New books on physics and related sciences

Metastable States and Phase Transitions Collected scientific works Vol. 2 (Ed. S N Syromyatnikov) (Ekaterinburg: RAS Ural Branch Publ., 1998) 124 pp. ISBN 5-7691-0821-5.

This book is a state-of-the-art collection of research findings relative to nonequilibrium phase transitions. Coverage includes the nucleation kinetics of a superheated liquid solution of gases, theoretical studies of the vaporization of radiation-superheated liquids, and a new method for determining the dispersion composition of emulsions containing a low-boiling-point dispersed phase. The book also presents experimental data on the explosive boiling of liquids at negative pressures and includes a molecular dynamics analysis of a two-phase Lennard – Jones liquid – vapor system with a plane interface. For specialists in thermal physics, molecular physics, physical chemistry, and heat engineering. (RAS Ural Branch Publ. regular mail address: 620219 Ekaterinburg, ul. Pervomaĭskaya 91)

Tyapunina N A, Naimi E K, Zinenkova G M *Effect of Ultrasound on Imperfect Crystals* (Moscow: MSU Publ., 1999) 238 pp. Bibliography: 387 refs. ISBN 5-211-02078-2.

This book describes the principles behind the propagation of elastic waves in real crystals and examines experimental aspects of the effect of ultrasound on materials. It discusses how the dislocation structure and the concentration and state of point defects are affected by ultrasound and explores in detail how these modifications influence the structure-sensitive crystal properties. Using computer simulation, the dynamic response of dislocations to an alternating load is discussed. The book is based on investigations carried out at the MSU Physics Department and is intended for researchers in the fields of solid-state physics and materials science, for engineers engaged in ultrasonic materials working, and for senior students and post-graduate students. (MSU Publ. regular mail address: 103009 Moscow, B. Nikitskaya ul. 5/7)

Aronchik G I *Iterative Computation and Optimization Methods for Complex Heat Exchange Processes* (Samara: SamGTU Publ., 1999) 145 pp. Bibliography: 116 refs. ISBN 5-7964-0090-8.

Based on the analysis of two types of operators — integral operators for radiative heat exchange and differential ones for convective – conductive heat exchange — this book presents an iterative algorithm implementing the problem decomposition scheme known as the iteration splitting method. Iterative processes for problems involving radiative and complex heat exchange are optimized and an optimization algorithm for a radiating system is constructed by correcting the temperature fields and optimization parameters in the framework of a unified iterative procedure (synchronous optimization method). To illustrate the efficiency of the methods proposed, solutions for a number of radiative and complex heat exchange problems are presented. (Samara State Technical University regular mail address: 443010 Samara, ul. Galaktionovskaya 141)

Gorish A V, Dudkevich V P, Kupriyanov M F, Panich A E, Turik A V *Piezoelectric Instrument Making* Vol. 1 *Physics of Ferroelectric Ceramics* (Ed. by A V Gorish) (Moscow: IPRZh 'Radiotekhnika', 1999) 368 pp. Bibliography: 686 refs. ISBN 5-88070-006-2.

This book provides general information on the physical properties of ferroelectric ceramic materials and examines their device applications in modern information technology and instruments. Topics covered include the physics and chemistry of ceramics synthesis and sintering processes; the formation of properties of ferroelectric ceramics on the base of lead zirconate – lead titanate solid solutions, and how the dielectric, piezoelectric, and other parameters of ferroelectric ceramics relate to the properties of ferroelectric crystals. For researchers, students, and post-graduate students in solid-state physics, materials science, radio engineering, information systems, measurement techniques, and device making. ('Radio Engineering' Editorial Board Publ. contact information: tel. (7-095) 921-4837, tel./fax (7-095) 925-9241, e-mail: zaoiprzhr@glasnet.ru)

XI Russian Symposium on Scanning Electron Microscopy and Analytical Methods in Solid State Research: *RÉM'99 (Chernogolovka, June 1999)* Abstracts of papers (Chernogolovka: Bogorodskiĭ Pechatnik, 1999) 146 pp. ISBN 5-89589-010-5.

The book contains abstracts of the papers presented at the XIth Russian Symposium on Scanning Electron Microscopy and Analytical Methods in Solid State Research, held in Chernogolovka in June 1999. The material is presented in the following sections: devices, and electron optics; local analysis methods and their application; diagnostics, semiconductors, and lithography; tunneling and optical microscopy. (Bogorodskiĭ Pechatnik Publ. regular mail address: 142432 Moscow region, p. Chernogolovka; tel. (7-09652) 4-4121)

II Congress of Russian Biophysicists (*Moscow, 23 – 27 August 1999*) Abstracts of papers in 3 volumes (Exec. Ed. A B Rubin) (Moscow: Institute of Cell Biophysics Publ., 1999) Vol. 2, 370 pp. ISBN 5-201-14416-0; Vol. 3, 396 pp. ISBN 5-201-14417-9.

The second and third volumes of the three-volume collection of abstracts of the papers presented at the 2nd Congress of Russian Biophysicists, held in Moscow on August 23 – 27, 1999, with a support from RFBR (Grant No. 98-04-58032). Volume 2 covers the following symposia — Symposium VI:

Biophysics of complex systems. Nonlinear processes. Self-organization in biosystems; Symposium VII: Biophysics of membranes; Symposium VIII: New methods in biophysics; Symposium IX: Medical biophysics. Volume 3 introduces readers to Symposium X: Biological system impact of physico-chemical factors; Symposium XI: Ecological biophysics. Symposium XII: Computers and new biology; Symposium XIII: Reception biophysics; Symposium XIV: Photobiology; Symposium XV: Biophysical education. Round table. Methodological issues. (Scientific and Technical Information Department of the RAS Pushchino Scientific Centre regular mail address: 142292 Pushchino, Moscow region, prospekt Nauki 3)

Advanced Information Transmission Technologies Proceedings of the 3rd International Conference (Vladimir, 1–5 July 1999) in 2 parts (Exec. Ed. A G Samoĭlov) (Vladimir: Institute for Natural Resource Assessment Publ., 1999) Part 1, 322 pp. ISBN 5-89722-016-6; Part 2, 224 pp. ISBN 5-89722-017-4.

This book is the Proceedings of the 3rd International Science and Technology Conference, held in Vladimir, Russia on 1–5 July 1999. The conference was aimed at promoting the development of radio- and telecommunication technologies, perfecting information transmission methods, and developing and introducing perspective construction and operation technologies for radio systems. The conference papers present the latest scientific, design and technological solutions as well as analytical and experimental results of practical interest for radio communication and telephony. It should be useful to those involved in the design and exploitation of information transmission equipment. (Institute for Natural Resource Assessment Publ. regular mail address: 600025, Vladimir, POB 4; tel./fax (7-0922) 322-576)

Evstigneev V A, Kas'yanov V N ***Theory of Graphs: Processing Algorithms for Contourless Graphs*** (Exec. Ed. I V Pottosin) (Novosibirsk: Nauka. Siberian RAS Company, 1998) 385 pp. Bibliography: 361 refs. RFBR project 97-01-14183. ISBN 5-02-030845-5.

A follow-up volume to the *Theory of Graphs: Tree Processing Algorithms* by the same authors, this is a systematic presentation of processing algorithms for acyclic or contourless graphs modeling partially ordered sets and, together with the trees, widely used in programming. The monograph covers basic methods and algorithms involved in the application of contourless graphs to informatics and introduces the reader to the rudiments of the theory of partially ordered sets, lattices, and semilattices. Algorithms for two basic program translation stages — context analysis and object code generation — are also presented. The book will be of interest to a wide range of professionals using theoretical graph methods in their work. (RAS Siberian Publishing, Printing, and Book-Trade Company 'Nauka' regular mail address: 630077 Novosibirsk, ul. Stanislavskogo 25)

Monastyrsky M I ***Berngard Riemann, Topology, and Physics*** (Moscow: Yanus-K, 1999) 188 pp. Bibliography: 55 refs. RFBR project 98-01-14035. ISBN 5-8037-0025-8.

This book, first published in English (Boston: Birkhauser, 1987), is divided into two interrelated parts. Part I is a

scientific biography of the nineteenth-century mathematician Berngard Riemann. Part II examines some developments in present-day mathematics and physics, specifically in elementary particle theory and condensed matter physics (including liquid crystals and superfluids). Meticulous attention is given to the relation between topology and physics. The book will be of interest to students, researchers, and everyone concerned with mathematics and its history. (Yanus-K Publ. contact telephone: (7-095) 132-4865)

A History of Astronomy in Russia and the USSR (Ed. by V V Sobolev) (Moscow: Yanus-K, 1999) 592 pp. RFBR project 98-06-87114. ISBN 5-8037-0034-7.

Written by a team of legal professionals from St. Petersburg State University, Moscow State University, the Pulkovo Observatory, and the RAS Institute of the History of Natural Science and Technology, this book explores the history of Russian astronomy from its beginning through the Soviet period, up to the present day. It examines the wide-ranging contributions of Russian and Soviet astronomers and describes the role of universities, observatories, and research institutes in the development of the science of astronomy. Special emphasis is placed on the latter half of the twentieth century, when the advent of radio astronomy and space exploration revolutionized the field. The book is intended for researchers and scholars in astronomy and related areas of science, for students and for general readers with an interest in astronomy and the history of science. (Yanus-K Publ. contact telephone: (7-095) 132-4865)

Kormil'tsev V V, Ratushnyak A N ***Geophysical Field Modeling Using 3D Vector Integral Equations*** (Ekaterinburg: UrO RAN Publ., 1999) 88 pp. Bibliography: 33 refs. ISBN 5-7691-0896-7.

This book examines 3D vector integral equations for determining electric potential, pressure, temperature, and concentration gradients and magnetic field strength of magnets in the event of several physically inhomogeneous 3D bodies placed in a uniform half-space. The authors also derive integral equations for crossed and composite effects such as the electrical flow and diffusion potentials, electro-ösmotic pressure, and heat transfer in a filtering medium. For complex geological structures, numerous calculated results are presented for current-induced electric and magnetic fields, the magnetic field in a strongly magnetized material, and for the Darsy flow velocity field, including the case of unsteady filtration of a compressible fluid, the electric and magnetic fields in the Darsy flow, and temperature and heat flows with additional convective transport. The monograph will be of interest to all those engaged in the study and application of geophysics and geophysical prospecting techniques. (Institute of Geophysics, RAS Ural Branch regular mail address: 620016 Ekaterinburg, ul. Amundsena 100)

Lipatnikov V N, Gusev A I ***Ordering in Titanium and Vanadium Carbides*** (Ekaterinburg: UrO RAN Publ., 2000) 265 pp. Bibliography: 456 refs.

This monograph is the first to summarize the experimental and theoretical results concerning the effect of atomic vacancy ordering on the structure and properties of titanium and vanadium carbides, namely, two of the most widely

known highly nonstoichiometric compounds. Although carbides — the hardest and most refractory of all compounds and also those with extremely extended homogeneity regions — may have extensive applications in many areas, thus far no uses have been found for their nonstoichiometry and ordering properties. The book analyzes the relation between nonstoichiometry and atomic vacancy ordering in the titanium and vanadium carbides and describes their superstructures. It presents Ti–C and V–C phase diagrams calculated and derived experimentally with account for the location of the ordered phases. The authors also explain how the vacancy concentration and distribution pattern affects the structural, electrokinetic, magnetic, thermodynamic, mechanical, and other properties of the two materials. Other topics addressed include M_8C_{12} compounds recently discovered in the Ti–C and V–C systems; some theoretically predicted new compounds; the fabrication of titanium and vanadium carbides, and the structure and properties of their nanocrystalline forms. The book is intended primarily for professionals involved in studying problems of solid-state physics, physical chemistry, solid-state chemistry, and materials science as well as for undergraduate students and post-graduate students seeking qualification through the corresponding courses. (Institute of Solid State Chemistry, RAS Ural Branch regular mail address: 620219 Ekaterinburg, GSP-145, ul. Pervomaĭskaya 91; tel. (7-3432) 493-523, e-mail: gusev@ihim.uran.ru)

Compiled by *E V Zakharova*