

PACS number: 01.30.Tt

New books on physics and related sciences

DOI: https://doi.org/10.3367/UFNe.2022.04.039185

Shavrov V G, Shcheglov V I *Spin Waves in Media with Exchange and Dissipation*. (Moscow: Fizmatlit, 2021) 496 pp. ISBN 978-5-9221-1940-5.

This monograph is devoted to the dispersion properties of spin waves in media with inhomogeneous exchange interaction and with moderate and low dissipation; first and foremost, these are films of yttrium-ferrum garnet (YFG). The properties of a gyrotropic wave in a bigyrotropic medium are considered. The effect of dissipation on dipole-type magnetostatic waves is noted. The focus is on short (nanometer) magnetostatic waves, for which dynamic demagnetization and inhomogeneous exchange interaction are decisive factors for the formation of the dispersion law. The prospects of application of nanometer exchange waves in terahertz information processing facilities are discussed. The monograph is intended for specialists working in the field of the physics of magnetic phenomena, engineers, microwave hardware makers, and students and postgraduates of the corresponding specialties. (Fizmatlit Publishers: tel. +7(495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Kul'bachinskii V A *Physics of Nanosystems*. (Moscow: Fizmatlit, 2021) 768 p. ISBN 978-5-9221-1913-9.

The latest achievements in nanosystem physics and the technologies for obtaining and applying low-dimensional structures are presented. Considered are the theoretical and experimental bases of the physics of semiconductor nanostructures, superlattices, and low-dimensional allotropic hydrogen modifications: graphene, fullerene, and nanotubes. Special attention is given to topological effects in crystals, to phenomena associated with surface and edge states in topological insulators and in Weyl metals, quantum nonlocality, and quantum and thermal fluctuations in mesoscopic superconducting systems. Integer-valued and fractional quantum Hall effects, spintronics, magnonics, and spin caloritronics are discussed. New conceptual approaches and experimental methods, as well as original explanations based on research work done by the author, are proposed. The book is intended for specialists in physics of nanosystems, condensed state physics, low-temperature physics, and superconductivity. A detailed analysis of the physical bases of the considered phenomena and properties is presented without the use of special methods of theoretical physics, which makes the material accessible to a wide range of professional readers. It will be useful for research workers, students, and postgraduates, as well as for all those interested in the latest discoveries and advances in these areas. (Fizmatlit Publishers: tel. +7(495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Berlin E V, Seidman L A *Obtaining Thin Films Through Reactive Magnetron Sputtering*. 2nd edition, revised and suppl. (Moscow: URSS 2022) 316 pp. ISBN 978-5-9710-9680-1.

This book is a detailed reference guide on the physical bases, technological features, and practical application of reactive magnetron sputtering of composite thin films, which are chemical compounds of metals or semiconductors with nitrogen, oxygen, and carbon. This process is already widely applied in the electronics industry and other fields, using a coating. The state-of-the-art of this process is generalized and a rich bibliography is given. The physical processes taking place during reactive magnetron sputtering and the resulting technological features of magnetron sputtering are described in detail. Particular attention is paid to ways of controlling active magnetron sputtering of thin films, providing stability and reproducibility of both the sputtering process itself and the properties of the obtained films. Variations in the composition and structure of the obtained films and their dependence on the parameters of the sputtering process are described. A wide nomenclature of the thus obtained compound films is considered. Modifications of this process differing in exploited power sources (direct current, mid-frequency pulses, high-power and high-frequency pulses) are considered. Practical recommendations are given for applying known processes of obtaining composite films by reactive magnetron sputtering and working out new ones. The book is intended for specialists engaged in studying, designing, and fabricating various items of electronic engineering and nanotechnology, upgrading the technology of their production, and fabricating specialized equipment. It will also be useful as a textbook for senior students and postgraduates of corresponding specializations. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: http://urss.ru/)

Surdin V G *Surveying Far Planets*. 5th edition (Moscow: Fizmatlit, 2022) 364 pp. ISBN 978-5-9221-1946-7.

The dream of every astronomer is to discover a new planet. It used to be a rare occasion — one or two planets a century. But in recent years, planets have been frequently discovered — about one major planet a week, and one hundred minor planets a night! The author speaks about how major and minor planets have been sought both in the Solar System and far from it, what technical means have been used for this purpose, and what helps and what hinders this work. He speaks about how planets are given names and what

Uspekhi Fizicheskikh Nauk **192** (5) 567 – 568 (2022)
Translated by M V Tsaplina

discoveries are to be expected. Exact data about planets, constellations, and the largest telescopes are described in the appendix. The book is meant for high-school students, teachers, and university students, and also for everyone who loves astronomy. (Fizmatlit Publishers: tel. +7(495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Krainov V P ***The Effect of Ionizing Radiation on Biological Tissues.*** (Moscow: Publishing house Intellekt, 2022) 96 pp. ISBN 978-5-91559-302-1.

This tutorial is devoted to the consideration of different analytical methods of field theory, quantum mechanics, and macroscopic electrodynamics used in modern medicine to describe the effect of intense fluxes of different particles: protons, alfa-particles, multicharged ions, relativistic electrons, and gamma-ray emission on biological tissues. Simple relations are given for paths of the above-mentioned particles in various media, their energy loss, and photon bremsstrahlung. The basic laws describing these interactions are derived. In several cases, where a derivation of such formulas is absent, references are, as a rule, given to corresponding sections of the classical ten-volume textbook by L D Landau and E M Lifshitz on theoretical physics. The energy of the indicated ionizing radiations always exceeds the energy of intermolecular and intramolecular bonds in biological tissue. The radioreaction of biological objects of every level of organization, macromolecules, cells, tissues, and human organs, is considered. The principal goal of the textbook is to disclose the general laws of biological responses to ionization. The main feature of the effect of ionizing radiation on living objects is a sharp discrepancy between the low value of the energy absorbed by a biological object and the considerable biological effect. The textbook may be recommended to students of physical and engineering-physics departments specializing in medical physics, postgraduates, PhD students, and specialists using acceleration techniques in radio biology, medicine, radio chemistry, and other related fields. (Publishing House Intellect: tel. +7 (495) 579-96-45, e-mail: id-intellect@mail.ru, zakaz@id-intellect.ru, URL: http://www.id-intellect.ru/)

Kyurkchan A G, Smirnova N I, Kleev A I ***Methods for Solving Diffraction Problems Based on the Use of A Priori Analytical Information.*** (Moscow: Fizmatlit, 2021) 312 pp. ISBN 978-5-9221-1914-6.

This monograph is devoted to mathematical simulation methods in diffraction theory based on the use of a priori information on the analytical properties of a solution. In the introduction, examples are discussed showing the importance of allowing for a priori information in working out algorithms to solve diffraction problems, in particular, information on the analytical properties of solutions. In the first chapter, the basic analytical representations of wave fields are derived and exact boundaries of existence domains of these representations are set. The chapter also presents the technique of localization of singular points of analytical continuation of wave fields and determination of their character, and exemplifies this type of localization. The second chapter of the monograph is devoted to the methods of auxiliary currents and sources of solutions to problems of diffraction by elastic scatterers in the vector formulation, among others. The third chapter describes the methods of zero field and T-matrices, which are very popular for solving problems in radio physics, radioastronomy, biophysics, etc. The fourth chapter presents the method of extended boundary conditions, based on displacement of the boundary condition from the scatterer surface to another surface located rather close to the scatterer surface and lying in the region where the solution is being sought. The fifth chapter presents the method of diagram equations, in which the problems of diffraction and wave propagation result in solutions to some integral-operator equations for the spectral function — the wave field diagram. The monograph will be interesting to researchers engaged in numerical simulation of wave scattering of various origins. The basic part of the presented results was obtained with the support of RFBR (projects 00-02-17639A, 03-02-16336A, 06-02-16483A, 09-02-00126A, 12-02-00062A, 16-02-00247A, 19-02-00654A). (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Novikov N Yu ***Basic Elements of the Theory of Information-Measuring and Control Systems.*** (Moscow: Fizmatlit, 2022) 560 pp. ISBN 978-5-9221-1908-5.

This book presents a new and rather general approach to information-measuring and control systems efficiently applied in practice. The mathematical interpretation and the principles of construction of these systems are for the first time based on fundamental bases of analysis, namely, Cartan filters, Moore and Smith generalized sequences, methods of the set theory, topology, and functional analysis. The apparatus of information-measuring and control systems is not limited to applicability of the concept of metrics or another conception using the notion of number and is not reduced to the investigation of physical quantities only. The results obtained can be used in very different classical and nonclassical applications of the theories of measuring, coding, and control in mathematical and technical physics, in theories of algorithmic and information complexity in technologies of multilevel searches in databases, in medicine, biology, and bioinformatics, in genetic engineering, in creating systems of artificial intelligence, in neuronets and virtual analogs (digital twins) of real objects, in designing test systems, and in simulating social networks. The book is recommended for a wide range of specialists and scientists applying modern information technologies in the natural, technical, biological, and social sciences. It may serve as a textbook for postgraduates and students at higher education institutions. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Kukushkin Yu A, Bogomolov A V, Soldatov S K, Alekhin M D et al. ***Riskometry of Functional Reliability of a Pilot.*** (Moscow: Fizmatlit, 2021) 288 pp. ISBN 978-5-9221-1917-7.

Presented are fundamental and applied aspects of the riskometry of functional reliability of flight personnel of state aviation as applied to dangerous flight factors (flight and shock overcharge, altitude and psychophysiological flight factors) affecting pilots of fifth-generation aircraft. A complex multifaceted characteristic of such factors is given, the technology of contactless monitoring of a pilot's state during flight is described, and algorithms are presented of the riskometry of functional reliability of flight personnel under the above-mentioned factors, making possible an adequate allowance for the 'human factor' when implementing intellec-

tual functional-adaptive control over aviation ergatic systems for the purpose of optimizing the function distribution between an operator and technical facilities. The book is meant for scientists and technical engineers specializing in the design, testing, and exploitation of state aviation aircraft, aviation medicine, aviation ergonomics, and flight safety. Reviewers: academician of RAE Vladimir Aleksandrovich Ponomarenko and academician of RAS Gurii Petrovich Stupakov. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Grigor'ev V I *Rem Viktorovich Khokhlov*: *Life and Activity of the Outstanding Physicist, Science Organizer, and Rector of Moscow University as Seen by His Friend.* (Series Nauka v SSSR: Through Thorns to Stars, 59. Series: Biographies of Outstanding Persons, 163) 2nd edition, enlarged (Moscow: URSS, 2022) 154 pp. ISBN 978-5-9710-9569-9.

This book, based on the author's personal reminiscences, narrates the life and scientific activity of the remarkable Soviet physicist, rector of Moscow State University, and academician of the USSR Academy of Sciences R V Khokhlov. Described are his childhood and years at the Physical Department of MSU; his research work in the area of nonlinear oscillations and waves, the creation of new lasers, and other fields, where his work became fundamental; and his activity as rector of MSU and member of the Presidium of the USSR Academy of Sciences, showing both the extent of his personality and his captivating ability to communicate with people. The book is recommended to physicists and historians of physics, as well as a wide range of readers interested in the history of Soviet science and the activities of its prominent representatives. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: http://urss.ru/)

Prepared by *E V Zakharova*
(e-mail: elena.zakharova.office@gmail.com)