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New books on physics and related sciences

Gabov S A ***New Problems in the Mathematical Theory of Waves*** (Moscow: Fizmatgiz, 1998) 448 pp. Bibliography: 187 refs.

This monograph addresses the propagation of waves in highly dispersive media governed by higher-order partial differential equations. Coverage includes problems of the mathematical theory of waves that have been encountered over the last decades in geophysics, hydrodynamics, plasma theory, hydroacoustics, and cryogenic engineering. Along with the solution of practically-interesting problems, a purely mathematical correctness analysis is carried out for recently formulated initial-boundary value problems for partial differential equations.

Gukhman A A, Zaĭtsev A A ***Generalized Analysis*** (Moscow: Faktorial, 1998) 304 pp. Bibliography: 162 refs. RFBR project 97-02-30072.

The authors examine generalized analysis as a quantitative investigational tool and a method for presenting results in the most rational form possible. Three basic aspects of the discipline — similarity theory, dimensional analysis, and the method of characteristic scales — are considered within a unified framework joined by the generality of the aim and the thematical basis.

Batenin V M, Buchanov V V, Kazaryan M A, Klimovskiĭ I I, Molodykh É I ***Lasers Based on Self-Restricted Transitions in Metal Atoms*** (Ed. by V M Batenin) (Moscow: Nauchnaya Kniga, 1998) 544 pp. Bibliography: 612 refs. RFBR project 96-02-30063.

Presenting a variety of methods of creating active media for lasers based on self-restricted transitions of metal atoms, this book discusses the excitation techniques and basic processes for such media; considers experimental data and theoretical results on plasma and discharge parameters, and analyzes how these parameters relate to the energy, time, and spectral characteristics of the induced radiation.

Silin V P ***Introduction to the Kinetic Theory of Gases*** 2nd ed., revised and expanded (Moscow: FIAN, 1998) 338 pp. Bibliography: 188 refs.

This revised and expanded edition of the 1971 Nauka publication addresses a wide variety of problems of the kinetic theory of gases, presents the basic principles of the theory and examines its most typical applications. Special attention is paid to the kinetics of rarefied plasma. Analyzing the foundations of kinetic theory allows the author to go beyond Boltzmann's gas kinetics. With its unified perspective and a large number of concrete problems considered, this a reliable reference source for any student of physical kinetics.

Caglioti G ***From Perception to Thought. The Dynamics of the Ambiguity and Symmetry Violations in Science and Art.*** (Transl. from the German by V A Koptsik) (Moscow: Mir, 1998) 221 pp. Bibliography: 167 refs. RFBR project 97-06-87032. [Caglioti G *Symmetriebrechung und Wahrnehmung* (Braunschweig:Vieweg, 1990)]

What unifies science and art or scientific work and creativity? How is it that the disordered flow of signals perceived by our sense organs transform into visual and sound images, i. e. into our brain's ordered states? Where do the uncertainty and ambiguity of our thinking come from? And how do we overcome them? In answering these questions, a renowned Italian scientist draws an analogy between perception and physical measurement and invokes the concept of synergy, an interdisciplinary subject which involves the collective behavior and self-organization of dissipative systems, information theory, statistical physics, critical phenomena and structural phase transitions. An English translation entitled 'The Dynamics of Ambiguity' was published by Springer-Verlag in 1992.

Katsnel'son B G, Petnikov V G ***Shallow Sea Acoustics*** (Moscow: Nauka, 1997) 191 pp. Bibliography: 172 refs. RFBR project 96-02-30051.

The acoustics of shallow sea may well be considered an independent branch of ocean acoustics because of its importance for human activity and due to some specific features of shelf sound propagation. The authors consider the theoretical approaches involved and field data on long-range sound propagation. Special attention is given to the prospects of acoustical monitoring of oceanic shelf regions. Much of the data discussed are taken from research work supported by RFBR (grants 96-02-17194 and 97-05-64878) and the International Science Foundation (grant MJ 5000). For researchers in ocean acoustics.

Zverev V A ***Image Formation Using Wave Fields: Physical Fundamentals*** (Nizhniĭ Novgorod: IPF RAN, 1998) 252 pp. Bibliography: 37 refs.

A part of the special-purpose federal program 'Integration' — Educational and Scientific Centre 'Basic Radiophysics,' this volume has developed from the author's book *Radio-optics. Transformation of Signals in Radio and Optics* (Sovetskoe Radio, Moscow, 1975) whose content, continuously revised and improved by the author, served him for over twenty years as the basis for lectures at the Radiophysics Department of Nizhniĭ Novgorod State University. In writing the new book,

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the author's extensive pedagogical experience enabled him to select what was the most essential from the bulk of the available material. Taking the signal transformation by a filter circuit as a unifying concept, the author considers wave diffraction both in free space and when wave fields are transformed by devices (antennas, optic objectives, and correlators) forming images for coherent and incoherent lighting. The basic principles of holography, coherent optics, and aperture analysis are illustrated with specific examples obtained by mathematically modeling relations derived in the text — a feature which makes the book a good reference guide to modeling problems concerned with the wave-field-assisted image formation. The Methodology Commission of the Physics Department of the Nizhnii Novgorod State University has recommended the work as a textbook for undergraduate and graduate students.

Grebnev A K, Gridin V N, Dmitriev V P *Opto-Electronic Elements and Devices* (Ed. by Yu V Gulyaev) (Moscow: Radio i Svyaz', 1998) 336 pp. Bibliography: 117 refs.

A result of the authors' many years of work, the book summarizes the extensive data and large experience gathered in many areas of incoherent optoelectronics within a single framework. Highlighting major developments in the field, both in Russia and abroad, the book focuses on how elements and devices perform in a restricted volume and under severe service conditions. Original circuit engineering designs of optoelectronic devices for use in information systems are presented and some design aspects of optoelectronics are discussed.

Leading Scientific Schools in Russia I. Handbook (Moscow: Yanus-K, 1998) 624 pp.

After a letter signed by Academicians V E Fortov, V E Zakharov, V P Skulachev, A F Andreev, and A V Gaponov-Grekhov was tendered to the Russian Federation Government, calling for the backing of Russian scientific schools, part of the federal budget was allocated by the State Duma for the purpose and a series of Government resolutions were issued working out the program and approving the make up of the council responsible for the task (with A V Gaponov-Grekhov as head). The idea of the handbook was put forward by Professor G V Kozlov, the first deputy Minister of Science and Technology, and its material was prepared by the officials from RFBR Scientific Schools Support Department (A S Levin, I V Solnykova, I A Malinovskaya, and M N Zamyslov) using I V Zemlyanov – A E Pavlovskĭ's databases. The handbook draws on the experience of school heads and presents basic information on program-covered schools. Some statistical data on Russian scientific schools are also given.

Evgeniĭ Konstantinovich Zavoĭskiĭ (1907 – 1976): Biographical Materials Scientific-historical publication (Ed. by K M Salikhov) 2nd ed., revised and expanded (Kazan': UNIPRESS, 1998) 96 pp.

This book is a revised and considerably expanded edition of materials of the biography of Academician Evgeniĭ Konstantinovich Zavoĭskiĭ, a prominent experimental physicist, the pioneer of EPR in condensed matter, and the founder of a world-respected school of magnetic radiospectroscopy. The previous, 1988 Nauka printing was sanctioned by the RAS General Physics and Astronomy Division. The present edition has been prepared by the editorial staff of the journal *Applied Magnetic Resonance* at KFTI KNTs RAS.

Kaganov M I *Landau's School: What I Make of it* (Troitsk: Trovant, 1998) 368 pp. RFBR project 97-02-30000.

Moiseĭ Isaakovich Kaganov, doctor of sciences (phys. & math.) and professor, formerly at the Physical and Technological Institute of the Ukrainian Academy of Sciences (1949-1970) and the Institute for Physical Problems RAS (1970-1994), presents his most recent essays as well as earlier journal publications.

Malykin G B *I L Bershteĭn. Scientific Career. To his 90th Birthday* (Nizhniĭ Novgorod: IPF RAN, 1998) 20 pp.

November 1998 marked the 90th birthday of Izrail' Lazarevich Bershteĭn, doctor of sciences (phys. & math.), professor, pioneer in the study of natural fluctuations in self-similarity vibrational systems and the founder of radio and optical microphasometry. The book traces Bershteĭn's career as a scientist and teacher, describes his encounters with L I Mandel'shtam and N D Papaleksi, his work under A A Andronov, and cooperation with G S Gorelik. A full list of Bershteĭn's publications, many of them co-authored by his students, is presented.

Compiled by *E V Zakharova*