I V Kurchatov, and includes his reflections on design training. The enlarged second edition was prepared at the Research and Design Institute of Energy Technologies to celebrate the centenary of the birth of N A Dollezhal' and is based on the book *At the Origins of the Handmade World* published by Znanie House in 1989. The book is a blend of science and fiction and is intended for a wide range of readers. (Publishing House of the Unitary State Company 'Research and Design Institute of Energy Technologies' regular mail address: 101000, Moscow, P/O box 788, NIKIET; tel: (7-095) 263-2390)

**Nizovtsev V V** *The Time and Place of the Physics of the 20th Century* ('Relata Refero' Series) (Moscow: Editorial URSS, 2000) 208 pp. Bibliography: 255 refs. ISBN 5-8360-0096-4.

This book offers a broad cultural perspective on the historical background against which 20th-century physics emerged and formed. It unravels the social and psychological origins of some of the controversial aspects of 20th-century physics and presents a lexicological analysis of some relevant textual materials. Comparing the doctrines and methodological approaches of modern physics with those used by the science of the past leads the author to the conclusion that the new physics is an analogue of Hellenic positivistic science. A picture of the evolution of physical science in the next century is painted. For undergraduate and post-graduate students with an interest in philosophy, physics, history of science, and cultural studies. (Editorial URSS Publ.: 113208 Moscow, ul. Chertanovskaya 2/11; tel./fax (7-095) 135-4423, e-mail: urss@urss.ru)

Compiled by *E V Zakharova*