New books on physics and related sciences

Timofeev A V *Resonance Phenomena in Plasma Oscillations* (Moscow: Fizmatlit, 2000) 224 pp. Bibliography: 142 refs. ISBN 5-9221-0059-9. RFBR project 00-02-30019.

This monograph examines the resonant interaction of collective degrees of freedom (self-consistent oscillations) with discrete ones (the motion of individual particles). In a nonmagnetized plasma and in a plasma put in a magnetic field this interaction appears as the resonant Cherenkov interaction (the Vavilov-Cherenkov resonance) and the cyclotron interaction, respectively. In nonuniform plasma flows, when the flow velocity equals the phase velocity of the oscillations involved, a hydrodynamic resonance occurs. If the plasma is inhomogeneous, then the resonant interaction due to the oscillation phase being constant along the particle path (phase resonance) may lead to a sharp increase in the oscillation wave vector locally (spatial resonance). At the same time, spatial resonances may also occur in the absence of phase resonances. A case in point is the Alfén resonance, which is also considered in the monograph. For researchers and undergraduate students specialized in physical disciplines. (Fiziko-Matematicheskaya Literatura-MAIK Nauka/Interperiodika Publishing regular mail address: 117864 Moscow, P.O. V-485, Profsoyuznaya ul. 90)

Kryuchkov Yu Yu, Chernov I P Fundamental Nuclear Analysis of Solids (Moscow: Énergoatomizdat, 1999) 350 pp. Bibliography: 322 refs. ISBN 5-283-03181-0.

This book gives a detailed account of the physical principles underlying such nuclear analysis methods as Rutherford and resonance backscattering of helium ions, and recoil nucleus techniques using helium, carbon, and nitrogen ions. It considers the potentialities and limitations of these methods and describes how they can be combined with the channeling effect to study the structure of a solid and the location of impurity atoms in it. Methodical aspects of preparing and performing experiments involving solid-state nuclear physics methods are also addressed. For academic and industrial level workers concerned with solid-state radiation physics, ion implantation, materials science and modification of the properties of semiconductors and opto- and microelectronics materials as well as applied nuclear physics. Students at graduate, master's and post-graduate levels should also be interested. (Energoatomizdat Publ. regular mail address: 113114 Moscow, P.O. M-114, Shlyuzovaya nab. 10)

Yaroslavtsev A B Fundamentals of Physical Chemistry (Moscow: Nauchnyĭ Mir, 2000) 232 pp. ISBN 5-189176-091-6.

Uspekhi Fizicheskikh Nauk **172** (1) 111–112 (2002) Translated by E G Strel'chenko DOI: 10.1070/PU2002v045n01ABEH001051

This is a concise introduction to modern physical chemistry, intended primarily for 1st and 2nd year chemistry undergraduates wishing to delve deeper into chemical disciplines at their current level. The book also puts particular emphasis on those aspects of physical chemistry that give more insight into the nature of the physical and chemical processes dealt with in everyday work of chemistry experimenter — a feature which makes the book especially valuable for students already oriented towards research work in their first college years. The author avoided higher mathematics as much as possible throughout the book, reducing its use to a level below which physical chemistry becomes impossible to study. It should be noted, however, that the book's material can only be used as a minimum program, i.e. one providing only an absolutely necessary amount of chemical knowledge. Some of the problems included in the book are taken from the 1st year chemistry seminar methodical studies for the Higher College of Materials Science (Moscow: MSU, 1993) developed by the author in cooperation with several faculty members of the MSU Chemistry Department. Recommended as a chemistry text-book by the Scientific and Methodical Council for Chemistry of the RAS Higher Chemistry College and D I Mendeleev Russian Chemistry and Technology University. (Nauchnyĭ Mir Publ. regular mail address: 119890 Moscow, ul. Znamenka, 11/11; tel./fax (7-095) 291-2847; e-mail: naumir@ben.irex.ru)

Kitaev A, Shen' A, Vyalyĭ M Classical and Quantum Computations (Moscow: MTsNMO, CheRo, 1999) 192 pp. Bibliography: 48 refs. ISBN 5-900916-35-9. RFBR project 99-01-14054.

This book is designed to provide a first acquaintance with a new and rapidly growing field of research, namely, the theory of quantum computations. A concise introduction to the classical theory of the complexity of computations is presented first and is followed by a detailed discussion of the foundations of quantum computation theory, including the major quantum algorithms now available. The book is largely based on the course 'Classical and Quantum Computation', which A Shen' and A Kitaev delivered during the spring semester of 1998 at the Higher College of Mathematics, Moscow Independent University. Another source used was the course 'Physics 229 - Advanced Mathematical Methods of Physics' (Quantum Computation) which John Preskill and A Kitaev (with the participation of Andrew Landahl) delivered at the California Institute of Technology in 1998-1999. For undergraduate students from the 2nd year and beyond as well as for post-graduate students and researchers whose work covers physics and mathematics. (Publishing House of the Moscow Continuous Mathematical Education Center regular mail address: 121002 Moscow, B Vlas'evskiĭ per. 11)

Logunov A A *Gravitational Field Theory* (Moscow: Nauka, 2000) 235 pp. Bibliography: 45 refs. ISBN 5-02-002550-X.

A relativistic theory of gravitation (RTG) is constructed within the framework of the special theory of relativity. The source of the gravitational field is the energy-momentum tensor density of all the fields of matter, including the gravitational field. The theory possesses the laws of conservation of energy-momentum and angular momentum. With this approach, a theory of the gravitational field is constructed as a gauge theory in a unique way. According to RTG, a uniform and isotropic Universe may only be 'flat' and evolves in cycles, varying from a certain maximum density to a minimum density in each cycle. For scientists and undergraduate and post-graduate students working in theoretical physics. (Nauka Publ. regular mail address: 117864 GSP-7, Moscow, P.O. V-485, Profsoyuznaya ul. 90)

Kusimov S T, Sultanov A Kh, Bagmanov V Kh, Krymskii V G Image Modeling and Processing in Optical Space Vision Systems (Ed. S T Kusimov) (Moscow: Nauka, 1999) 208 pp. Bibliography: 182 refs. ISBN 5-02-002604-2.

The book examines problems encountered in the simulation of remote sensing processes and in the processing of optical images in aerospace observation systems: the image formation mechanism, transfer of images through the atmosphere, transformation of images by optical systems, the computerassisted synthesis of images, and image processing using hybrid optoelectronic systems. While failing to cover all aspects of the problems it touches upon, the monograph can well serve as a current introduction to the subject. The book is based on the research conducted by the authors at Ufa State Aviation Technology University as part of the specialpurpose Federal Program 'Integratsiya' and will be of interest to mathematical modeling specialists and for those engaged in the processing and interpretation of aerospace images in the optical range. (Nauka Publ. regular mail address: 117864 GSP-7, Moscow, P.O. V-485, Profsoyuznaya ul. 90)

Blokh A M The Soviet Union in the Nobel Prize Interieure: Facts, Documents, Reflections, and Comments (Ed. Prof. A I Melua) (St.-Petersburg: Gumanistika Publ., 2001) 608 pp. ISBN 5-86050-121-8.

Known for his publications on the theme of Nobel Prizes, Abram Blokh, a science historian and Doctor of Geological and Mineralogical Sciences, now addresses the history of relations between the Nobel Foundation and the leaders of the Soviet Union. Based on the analysis of unique documents from archives in Russia and abroad, he shows that although the Soviet leadership did acknowledge the authority of the Nobel movement — and indeed because of this — it launched a campaign to prevent Soviet citizens (primarily, scientists) from any having contact with the foundation. The author for the first time brings into use unknown facts regarding the history of Russian science and the life and creative career of a number of prominent Russian and foreign scientists, writers, and politicians. For readers interested in the history of science. [Gumanistika Publ. contact information: tel./fax (7-812) 310-3130; e-mail: meloua@humanistica.ru; for purchase information please call (7-095) 978-2605]

Studies in the History of Physics and Mechanics 1998–1999 (Ed.-in-Chief G M Idlis) (Moscow: Nauka, 2000) 301 pp. ISBN 5-02-002341-8.

A collection of papers addressing a wide variety of topics in the history of physics and mechanics. Part I entitled 'Glimpses of the Russian Academy of Sciences (on the 275th anniversary)' begins with talks presented at an Academician VA Fock centennial conference which was held at the S I Vavilov Institute of the History of Natural Sciences and Technology, RAS. The closing papers of Part I, grouped under the heading 'Academicians and more ...' make use of I E Tamm's letters to S A Al'tshuler to look historically at the study of the magnetic properties of atomic nuclei (N S Al'tshuler, A L Larionov), assess Ya G Dorfman's contribution to magnetochemistry and magnetic resonance studies (A V Kessenikh), discuss L I Gudzenko's basic ideas on the physics of plasma lasers (S I Yakovlenko), and present an account of M A Leontovich's creative research lessons (N V Vdovichenko). Part II, 'Russian science outside the Academy', includes original papers about N A Umov and P N Lebedev (V P Vizgin) as well as the physics and physicists at Saratov State University (M A Kovner), and presents archival materials on the life of a repressed scientist P A Val'ter (V A Volkov). The papers in Part III, 'Miscellany of the history of physics,' cover quite a gamut of topics, ranging from P Varignon's contribution to the motion science (V N Chinenova, V I Yakovlev) and the role of physics in changing the meaning of the concept of 'probability' (A V Andreev) through the completeness of the quantum-mechanical description of physical reality (O V Kuznetsova) to some aspects of the interpretation of quantum mechanics in L I Mandelstam's 'Lectures' (A A Pechenkin); also new materials on the discovery of the Earth radiation belts are presented. Part IV, 'In memory of a scientist,' comprises G M Idlis' essay on Academician A D Aleksandrov. For specialists in physics, mechanics and the history of science as well as for the general reading public. (Nauka Publ. regular mail address: 117864 GSP-7, Moscow, P.O. V-485, Profsoyuznaya ul. 90)

Studies in the History of Astronomy (Ed.-in-Chief G M Idlis) Issue XXV (Moscow: Nauka, 2000) 301 pp. ISBN 5-02-002485-6.

This publication brings together the papers on topical problems in the history of astronomy in Russia and abroad. The book contains the following sections: (1) History of observatories and astronomical organizations (the rise and development of the Central Astronomical Observatory of the Ukrainian Academy of Sciences; lesser known materials on the history of the Tiflis Astronomical Observatory in the 19th century; an article about the First Congress of the All-Russia Astronomical Union in Petrograd in April 1917); (2) Research and findings (a historical perspective on theoretical astronomy and cosmology, including the fate of Jeans-Lindblad's galaxy theory, astronomical aberration, etc.), and (3) Astronomy in the history of Moscow and Moscow region (materials from a 1997 conference devoted to Moscow's 850th anniversary). For research scientists, amateur astronomers, astronomy teachers, and readers with an interest in the history of science. (Nauka Publ. regular mail address: 117864 GSP-7, Moscow, P.O. V-485, Profsoyuznaya ul. 90)

Kadomtsev B B On a Pulsar (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika'; Moscow: Physics-Uspekhi Editorial Board, 2001) 128 pp. ISBN 5-85504-013-5.

This small book is written for new entrants to the field of physics, whether senior pupils with an active interest in this science or college students who intend to become professional physicists. It is addressing these two large youth groups, which has dictated the manner of exposition and layout of the book. The latter is written in the form of conversations about physics — or more precisely about those areas of it which naturally border on the physics of the unusual neutron stars known as pulsars — and is in fact a blend of two genres, science fiction and popular science. The reader can pass over problem solutions on his first reading and then return to them on the second if his level permits. (Scientific Research Center 'Regular and Chaotic Dynamics': http://rcd.ru)

Compiled by E V Zakharova