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# New books on physics and related sciences

**Vasil'ev A N** ***The Quantum Field Renormalization Group in the Theory of Critical Behaviour and Stochastic Dynamics*** (S.-Pb.: Petersburg Institute of Nuclear Physics Publ., 1998) 774 pp. Bibliography: 239 refs. RFBR Grant 96-02-30086.

The book addresses the quantum field renormalization group technique and its applications to critical behaviour and stochastic dynamics. As all necessary concepts are developed within the text, no background in the mathematical apparatus of quantum field theory is needed.

**Zatsepina G N** ***The Physical Properties and Structure of Water*** 3rd revised ed. (Moscow: Moscow State University Press, 1998) 184 pp. Bibliography: 217 refs.

This monograph, first published in 1974 and reprinted in 1987, investigates the physical properties of water and ice based on the electron structure of water molecules and on hydrogen bond models. The authors show that the unique properties of water are due to the unique position water molecules occupy among their chemical and isoelectronic homologies. Throughout the text, many tables and graphs are included to illustrate the physical properties of water. Extensive data compilation makes the book a valuable reference source.

**Orlov E F, Sharonov G A** ***Sound Wave Interference in the Ocean*** (Vladivostok: Dal'nauka, 1998) 196 pp. Bibliography: 56 refs. RFBR Grant 97-05-78179.

The authors suggest a new approach to low-frequency sound propagation in the ocean, in which regular fine-interference features of the space-frequency distribution of sound wave energy are taken into account. This book summarizes long-term developments along these lines. The authors demonstrate both theoretically and experimentally that, due to the discrete nature of waveguide modes, layered oceanic waveguides show regular discrete features in their two-dimensional structural spectra (spectral focusing). The text presents advances in maritime field work techniques, including super-long-base autonomous-reception acoustic interferometry. It also provides a great deal of data on the local (intermode) and spatial interference as well as on low-frequency sound dispersion in various regions of the World Ocean. The results obtained are important in modelling oceanic waveguides and hydroacoustic signals and fields.

**Behrisch R et al.** ***Sputtering by Particle Bombardment III. The Characteristics of Sputtered Particles and Technical Applications*** (Topics in Applied Physics, Eds R Behrisch, K Wittmaack) (Moscow: Mir, 1998) 551 pp. Bibliography: 1709 refs. RFBR Grant 98-02-30018. Russian translation from the English original (Berlin: Springer-Verlag, 1991)

A collection of papers by authoritative researchers from Germany, USA, and Sweden offers basic information on the mechanisms, regimes, and other aspects of physical sputtering. Specific topics covered include the angle-of-departure distribution of sputtered particles; desorption of large biomolecules from ion-bombarded solid and liquid surfaces; charged and excited states of sputtered particle, and the surface and bulk composition of sputtered solids.

**Boyarchuk K A** ***Introduction to the Physics of the Light – Medium Interaction*** (Moscow: RADÉKON, 1997) 176 pp. Bibliography: 20 refs. RFBR Grant 95-02-24035.

Based on the introductory course offered at the Moscow Institute of Physics and Technology, this volume offers a systematic and unified presentation of the basic principles behind the light – medium interaction and gives a minimum of necessary theoretical background. Highlighted within the work are the major effects of laser physics, such as various kinds of induced light scattering, optical mode generation, parametric light amplification, and light beam self-focusing. Coverage also includes linear optical effects, notably the propagation and associated scattering of light in inhomogeneous media. Intended for graduate students and researchers, the present book concerns the material structure and remote probing techniques.

**Kirillin V A** ***Encounters with Interesting People*** (Moscow: Nauka, 1994) 61 pp. Supported by RFBR Grant 94-06-20059.

Drawing on personal acquaintances with his heroes, the author looks at the lives, careers, personalities, major scientific achievements, and, in much detail, at the respective areas of research of ten prominent Russian scientists, including P L Kapitza, M V Keldysh, M A Lavrent'ev, and N N Semenov. The book is illustrated with photographs, some previously unpublished.

**Akhmanov S A, Nikitin S Yu** ***Physical Optics. Textbook*** (Moscow: Moscow State University Press, 1998) 656 pp. Bibliography: 487 refs.

Based on the authors' course at the Physics Department of Moscow State University, this volume covers the electromagnetic theory of light; the physics of light emission; the interference, diffraction and coherence of light, and the physics of the light – matter interaction. Highlighted in the text are the modern problems of optics, such as lasers, nonlinear optics, supershort light pulses and superstrong light fields, new methods of optical spectroscopy, Fourier optics, holography, optical levitation, and laser-assisted thermonuclear fusion. Special appendices are concerned with theoretical problems, including the electrodynamics of radiation, two-level quantum systems, spectral resolution,

and random processes. Some aspects of physical optics are historically addressed.

***Research and Production Association 'State Institute of Applied Optics'.*** Scientific and Technological Collection in Two Parts (Ed. S O Mirumyants) (Kazan': Press House, 1997) 701 pp. Part 1.

Part 1. A concise historical account of the research and production association 'State Institute of Applied Optics' (NPO GIPO).
Part 2. Selected papers of NPO GIPO veteran scientists. Prepared by the editorial board and NPO GIPO's leading researchers, this collection examines the origins, first steps, and maturation of the association and presents its achievements in major research fields between 1957 and 1997. The work also presents a number of original or review papers by the association's veterans.

***Plasma: 20th Century. Materials of the All-Russian Science Education Olympiad Comprising the Proceedings of the 1998 Low-Temperature Plasma Physics (LTPP – 98) Conference and the Lectures Given at the Workshop of Young Scientists held in Petrozavodsk, Russia, 22 – 27 June 1998.*** (Ed. A D Khakhaev). In two parts (Petrozavodsk: Petrozavodsk University Press, 1998) Part 1. Proceedings of the LTPP conference '98, 726 pp. Part 2. Lectures at the young scientist workshop, 212 pp.

The conference material includes original, previously unpublished results obtained since the preceding 1995 LTPP conference and will be useful to researchers of low-temperature plasma. Workshop lectures review the basic research directions and major results achieved in the field.

***New Magnetic Materials in Microelectronics. Abstracts of Papers Presented at the 16th International Workshop (June 23 – 26, Moscow)*** Parts 1, 2 (Moscow: URSS, 1998) 674 pp. RFBR Grant 98-02-26009.

Here is a convenient way to stay abreast of the developments presented at the 16th International Workshop 'New magnetic materials in microelectronics' organized by the 'Magnetic Films' section of the Russian Academy of Sciences Research Council on magnetism. The workshop was supported by the RF Ministry for Science and Technology, the Russian Foundation for Basic Research, the Moscow Mayor's Office, the Moscow Foundation for the Development of Natural Sciences, and the Russian Magnetic Society.

***The Physics of the Atomic Nucleus and Elementary Particles: Proceedings of the 31st St Petersburg Nuclear Physics Institute Winter School*** (St.-Pb.: PNPI Press, 1997) 456 pp. RFBR Grant 97- 02-26000.

The book examines topical problems of the physics of elementary particles and the nucleus, and also addresses general problems of theoretical physics. The introductory theoretical lecture is concerned with a new phase transition, due to Fermi surface reconstruction and one-particle excitations in a strongly correlated Fermi liquid. A lecture on the lightest scalar glueball reviews the $K$-matrix studies of meson spectra. Of particular interest are the quantum mechanical and classical analyses of the Aharonov – Bohm and Aharonov – Kasher effects. A paper on $\pi^-$ atoms presents formulae for calculating the nuclear widths of these objects, and a lecture on the generalized optical model treats the direct nucleon decay of quasi-coupled single-particle states. Works on experimental nuclear physics consider laser spectroscopy on heavy ion beams, medium-energy $NN$-scattering, and the parton picture of heavy nuclei fragmentation. Papers on the theoretical problems of particle physics discuss possible action-at-a-distance effects on high-energy hadron collisions and QCD-radiation corrections to the pionium lifetime. The book concludes with the latest advances in the derivation and solution of evolution equations.

***Continuum Dynamics: Proceedings of the 4th CIS Seminar on the Acoustics of Inhomogeneous Media*** (Acoustics of inhomogeneous media, No 112, Ed. V K Kedrinskiĭ) (Novosibirsk: M A Lavrent'ev Institute of Hydrodynamics, SB RAS, 1997) 260 pp. RFBR Grant 96-02-26068.

The 4th CIS seminar on the acoustics of inhomogeneous media took place in Novosibirsk, Russia, 28 – 31 May 1996 (the previous meetings were held in 1990, 1992, and 1994). The aim of the seminar, attended by over 60 experts, was to exchange information on the methodology developed and major results achieved by various scientific centres in the field of wave processes in complex multiphase systems. Coverage spans the structure and amplification of waves in chemically active or passive, mono- and polydisperse bubble media (including those with phase transitions); rheology and destruction mechanisms in cavitating media; wave propagation in foams, porous media, suspensions and gas – drop – particulate systems; acoustics in combustion chamber and waveguides; uses of acoustic methods in gravitation-capillary oil ejecting and mineral mining and in the study of plastic deformation and fracture of alloys. Such topics as sonoluminescence and wave focusing in lithotriptor systems are also analyzed.

***Current Problems in Nuclear Physics and in the Physics and Chemistry of Condensed Media: Proceedings of the ITEF 1st Moscow International Winter Physics School*** (Zvenigorod, Moscow region, 17 – 26 February 1998) (Eds Yu G Abov, A L Suvorov, V G Firsov) (Moscow: Physics-Uspekhi Editorial Board, 1999) 256 pp. ISBN 5-85504-009.

Researchers of ITEF (L D Landau Institute of Theoretical and Experimental Physics) and authorities from Russia and abroad give lectures and present original results on nuclear physics and on the physics and chemistry of condensed media. The publication is intended and will be of interest to a broad audience of workers interested in state-of-the-art of nuclear physics, and the physics and chemistry of condensed media.

Compiled by *E V Zakharova*