

New books on physics and related sciences

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Ginzburg V L, Rukhadze A A *Waves in Magnetized Plasmas* 3rd ed. (Moscow: Librokom Publ., 2013) 256 pp. ISBN 978-5-397-03297-1.

The book presents a consistent theory of the propagation of electromagnetic waves in plasmas. Plasma is treated as a material medium with not only frequency dispersion, but with spatial dispersion as well, and the authors discuss the general issues of linear electrodynamics in media with spatial dispersion, as well as various models used to describe collisionless plasma and the domains of their applicability. Collisions in fully ionized and weakly ionized plasma are taken into account. The model described by the kinetic equation is discussed in detail. This model is used to calculate the dielectric constant of the isotropic and anisotropic plasmas in the absence of external fields. Also highlighted is the aspect of plasma behavior in an external electric field. The book concentrates on the study of wave propagation in plasmas in the cases of waves in uniform and isotropic plasmas in the absence of external fields, and then of waves in uniform magneto-active plasmas (cold and hot). The stability of uniform anisotropic plasma is also discussed. The last sections of the book are devoted to some very important issues like waves in nonuniform and nonequilibrium plasmas and the stability of the magnetic confinement of plasmas. The book is recommended for a broad range of physicists—under- and postgraduate students, teachers, researchers. The first edition was published by (Moscow: Nauka) in 1970; the second edition by (Moscow: Nauka) in 1975. (Izdatel'skaya gruppa URSS: 117335 Moscow, Nakhimovskii prosp. 56; tel./fax +7 (499) 724-25-45; e-mail: urss@urss.ru; URL: <http://urss.ru/>)

Khvol'son O D *Popular Lectures on Basic Hypotheses* [Series 'Physical and Mathematical Heritage: Physics' (History of Physics)] 2nd ed. (Moscow: URSS Publ., 2012) 141 pp. ISBN 978-5-397-02884-4.

Readers are offered a book by the well-known Russian physicist and science populariser, O D Khvol'son (1852–1934), presenting a collection of his popular lectures on basic hypotheses for physics. Lecture One gives a brief historical review of the physical method development, defines the concept of hypothesis, and describes the types and properties of hypotheses. Lecture Two treats simplification of hypotheses and so-called imaginary hypotheses, while also outlining the formation of the three main hypotheses for physics—the inertia principle, the principle of conservation of matter, and the principle of conservation of energy. Lecture Three discusses hypotheses for the ether, atoms,

and the structure of gas. Finally, Lecture Four turns to physical hypotheses related to electricity. The book, written more than a hundred years ago (its first edition was published in 1887) will be of interest first of all to physics historians, as well as to students and lecturers in physical and mathematical departments. (Izdatel'skaya gruppa URSS: 117335 Moscow, Nakhimovskii prosp. 56; tel./fax +7 (499) 724-25-45; e-mail: urss@urss.ru; URL: <http://urss.ru/>)

Bobrov Yu K, Gusein-zade N G, Rukhadze A A, Yurgenas Yu V *Physical Models and Mechanisms of Electrical Breakdown in Gases* (Moscow: Moscow State University Publishers, 2012) 368 pp. ISBN 978-5-211-06367-9.

The book presents a general approach to the description of the propagation of the plasma produced by electrical breakdown in gases at all its stages; it is based on an analogy to processes of propagation of the combustion and detonation fronts. An analysis is given of experimental and theoretical studies of electrical breakdown, and physico-mathematical models are proposed. The basic mechanisms of gas breakdown are scrutinized. The book is intended for researchers in the fields of electrical discharge physics, electrophysics, and high-voltage technology, for postgraduate and undergraduate students. (Izdatel'stvo Moskovskogo Universiteta: 125009 Moscow, ul. Bol'shaya Nikitskaya 5/7; tel. +7 (495) 629-50-91; e-mail: secretary-msu-press@yandex.ru; URL: <http://msupublishing.ru/>)

Koch C, Ovid'ko I A, Seal S, Veprek S *Structural Nanocrystalline Materials: Fundamentals and Applications* (Translated from English by A G Lanin, ed. by M Yu Gutkin) (Moscow: Fizmatlit Publ., 2012) 448 pp. ISBN 978-5-9221-1395-3.

The book offered to readers was written by four well-known authors, Professor Carl C Koch (USA), Ilya Ovid'ko, DSc (Russia), Professor Sudipta Seal (USA) and Professor Stan Veprek (Germany); it treats the fundamentals of nanotechnological processes and structural states of bulk nanomaterials, nanocomposites, and coatings at the theoretical and applied levels. The book examines the application of bulky nanomaterials in load-bearing structures, analyzes the stability of nanocrystalline microstructures, and describes methods used to study their structure. The authors studied the behavior and specific features of changes in the mechanical and functional properties of nanomaterials in possible areas of application. Theoretical models of the structure of nanocrystalline materials are presented, and mechanisms of their behavior under different types of loading are discussed. There is no doubt that this book, presenting the latest information on the properties of nanomaterials, on problems encountered in using them, and on prospects for finding nontrivial solutions, will prove useful to undergraduates, postgraduate students, scientists, and engineers involved in the development and application of nanomaterials in various

fields of technology. (Original publication: Koch C, Ovid'ko I, Seal S, Veprek S *Structural Nanocrystalline Materials: Fundamentals and Applications* (Cambridge: Cambridge University Press, 2007)) (Izdatel'stvo Fizmatlit: 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/>)

Gubin S P, Tkachev S V *Graphene and Related Carbon Nanoforms* 2nd ed. (Moscow: Librokom Publ., 2012) 104 pp. ISBN 978-5-397-03286-5.

This book gives a brief survey of carbon-containing nanoobjects based on graphite and products of its modification. The focus is on the new carbon nanomaterial—the graphene. The authors explain what precisely is defined as 'graphene' in publications in Russia and abroad, describe the basic methods for graphene preparation and its physical and chemical properties, show how composites and graphene-based compounds can be produced, and list the main areas of application of this promising material. The book is recommended to a wide circle of specialists—chemistry and physics researchers, practising engineers working in production and application of nanomaterials, as well as undergraduate and postgraduate students specializing in technical sciences and technical information. (Izdatel'skaya gruppa URSS: 117335 Moscow, Nakhimovskii prosp. 56; tel./fax +7 (499) 724-25-45; e-mail: urss@urss.ru; URL: <http://urss.ru/>)

Nikitov S A, Ivanov O V *Cladding Modes of Optical Fibers and Long-Period Fiber Gratings* (Moscow: Fizmatlit Publ., 2012) 256 pp. ISBN 978-5-9221-1393-9.

The use of cladding modes for controlling the radiation in optical fibers has become one of the new techniques in fiber optics. The book presents the results of theoretical and experimental studies of the excitation, propagation, and interaction of cladding modes in long-period and Bragg fiber gratings. An integrated experimental study is outlined of long-period optical fiber gratings induced by the action of the electric arc on fiber. Principles of designing sensors of various physical parameters based on gratings induced in the arc are explained. The propagation of cladding modes in twisted optical fibers is analyzed. The transformation of the spectra of long-period gratings under torsion, tension, and heating of fibers is investigated. (Izdatel'stvo Fizmatlit: 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/>)

Bol'basova L A, Lukin V P *Adaptive Correction of Atmospheric Distortion of Optical Images Based on an Artificial Reference Source* (Moscow: Fizmatlit Publ., 2012) 128 pp. ISBN 978-5-9221-1383-0.

The book is devoted to using adaptive optics in astronomical applications. The presentation stems from the original work of the authors on studying the adaptive phase correction of turbulent distortions of optical images generated in astronomical telescopes using an artificial reference source—a laser reference star. The book is intended for researchers who specialize in atmospheric adaptive optics, as well as for postgraduate students and senior students majoring in

optical technologies. (Izdatel'stvo Fizmatlit: 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/>)

Pleskova S N *Atomic Force Microscopy in Biological and Medical Research* (Dolgoprudnyi: Intellekt Publ., 2011) 184 pp. ISBN 978-5-91559-108-9.

This textbook covers not only aspects of the design, functioning, and operating principles of the SPM (scanning probe microscope), but also aspects of the study of biological objects, including nucleic acids, proteins and protein-membrane complexes, bacterial cells, and subcellular structures. The book is definitely of considerable interest because the author presents the results of her own research, not avoiding technical problems arising in the study of biological objects. A principal issue in working with biological specimens is the observation in physiological media, where nativity of cells and tissues survives. The AFM method offers this option of examining live cells with high resolution without the need for cell fixation. The author uses her experience to give a review of the methodical approaches developed and the results obtained in the study of eukaryotic cells in their optimal environment. The book has no analogues in the scientific and educational literature in Russian. It will be a valuable reference for researchers, senior students, and lecturers in the biological and physico-chemical specialties. (Izdatel'skii dom Intellekt: 141700 Dolgoprudnyi, Moscow region, Promyshlennyi proezd 14; tel. +7 (495) 579-96-45; e-mail: id-intellect@mail.ru; URL: <http://www.id-intellect.ru/>)

Lie Sophus *Theory of Transformation Groups* In three parts: Pt. 1 (Translated by L Frai, ed. by A Bolsinov) (Moscow–Izhevsk: Institute for Computer Sciences, 2011) 712 pp. ISBN 978-5-4344-0009-1.

Lie Sophus *Theory of Transformation Groups* In three parts: Pt. 2 (Moscow–Izhevsk: Institute for Computer Sciences, 2012) 640 pp. ISBN 978-5-4344-0057-2.

In this classic monograph, the brilliant Norwegian mathematician Sophus Lie systematically presented the results of his extensive research in continuous transformation groups, which he developed beginning in 1873. The monograph, written with the assistance of the German mathematician Friedrich Engel, makes it possible to gain understanding of all fundamental directions of Lie's research: continuous groups and their applications, contact transformations, and differential equations, as well as his poorly known results in geometry. The theory of continuous groups developed by Lie, now known as the theory of Lie groups, profoundly influenced progress in the foundations of geometry, topology, and theoretical physics. (Original publication: Lie Sophus *Theorie der Transformationsgruppen* (Unter mitwirkung von dr. Friedrich Engel bearb.) (Leipzig: B.G. Teubner, 1888, 1890)). (Regular and Chaotic Dynamics Scientific Publications Center: 426034 Izhevsk, ul. Universitetskaya 1, Udmurtia State University, RChD; tel. +7 (3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://shop.rcd.ru/>)

Sergei Mikhailovich Rytov: Life, Reminiscences, Interviews, Notes, Poems, Documents (Composed by V M Berezanskaya

and N S Rytova; ed. by A A Gippius; introduction by V G Polevoy and A B Shmelev) (Moscow: LENAND Publ., 2012) 552 pp. ISBN 978-5-9710-0462-2.

This collection is dedicated to the memory of Sergei Mikhailovich Rytov, the outstanding scientist and educator, Corresponding Member of the Russian Academy of Sciences, Professor, and one of the founders of modern radio physics. Most of the materials gathered for this collection were previously unpublished. The list of S M Rytov's main publications is given. In addition to the memories of the relatives and colleagues of S M Rytov, the book utilizes materials from the personal archives of N S Rytova, from the Archive of the Russian Academy of Sciences, and from the archive and the library of the Lebedev Physical Institute, RAS. (OOO LENAND: 117312 Moscow, prosp. 60-letiya Oktyabrya, d. 11A, str. 1; tel. + 7 (499) 724-25-45; e-mail: urss@urss.ru; URL: <http://urss.ru>)

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