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## New books on physics and related sciences

Inogamov N A, Dem'yanov A Yu, Son É E *Hydrodynamics of Mixing* (Moscow: MFTI Publ., 1999) 464 pp. Bibliography: 513 refs. ISBN 5-89155-017-2. RFBR project 95-02-07274.

This book focuses on mixing processes due to Rayleigh-Taylor and Richtmyer-Meshkov instabilities. RTIs have much in common with thermal and concentration-induced convections, whereas RMIs are associated with the Cauchy (initial impact 'spreading') problem for the initial velocity field near the contact boundary (such fields arise, in particular, when a shock wave crosses the contact boundary). Both RTIs and RMIs have a wide range of applications in inertial fusion (laser shell destruction and neutron yield reduction problems) and astrophysics (fragmentation of supernova remnants, instabilities in magnetospheres of relativistic stars). The theory of these instabilities turns out to be rich in terms of mathematics and is closely related to the theory of gravitational waves on water. In this book, interesting geometrical effects arising in a three-dimensional space are described. Methods of computational physics and computer character conversion are applied to a variety of problems and, based on the periodic dynamics/subharmonic instability/inverse turbulent cascade scheme, the origin of large structures in the mixing layer is elucidated. The book summarizes many years of research on hydrodynamic instability and turbulence at the L D Landau Institute for Theoretical Physics and the Moscow Physico-Technical Institute. The first book on RTIs and RMIs, it is intended for undergraduate and post-graduate students in physics as well as for specialists in mathematical physics, computational mathematics, and mechanics engaged in nonlinear physics, inertial fusion, hydrodynamical instability, and turbulence. (MFTI Publ. regular mail address: 141700, Dolgoprudnyĭ, Moscow region, Institutskii per. 9; tel./fax: (7-095) 408-7681)

**Devyatov A M, Shibkov V M** *Fundamental Processes in an Ionized Gas* Textbook (Moscow: MSU Physics Department Publ., 1999) 84 pp. Bibliography: 81 refs. FTsP 'Integration' project No. A-0111.

This textbook introduces the reader to the elementary physical processes at work in an ionized gas. It presents the basic aspects and characteristics of binary and triple particle interactions in a low-temperature plasma; briefly discusses the principles governing the elastic scattering of electrons from atoms and molecules and underlying electron-impact excitation and ionization processes, and presents basic introductions to the classical and quantum-mechanical methods for computing the effective cross sections of particle collisions in ionized gases. For various methods, a comparison of the predicted effective cross sections with experimental data is drawn. For research workers, students, and post-

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graduate students specializing in plasmas, gas discharge, atomic and molecular physics, and related areas. (MSU Physics Department contact information: tel.: (7-095) 939-5494; http://publish.phys.msu.su)

*Physics of Microwaves* A collection of 1999 RF MNTP reports (Exec. ed. E V Suvorov) (Nizhniĭ Novgorod: IPF RAN, 2000) 156 pp. ISBN 5-8048-0009-4.

This collection contains progress reports for 1999 on 39 scientific projects carried out in the framework of the Interindustry Science and Technology Program (Russ. abbr. MNTP) 'Microwave Physics'. The major topics covered include (1) microwave sources, (2) microwave propagation and environment monitoring, (3) microwave spectroscopy, metrology, and microwave receivers, and (4) interaction of microwave radiation and matter. The physics learned and methods and devices developed within the program find uses in radio spectroscopy, communications, radiolocation, radiovision, remote sensing of surrounding medium, plasma chemistry, new technologies, and other branches of science and engineering. A valuable resource for a wide range of radio physicists and radio engineers. (IPF RAN regular mail address: 603600, Nizhniĭ Novgorod, ul. Ul'yanova, 46)

Dedus F F, Makhortykh S A, Ustinin M N, Dedus A F A Generalized Spectral-Analytical Method for Data Array Processing. Image Analysis and Pattern Recognition Problems (Gen. ed. F F Dedus) (Moscow: Mashinostroenie, 1999) 357 pp. Bibliography: 79 refs. ISBN 5-217-02929-3. RFBR project 98-01-14108.

This book discusses a new and virtually universal method for the data array processing and examines its applications to the parametrical identification problems and development of control and diagnostic systems. The method integrates analytical and digital data processing procedures and makes use of the adaptive expansion of original data arrays in a function basic set consisting of classical algebraic polynomials and functions. For specialists, students, and postgraduate students engaged in applied mathematics, informatics, experimental data processing, and image analysis and pattern recognition. (Mashinostroenie Publ. regular mail address: 107076 Moscow, P.O. B-76, Stromynskiĭ per. 4)

*Molecular Physics of Nonequilibrium Systems* Proceedings of the Second All-Russian Conference (Ivanovo, May 29–June 1, 2000) (Ivanovo: Ivanovo State University Publ., 2000) 278 pp. ISBN 5-7807-0155-5.

This book represents the proceeding of the Second All-Russian Conference 'Molecular Physics of Nonequilibrium Systems'. Subjects include: nonequilibrium processes in lasers, physical parameters and kinetic processes in nonequilibrium plasmas, structurization properties of mesophase systems, active particles in aqueous solutions and biological systems, thin-film characteristics and production processes, thermodynamics and biophysics of nonequilibrium systems, thermodynamic characteristics of new materials, physico-chemical processes in ozone-containing mixtures, and processes in the Earth's upper atmosphere. The edition is supported by an RFBR grant. (Ivanovo State Universit Publ. regular mail address: 153025 Ivanovo, ul. Ermaka 39)

Hydroacoustics in Russia: Its History in Articles, Essays and Memoirs (Compiled by Ya S Karlik) (St. Petersburg: Academician A N Krylov GNTs TsNII, UGP TsNII 'Morfizpribor', 1998) 692 pp. Bibliography: 23 refs. ISBN 5-900703-49-5.

Written by Russian Navy officials, research workers, and industrial engineers, the articles, memoirs, and essays of this collection provide a historical account of the development of hydroacoustic weapons and their use on the Navy's ships and coastal bases. The book covers the period from the latter half of the 19th century to the present day. It commemorates the 300th anniversary of the Russian Navy Forces and was published under the auspices of and with support from Akvamarin Ltd., the Academician N N Andreev Institute of Acoustics, Vodtranspribor Inc., Rosmark Ltd., Acad. A N Krylov GNTs TsNII, TsNII 'Morfizpribor', and the Taganrog-based Priboĭ plant. The book is intended for a wide range of readers interested in the history of the Russian Navy and in its weapons systems. (Academician A N Krylov TsNII regular mail address: 196158 St. Petersburg, Moskovskoe shosse 44)

Kalinin V A Properties of Geomaterials and the Physics of the Earth Selected Works (Exec. ed. V N Strakhov) (Moscow: OIFZ RAN, 2000) 334 pp. ISBN 5-201-11883-6.

This volume contains the major works on high-pressure geophysics and the physics of the Earth's interior, published by V A Kalinin in the period from 1955 to his death in 1995. The collection is arranged in five sections: equations of state and phase diagrams; internal structure of the Earth and other planets; elastic properties and anisotropy; geodynamic effects of microstructural transformations, and experimental work. The preface to the book gives a brief assessment of V A Kalinin's major works in the general context of geophysical studies. A concise biography of the prominent scientist and a complete list of his publications conclude this book, intended for a wide range of geophysicists as well as for post-graduate and undergraduate students in related disciplines.

Vorontsov N N Development of Evolutionary Ideas in Biology (Moscow: UNTs DO MGU Publ. Dept., Progress-Traditsiya, ABF, 1999) 640 pp. Bibliography: 770 refs. ISBN 5-88800-107-4.

Written by an acknowledged expert in evolutionary biology, zoology, and ecology, this book is a revised and expanded lecture course on the theory of evolution taught by the author at the chair of biophysics at the MSU Physics Department. The book traces the development of the evolutionary idea from its origins — thousands of years before Darwin — to its role as one of the cornerstones of scientific thought in the period from the late 19th and throughout the 20th century. The book describes how evolutionary concepts emerged and

formed starting from the primitive society, and places special emphasis on the history, development and reception of Darwinism (in particular, in Russia), and on its influence on the whole of the natural sciences. The material of the concluding chapters shows that today's discoveries in molecular biology, genetics and many other disciplines pave the way to a new synthesis of evolutionary ideas, thus promising a breakthrough in the history of the field. The book is rich in little-known historical detail and contains many illustrations, both original and taken from difficult-toaccess publications. The book is intended for anyone interested in modern science and its history, the biologist and nonbiologist alike.

Zalogin B S, Kosarev A N *Seas* (A volume in the 'Nature of the World' series) (Moscow: Mysl', 1999) 400 pp. Bibliography: 76 refs. ISBN 5-244-00624-X.

A further contribution to the series 'Nature of the World', this reference is the first book in the world scientific literature to summarize information on the seas of the World Ocean. The comprehensive geographical description of the seas is augmented with original maps and colored illustrations. A valuable source for a wide range of readers. (Mysl' Publ. regular mail address: 117071 Moscow, P.O. V-71, Leninskiĭ pr. 15)

Compiled by E V Zakharova