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New books on physics and related sciences

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Alekseev A V, Zinin Yu A, Kholodkevich E D ***Polychromatic Spectroscopy*** (Vladivostok: Dal'nauka, 1999) 196 pp. Bibliography: 162 refs. ISBN 5-7442-1150-0.

This monograph addresses the problems of the polychromatic spectroscopy of atomic and molecular media using the two-level atomic model to describe field – medium interactions. Despite its apparent simplicity, this model has proved very successful, allowing spectroscopists to make predictions of novel effects along with explaining existing data. Although the authors' method of polychromatic excitation of spectral transitions is universal due to the fact that any periodic field can be represented by trigonometric Fourier series, the use of this representation does not by any means limit the class of possible modulations because any basis is in fact allowable subject to the sufficiency and completeness conditions. Spectral models for the interaction of polychromatic components with a medium are analyzed phenomenologically based on the optical equations of Bloch — a totally justifiable approach for real experimental situations. An account is given of effects due to resonant amplitude-phase-modulated fields, such as generation of high-order multiresonances, resonant fluorescence, formation of anomalously high refractive indices of the medium, etc. It is shown that four-wave mixing effects are strongest when the medium is excited polychromatically. The relation between the intraresonator excitation of the medium and field propagation characteristics is also examined. The book is intended for professionals, post-graduate students, and undergraduate students in spectroscopy, nonlinear optics, and the remote sensing of gas media. (RAS Far-East Branch 'Dal'nauka' Press regular mail address: 690041 Vladivostok, ul. Radio 7)

Ivako A V ***Introduction to the Theory of Molecular Spaces*** (Moscow: PAIMS, 1999) xii + 338 pp. Bibliography: 55 refs. ISBN 5-89574-2

Drawing on the author's work from 1983 to 1998 (some of it in collaboration with colleagues) and on his 1997 monograph *Theory of Molecular Spaces and Its Applications in Computers, Physics, and Other Areas*, the book offers a comprehensive look at molecular spaces constituting the computer-work-oriented discrete models of multidimensional continuous objects. The book will be useful to mathematicians, programmers, computer graphics designers, and anyone dealing with multidimensional computer images. The models proposed in the book are of interest to physicists but can also be applied in biology, chemistry, and many other fields. A valuable resource for a wide range of readers using computers in their work. (PAIMS Publ. regular mail address: Moscow, ul. Ordzhonikidze 3)

Uspekhi Fizicheskikh Nauk **170** (8) 919 – 920 (2000)
Translated by E G Strel'chenko

Shakhtarin B I ***Synchronization System Analysis Using the Averaging Method*** (Moscow: Radio i Svyaz', 1999) 496 pp. Bibliography: 179 refs. ISBN 5-256-01369-6.

This book examines the application of the averaging method to the analysis of nonlinear systems such as oscillators (self-excited, synchronized, fluctuation-noise-affected, chaos-producing) and automatic phase control systems (continuous, pulsed, and digital). Coverage includes both dynamic characteristics (locking band, transient period, asynchronous operation frequency response) and statistical characteristics (error signal probability density, average pre-mistracking time, etc.). In discussing the dynamics of automatic phase control systems, the dependence of APCS parameters on the shape of the phase discriminator characteristic is analyzed; in particular, sinusoidal, rectangular, and triangular shapes are considered. For APC systems with piecewise characteristics, comparison with point mapping data for second- and third-order systems is made. Random oscillators using automatic phase and frequency control and Josephson junction are described. Chua's chaos generator and the Duffing oscillator are also considered. For senior students as well as for engineers and researchers concerned with the analysis and synthesis of nonlinear systems, including synchronization systems. (Radio i Svyaz' Publ. regular mail address: 101000 Moscow, Head Post-Office, POB 693)

Martynov V N, Kol'tsov G I ***Semiconductor Optoelectronics*** Textbook (Moscow: MISIS Publ., 1999) 400 pp. Bibliography: 9 refs. ISBN 5-87623-020-0.

This manual describes the physical principles underlying the component base of modern semiconductor optoelectronics and highlights the performance parameters of optoelectronic devices and systems, in which the interaction of optical radiation with a substance is employed to produce, transfer, process, store, and represent information. It also introduces necessary computation and control techniques, examines the design features and technological characteristics of optoelectronic devices, and describes the basic optoelectronic devices currently used for information representation and transfer purposes. In this book, the selected and systematized material from semiconductor optoelectronics literature is combined with two lecture courses, 'Semiconductor optoelectronics' and 'Optoelectronics and integrated optics', that have been given for many years to students in the disciplines of microelectronics and semiconductor devices and of electronics and microelectronics at the MISIS Semiconductor Electronics and Physics Department. Recommended by the Russian Federation Ministry of Education as a textbook for college and university courses in these two disciplines. (Moscow State Institute of Steel and Alloys Publ. regular mail address: 117936 GSP Moscow, V-49, Leninskiĭ pr. 4)

Noise and Degradation Processes in Semiconductor Devices: Metrology, Diagnostics, Technology Proc. reports presented at the scientific and engineering seminar held in Moscow on 16 – 19 Nov 1998 (Moscow: A S Popov MNTORÉS Publ., MÉI, 1999) 442 pp.

This book is a collection of 75 papers presented and discussed at the annual Scientific and Technology Seminar held in Moscow, Russia on November 16 – 19, 1998. It covers a wide range of topics, including the theoretical and experimental study of low-frequency noise in materials and 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 study of fluctuation processes in electronic systems — fractal and wavelet analyses — are presented, and in some of the papers noise and degradation processes in biological objects are 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. (Moscow Power Engineering Institute, Electronic Technology Department, Chair of Semiconductor Microelectronics. Organizing committee regular mail address: 105835 GSP Moscow, E-250, ul. Krasnokazarmennaya 14)

Application of Remote Radiophysical Methods to Natural Environment Studies (Ed.-in-Chief N A Armand) (Murom: Publ. House of the Murom Branch of Vladimir State University, 1999) 300 pp.

The book contains the proceedings of the 3rd All-Russian Conference held in Murom, Russia on June 17 – 18, 1999. It covers experimental and theoretical results on the remote sensing of the ocean and atmosphere, the ground and subsurface; the methodology and instrumentation of remote sensing, and methods for the processing and interpretation of remote sensing data. (Education, Science-Production Copy-Making Laboratory of the Murom Institute: 602200 Vladimir region, Murom, ul. Orlovskaya 23)

Protasevich E T ***Dictionary and Handbook of Gas Discharge Physics and Diagnostics*** (Tomsk: Tomsk Polytechnic University Publ., 1999) 82 pp. Bibliography: 39 refs. ISBN 5-7623-0614-3.

This book contains some 250 entries on gas discharge, plasma, and related fields such as lasers and laser technology, optics and spectroscopy, radiophysics, and microwave technology. While intended for researchers, engineers, teachers, post-graduate students, and undergraduate students in these disciplines, the book should also be a welcome source of information to experimenters in other areas of science and technology. (Tomsk Polytechnic University Press regular mail address: 634034 Tomsk, pr. Lenina 30)

Samuil Borisovich Kormer Remembered by ... (Ed.-in-Chief S A Sukharev) (Sarov: RFYaTs-VNIIÉF Publ., 1998) 369 pp.

In this collection of memoirs colleagues, friends, and relatives recall Samuil Borisovich Kormer, an eminent physicist, a Corresponding Member of the Academy of Sciences of the USSR, the winner of the Lenin and USSR State Prizes. The book also features Kormer's personal views and records of life, people, and science. Numerous photographs from Kormer's family archive and from the archives of N N Beznasyuk and V I Luk'yanov illustrate various periods of the scientist's life.

Bonchkovskaya T V, Evpakova T P ***Vyacheslav Frantsevich Bonchkovskiĭ*** (Book series "Prominent Scientists of the MSU Physics Department", No. 1. Edited by T A Proskuryakova) (Moscow: MSU Physics Department Publ., 1999) 106 pp.

This book traces the life and work of the Honored Scientist, Doctor of Physical and Mathematical Sciences, Professor V F Bonchkovskiĭ. Student of Professor É E Leist in Moscow University (1906 – 1910), privat-docent (from 1913), and professor (1919 – 1959), V F Bonchkovskiĭ worked for many years as a teacher and researcher at the Moscow State University and at its geodesic and meteorological observatories. Along with instructing wide-ranging specialists in geodesy, V F Bonchkovskiĭ was a co-founder, then under the auspices of the Education Ministry, of the first State Research Institute of Geophysics. After the geophysics department had been restored at the University, he took the chair of physics of the Earth's crust at the Physics Department. From 1934, V F Bonchkovskiĭ spent his last thirty years combining a teaching career with the position of department head at the USSR Academy of Sciences Seismology Institute (later at the Institute of Geophysics and at the Institute of Earth Physics). (MSU Physics Department Publ. regular mail address: 119899 Moscow, Vorob'evy gory, M V Lomonosov MSU, Physics Department)

Essays in the History of Informatics in Russia (Compiled and edited by D A Pospelov and Ya I Fet) (Novosibirsk: Science and Publishing Center of the OIGGM of the RAS Siberian Branch, 1998) 663 pp. RFBR project 97-06-87061. ISBN 5-7692-0101-0.

In this collection of materials pertaining to the time when cybernetics and informatics were coming to life in Russia, leading researchers present their analysis of this process. The book also features memoirs of the witnesses and participants of those developments, re-published key papers, and essays on the most influential figures and schools then active in the field. Archival material about A I Berg, L V Kantorovich, A N Kolmogorov, A A Lyapunov, and other major figures is also provided. For researchers and all those interested in the history of science in Russia. (Science and Publishing Center of the OIGGM of the RAS Siberian Branch: 630090 Novosibirsk 90, prosp. Akad. Koptyuga 3)

Compiled by *E V Zakharova*