New books on physics and related sciences

Bogoliubov N N *Collected Scientific Works* in 12 volumes. (Science Classics Series composed and edited by A D Sukhanov) *Quantum Theory* in 4 volumes: Vol. 11. **Bogoliubov N N, Logunov A A, Oksak A I, Todorov I T** *General Principles of Quantum Field Theory.* (Eds D V Shirkov, A D Sukhanov, A I Oksak) (Moscow: Nauka, 2008) 1006 pp. ISBN 978-5-02-035719-8. RFBR project 08-01-07035d.

This is the first attempt of publishing the complete collected body of research work of N N Bogoliubov, a classic of mathematics and natural sciences. It will comprise twelve volumes. Its uniqueness will stem from the fact that the included papers and books were never before published all together. Volume 11 includes the widely known monograph by N N Bogoliubov and his co-authors published in Russian (1987, 2006) and in English (1990). It contains a systematic presentation of the results of an axiomatic approach in quantum field theory. The new edition in Russian is almost completely identical to the previous English edition (Bogoliubov N N, Logunov A A, Oksak A I, Todorov I T *General Principles of Quantum Field Theory* (Dordrecht: Kluwer, 1990)) but contains corrections of the discovered misprints and inaccuracies. The volume is published with Appendices — two articles by A A Logunov and co-workers written at the end of the 1970s and mentioned in bibliographical notes to Chapter 16 of the main text. The general approach to describing the analytical properties of scattering amplitude was extended for the first time to multiparticle amplitudes in these articles. The book is intended for undergraduate students, postgraduates, researchers, and teachers who specialize in mathematical physics, quantum field theory, and the history of physics. (Akademizdatcentr Nauka RAN: 117997 Moskva, ul. Profsoyuznaya 90; tel. (7-495) 334-71-51; fax (7-495) 420-22-20; e-mail: secret@naukaran.ru; URL: http://www.naukaran.ru/)

Rautian S G *Introduction to Physical Optics* (Moscow: URSS, 2009) 256 pp.

The book briefly presents the main problems and methods of theoretical physical optics, such as propagation of electromagnetic waves in the optical range of the spectrum in uniform, nonuniform, isotropic, and anisotropic media, and an analysis of optical cavities, fiber-optic waveguides, and diffraction phenomena. In the problems suggested, solutions are discussed in detail under certain typical specific conditions. Chapter 1 formulates, very briefly and declaratively, the basic concepts of electrodynamics of continuous media; the reader is assumed to be familiar with them and they are given as, say, reference material in a form convenient for the main part of the book. Subsequent chapters treat wave propagation in uniform, nonuniform, and anisotropic media, and problems of diffraction. Much attention is paid to methodological aspects. Methods of reasoning and proofs

are chosen in such a way that they prove useful and 'workable' in nonlinear optics and in other new fields outside the scope of this book. The brevity of the course necessitated a strict sifting of the material and assuming the minimum knowledge required to achieve a certain level of education of a physicist. The book is based on lectures that the author gave to optics students at the Moscow Institute of Physics and Technology and Novosibirsk State University. It can be of use to undergraduates and postgraduates, research workers, and practising engineers. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the Institute for Systems Analysis of the RAS; tel./fax (7-499) 135-44-23, 135-42-16; e-mail: urss@urss.ru; URL: http://www.urss.ru/)

Gurbatov S N, Rudenko O V, Saichev A I *Waves and Structures in Zero-Dispersion Nonlinear Media: Applications to Nonlinear Acoustics* (Moscow: Fizmatlit, 2008) 496 pp. ISBN 5-9221-1042-2.

The book outlines the basic ideas and methods of analyzing nonlinear hydrodynamic type models. The theory is illustrated with examples of high-intensity acoustic waves, surface growth, propagation of laser beams, and advancing of a flame front. Wave distortion, the formation of shock fronts, and the emergence of a 'multiflow' mode are investigated in detail. Special attention is paid to generalized solutions of nonlinear equations in zero-dispersion media, in relation to the laws of conservation and physical realizability. Detailed analysis is conducted of the Maxwell rule of construction of discontinuous solutions, the Lax – Oleynik principle of the absolute minimum, and the Rykov – Sinay global principle. Aspects taking into account dissipation, describing the properties of the Kardar – Parisi – Zhang (KPZ) and Burgers solutions, including specifics in the behavior of N-, U-, and saw-tooth waves, multiscale signals, and noise fields occupy considerable space in the book. Model type Burgers equations that take into account the competing effects of nonlinearity and absorption are analyzed. Weak and regularized solutions describing the behavior of multidimensional nonlinear zero-dispersion waves are discussed using the two-dimensional KPZ equation and the three-dimensional Burgers equation as examples. Part 2 of the book deals with problems of nonlinear acoustics: the evolution of wave beams, waves and beams in a cubic-nonlinear medium, nonlinear waves in systems with complicated frequency-dependent dissipation and external sources, and nonlinear waves in bounded systems and resonators. The monograph is intended for students of natural science departments of universities, academies, and educational institutes, as well as for holders of a master's degree and postgraduates studying the theory of nonlinear waves of various physical natures. It will be an equally useful reference source for engineers and research workers who in the course of their practical work need to take into consideration nonlinear wave effects. (Publishing 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/)

Izyumov Yu A, Anisimov V I *Electron Structure of Strongly Correlated Compounds* (Izhevsk: Institute for Computer Studies, 2008) 376 pp. ISBN 978-5-93972-695-5.

The authors analyze the electronic structure and physical properties of strongly correlated systems (systems incorporating elements with unfilled 3d-, 4d-, 4f-, and 5f-shells) in terms of the dynamic mean field theory (DMFT). At the moment, the DMFT represents a universal and mostly efficient tool for studying states with strong electron correlations. The book provides a detailed characterization of the foundations of the method and describes its applications to various classes of such systems. The book will be of interest to a broad range of possible readers: physics theorists and experimenters working on strongly correlated systems, undergraduates, postgraduates, and anyone wishing to familiarize themselves with an active and important field of solid-state physics. (Institute for Computer Studies Publ.: 426034 Izhevsk, ul. Universitetskaya 1; tel/fax (3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://ics.org.ru/)

Beskin V S *Gravitation and Astrophysics* (Moscow: Fizmatlit, 2009) 160 pp. ISBN: 5-9221-1054-9.

The book describes, in a sufficiently simple language, the quantitative foundations of the general theory of relativity (metric tensor, energy – momentum tensor, curvature, Einstein's equation). The main emphasis is on the physics foundations of the theory. Both classical and the recently conducted observational tests that demonstrate complete agreement of the theory with the observed data are thoroughly discussed. The last part of the book discusses problems arising in black hole astrophysics. Numerous applications and problems will allow the reader to carry out uncomplicated calculations without assistance. The book is intended for university students in the first years training in the specialties of physics and astronomy, for school students in the senior classes, and for anyone interested in today's astrophysics. (Publishing 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/)

Fluctuations and Noise in Complex Biotic and Abiotic Systems (Eds P M Yul'met'ev, A V Mokshin, S A Demin, M Kh Salakhov) (Kazan': Published by the Ministry of Education and Science of the Republic of Tatarstan, Editorial and Publishing Center 'School', 2008) 456 pp. ISBN 5-94712-015-1. Published with financial assistance of the RNP foundation (grant No. 2.1.1.741).

The book is a collection of original publications of well-known Russian specialists on problems in the study of the fundamental role of fluctuations and noise in the behavior of complex biotic and abiotic systems and on their possible applications to physiology, medical sciences, neurophysiology, radiophysics and functional electronics, seismology, astrophysics, and other fields of modern natural science. Judging by its structure and by the topicality of the problems discussed, the book is a team monograph written by the leading specialists in the field. It is designed for a wide circle of specialists in fundamental aspects of fluctuations and noise and their possible applications in a broad range of phenomena in modern physics and other natural sciences. The book contains both the latest results of research and review type papers. One of the main aims of the present edition was to attract undergraduate students, postgraduates, and young scientists to an exciting area of research in a novel and rapidly progressing field of physics.

Contents:

1. V V Uchaikin "The Universe as fractal dust: fluctuations and correlations."
2. V S Anischenko, T E Vadivasova, G E Strelkova "The influence of noise on chaotic systems."
3. P M Yul'met'ev, P Khanggi "Mechanisms of formation of long-term correlations in complex systems via statistic memory effects."
4. S F Timashev "Flicker noise spectroscopy as a universal phenomenological approach to extracting information from chaotic signals."
5. P P Nigmatullin "What is the UQM (universal quantitative marker) and when does it turn up?"
6. V V Rozanov, V O Rudenko, N N Sysoev "Borderline problems in nonlinear acoustics and haemodynamics."
7. A V Mokshin "Processes of structural ordering in glassified metal: the effect of shearing action".
8. A A Potapov "Fractal methods of studying signal fluctuations and dynamic systems in a space of fractional dimensions."
9. V V Afanas'ev, S S Loginov "Diagnostics of electron dynamic systems based on nonharmonic fractional power spectra."
10. V V Afanas'ev, V P Danilaev, Yu E Pol'skii "Generalized multimode models in the analysis and diagnostics of fractal structures, and biotic and abiotic dynamical systems."
11. G V Grushevskaya, G G Krylov "Biologically motivated neural networks of chaotic oscillators."
12. A N Chuvyrov "Phase waves in nematic liquid crystals: the consequence of self-organization of hydrodynamic fluctuations."
13. N G Migranov, R N Migranova "Cooperative phenomena in open systems: a functional approach."
14. G V Vstovskii "Identification of spatial and temporal hierarchical structures in complex systems."

(Ministry of Education and Science of the Republic of Tatarstan, Editorial and Publishing Center 'School': 420111 Kazan', ul. Dzerzhinskogo; tel. (7-843) 292-24-76)

Vanag V K *Dissipative Structures in Reaction–Diffusion Systems: Theory and Experiment* (Izhevsk: Institute for Computer Studies, 2008) 300 pp. ISBN 978-5-93972-658-0.

This presentation of the state-of-the-art in the science of dissipative structures in chemical reaction – diffusion systems is built on the huge wealth of factual data and the theory of diffusion instabilities. Helical waves and antiwaves, stationary Turing structures and standing waves, localized waves and oscillons, spot fragmentation and wave packets, oscillational clusters and segmented spirals — all these and other structures found in real chemical systems are described in terms of rather simple reaction – diffusion equations. The book is intended for senior university undergraduates, postgraduates, teachers, research workers, and anyone wishing to learn what is produced as a result of the interaction of biophysics, physics, chemistry, mathematics, and biology. (Institute for Computer Studies Publ.: 426034 Izhevsk, ul. Universitetskaya 1; tel/fax +7 (3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http:// ics.org.ru/)

Compiled by *E V Zakharova*
(e-mail: zaharova@ufn.ru)