

PACS number: 01.30.Tt

New books on physics and related sciences

DOI: 10.3367/UFNe.0184.201401f.0109

Fortov V E ***High Energy Density Physics*** (Moscow: Fizmatlit, 2013) 712 pp. ISBN 978-5-9221-1468-4.

This monograph is concerned with numerous physical phenomena and properties of highly compressed and heated matter of high energy densities. It deals with methods of generation and diagnostics, as well as theoretical approaches to describing the behavior, of matter at extremely high pressures and temperatures which are reached in laboratory and quasilaboratory conditions. States of matter are discussed at high energy densities that arise at various stages of the evolution of astrophysical objects owing to gravitational forces and release of thermonuclear energy. An attempt has been made to systematize, generalize, and present from a unified standpoint extensive theoretical and experimental material falling within a new field of science — the physics of high energy densities. The book is based on lectures delivered by the author to students of the Moscow Institute of Physics and Technology, the Higher School of Physics of the Russian Ministry of Atomic Energy, and review and invited papers at scientific conferences and symposia. The book may be of use to a wide range of scientists, postgraduates and undergraduate students majoring in the natural sciences, opening access to original publications and making it possible for them to find their way among exciting problems in modern physics. (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/)

Gantmacher V F ***Electrons in Disordered Media*** Third edition, revised and enlarged (Moscow: Fizmatlit, 2013) 288 pp. ISBN 978-5-9221-1487-5.

This book is intended for students of senior courses and postgraduates who specialize in solid state physics, and also for researchers and anyone who needs a professional understanding of the fundamentals of physical processes that govern the behavior of electrons in solids. It has been written at a minimum mathematical level. The main focus is on discussing the physical essence of the phenomena and revealing profound connections and analogies. The present (third) edition was extended by adding chapters on the quantum Hall effect and quantum phase transitions. Some chapters of the book were reworked. Questions and problems were added to all chapters. (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/)

Bisikalo D V, Zhilkin A G, Boyarchuk A A ***Gas Dynamics of Close Binary Stars*** (Moscow: Fizmatlit, 2013) 632 pp. ISBN 978-5-9221-1404-2.

Uspekhi Fizicheskikh Nauk **184** (1) 109 – 111 (2014)
DOI: 10.3367/UFNr.0184.201401f.0109
Translated by M V Tsaplina

This book generalizes the results of fundamental research on the gas dynamics of mass transfer in close binary stars at the stage of mass exchange. The basic data are presented on the physics of processes participating in mass exchange in close binaries. The book treats the general principles of computer simulation and presents a review of modern numerical techniques that are used most often in solving gas-dynamic astrophysical problems. Results are given relevant to numerical modeling of gas dynamics of matter in close binary systems without a magnetic field. Changes are discussed in the flow pattern of matter due to magnetic fields in close binary systems. The book was meant for researchers, postgraduates and undergraduate students learning astrophysics as their major field. (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/)

Dnestrovsky Yu N ***Self-organization of Hot Plasma*** (Moscow: National Research Centre 'Kurchatov Institute' Publ., 2013) 172 pp. ISBN 978-5-9044-3734-3.

This monograph presents a one-dimensional transport model for a tokamak, based on the plasma self-organization effect. The basic concepts involve those of canonical profiles for plasma temperature and pressure whereto arbitrary initial distributions relax. It is assumed that canonical profiles are determined by the minimum of magnetic energy of the plasma current. The boundary value problem was constructed for the canonical profile of a poloidal magnetic field containing a nonlinear second-order differential equation with two parameters. Algorithms for solving this problem are discussed. The system of transport equations contains fluxes of heat and particles with critical gradients. The critical gradients themselves are presented as logarithmic derivatives of corresponding canonical profiles. Numerous examples are given of applications of the model as developed in tokamak experiments. The monograph is intended for researchers, postgraduates, and senior-year students interested in describing open systems with self-organization, and, in particular, modeling of transfer processes in the hot plasma of thermonuclear facilities with a magnetic confinement. (Izd-vo National Research Centre 'Kurchatov Institute': 123182 Moscow, pl. Akademika Kurchatova 1; tel. +7 (499) 196-95-39; tel./fax +7 (499) 196-17-04; e-mail: nrcki@nrcki.ru; URL: http://www.nrcki.ru/)

Erofeev V I ***Principles Underlying the Development of High-Informative Models of Plasma Kinetics*** (Novosibirsk: Russian Academy of Sciences, Siberian Branch Printing House, 2013) 286 pp. ISBN 978-5-7692-1307-6.

This book is devoted to the most fundamental problem of the physical theory of plasma — that of the information content of its concepts concerning nonlinear processes occurring in the plasma. It is shown that the traditional methods of

theoretical plasma research cannot insure acceptable reliability of the final conclusions. The fundamental causes of insufficient informativity of the results of the habitual plasma-theoretical calculations are revealed: the asymptotic nature of convergence of successive approximations of the theory and the general physics-theoretical tradition of replacement of real plasmas by their probabilistic ensembles (the ensemble method). Key principles are formulated for developing informative scenarios of plasma kinetics and limiting potentialities are improved as much as possible to increase the informativity of such scenarios. The book also presents the high-informativity correlation analysis of plasma kinetics which adapts the above-outlined principles to the problem of reduction of the complete description of weak-turbulence collisionless plasma until its high-informativity kinetic analogue is produced. It is applied to reconsider the key concepts of nonlinear phenomena in plasma with a weak Langmuir turbulence. The book was intended for specialists in the simulation of physical phenomena and theoretical physicists, as well as young researchers who wish to join the program of developing high-informativity models of physical phenomena in plasma objects or to apply the appropriate knowledge to studying physical objects of a different nature. (RAS Siberian Branch Printing House: Morskoi prosp. 2, 630090, P/O Box 187, Novosibirsk; http://sibran.ru/)

Kiselev V K, Kostenko A A, Khlopov G I, Yanovsky M S ***Quasioptical Antenna Feeder Systems*** (Edited by G I Khlopov) (Kharkov: Publishing and Polygraphic Enterprise 'Kontrast', 2013) 408pp ISBN 978-966-8855-92-4.

This monograph generalizes the results of research and development in the field of quasioptical antenna feeder devices for radio engineering systems in the short-wave segment of the millimeter and sub-millimeter ranges of the spectrum. The results obtained by specialists at Soviet research institutions are given which reflect, among other things, many years of experience by the authors of the present monograph. Characteristics are discussed of the propagation of the dominant modes of oscillations in the most widespread types of oversized metal and metal–dielectric waveguides, the properties of typical inhomogeneities, the specifics of designing the key elements of a tract, and quasioptical systems based on them and the antennae devices. The book is intended for researchers, postgraduates, and undergraduate students specializing in the range of quasioptical technologies, as well as for practising engineers developing reception and transmission radio technical systems of the short-wave segment of the millimeter and sub-millimeter ranges. ('Kontrast' Publ.: Lenin ave. 40, office 231, Kharkov, Ukraine; tel./fax: +38 (057) 719-49-13; e-mail: kontrast@webest.com; URL: http://kontrast.kh.ua/)

Arkhipova V P, Blinnikov S I, Lamzin S A, Popov S B, Prokhorov M E, Samus' N N, Surdin V G, Fadeev Yu A, Tsvetkov D Yu ***The Stars*** (Composed and edited by V G Surdin) 3rd edition, revised and enlarged (Moscow: Fizmatlit, 2013) 428 pp ISBN 978-5-9221-1466-0.

This book is a part of the series 'Astronomy and Astrophysics' and contains a survey of the current concept covering our understanding of the stars. It describes the origin of names of stars and constellations, the possibility of observing them at night and in the daytime, the main characteristics of stars, and their classification. The main focus is on the nature of stars: their internal structure, their energy sources, their origin, and their evolution. The later stages of stellar evolution are discussed, which lead to the formation of planetary galaxies, white dwarfs, neutron stars, and nova and supernova outbursts. The book is intended for students of junior courses in departments of the natural sciences in universities and for specialists in related fields of science. The book will be of special interest for astronomy amateurs. (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/)

Zhmurikov E I, Bubnenkov I A, Dremov V V, Samarin S I, Pokrovsky A S, Khor'kov D V ***Graphite in Science and Nuclear Technology*** (Exec. editor P V Logachev) (Novosibirsk: RAS Siberian Branch Printing House, 2013) 159 pp ISBN 978-5-7692-1314-4.

This monograph is concerned with applications of graphite and graphite composites in science and technology. It treats the structure and electrophysical properties, the technological aspects of producing high-strength artificially grown graphites, and the dynamics of graphite destruction traditionally used in the atomic industry. Much attention is devoted to the specifics of graphitization and the physical properties of graphite composites based on the ^{13}C isotope of carbon. The book is mostly based on original results and covers topical issues of the application and testing of graphite materials in contemporary nuclear physics and in science and technology implementations. The monograph is intended for researchers and practising engineers specializing in the field of nuclear physics and technology, nuclear reactors physics, and condensed matter physics. (Siberian Branch of the Russian Academy of Sciences Printing House: Morskoi prosp. 2, 630090, P/O Box 187, Novosibirsk; http://sibran.ru/)

Louis de Broglie ***Selected Works*** **Vol. 3** ***Theory of Light Based on the Theory of Fusion. Particles with Spin*** (Moscow: Media Industry Academy, 2013) 528 pp. ISBN 978-5-90631-005-7.

This volume presents the work of the outstanding French scientist and one of the creators of quantum mechanics, Louis de Broglie. Two volumes of the *New Theory of Light* which are included in this issue were published in 1940–1943 and reflect progress in the wave mechanics of the photon. This work by de Broglie is being published in the Russian language for the first time. Louis de Broglie is one of the greatest scientists of the 20th century. His contribution to progress in quantum physics was honored in 1929 with the Nobel Prize in Physics "for his discovery of the wave nature of electrons". He achieved very much in the philosophy of science and organization of fundamental education. Many of de Broglie's ideas still remain important today. Unfortunately, the work of the Foreign Member of the Soviet Academy of Sciences, Louis de Broglie, is very little known in our country. Louis de Broglie wrote only in French, and those among his publications which emerged in Russian translation were printed more than 30 years ago and became bibliographic rarities. This publication is intended for physicists, philosophers, and experts in science studies. (To buy the volume, contact: e-mail: afsmyk@mail.ru; tel. +7 (915) 119-42-12, +7 (499) 976-39-87)

Barrow J D, Davies P C W, Harper C L, Jr. (Eds) ***Science and Ultimate Reality*****: *Quantum Theory, Cosmology, and Complexity*** (Translated from English by V Matsarsky, O Matsarsky; Gen. Sci. Ed.: L B Okun) (Moscow–Izhevsk: Regular and Chaotic Dynamics, Institute of Computer Science of Udmurt State University, 2013) 664 pp. ISBN 978-5-93972-955-0.

This book gives a translation into Russian of papers presented by thirty authors on the multifaceted creative contribution of the outstanding theoretical physicist John Archibald Wheeler. Careful attention is paid to those aspects of interpretation of quantum mechanics which lie within the concept of an infinite number of universes. Many of the authors analyze the greatly surprising property of the anthropic nature of our Universe: its compatibility to the existence of humans in it. Also considered are the inflationary stage of the development of the early Universe and its relation to string theory. Translated from the publication: Barrow J D, Davies P C W, Harper C L, Jr. (Eds) Science and Ultimate Reality: Quantum Theory, Cosmology, and Complexity. (Cambridge: Cambridge Univ. Press, 2004) (Scientific and Publishing Center 'Regular and Chaotic Dynamics', Institute of Computer Science of Udmurt State University: ul. Universitetskaya 1, 426034 Izhevsk, Russian Federation; tel. +7 (3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: http://shop.rcd.ru/)

Oganesyan Yu Ts, Vdovin A I (Eds) ***JINR and One Hundred Years Since the Discovery of the Atomic Nucleus*****: *Proceedings of the Symposium, JINR, Dubna, Russia, 11–12 March 2011*** (Moscow: Fizmatlit, 2013) 224 pp. ISBN 978-5-9221-1482-0.

This book comprises a collection of papers submitted to a symposium on the hundredth anniversary of the discovery of the atomic nucleus. The symposium was organized by the Joint Institute for Nuclear Research (Dubna, Russia) and was held in Dubna in March of 2011. The reports covered both separate aspects of the history of fundamental nuclear physics and many of the results of the latest nuclear physical research. Great attention is paid to the contribution of JINR's researchers, both experimentalists and theorists, to various branches of atomic nucleus physics. The book may be interesting to research workers, postgraduates, and undergraduate students majoring in the field of nuclear and elementary particle physics. (Izdatel'stvo Fizmatlit: 117997 Moscow, Profsoyuznaya ul. 90; tel. +7 (495) 334-74-21; fax: +7 (495) 334-76-20; e-mail: fizmat@maik.ru; URL: http://www.fml.ru/)

Vintizenko I I ***Relativistic Magnetrons*** (Moscow: Fizmatlit, 2013) 359 p. ISBN 978-5-9221-1429-5.

This book presents the results of theoretical and experimental studies on relativistic magnetrons, carried out by researchers in Russia and abroad, including the author of this monograph, over the period of 1976 to 2011. The design of devices, the principle of operation, and the distinction from classical analogues are described. The problems of superhigh-power microwave pulses generated in relativistic magnetrons using high-current electron accelerators and linear induction accelerators as a power supply are discussed in detail. The main parameters of experimental setups, operating conditions, and microwave radiation characteristics are also given. Nontraditional means of controling the oscillation process in relativistic magnetrons, its spectrum, and energy fluxes by introducing external feedback into the resonance system are considered. The book is of interest for researchers and devisers working in the field of microwave electronics and accelerating techniques. (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/)

Yury Borisovich Rumer**: *Physics, 20th Century*.** (Authors-compilers: I A Kraineva, M Yu Mikhailov, T Yu Mikhailova, Z A Cherkasskaya; Exec. Ed. A G Marchuk) (Novosibirsk: ARTA Publ., 2013) 592 pp. ISBN 978-5-9027-0020-3.

This monograph is devoted to the life and activities of the outstanding scientist, the founder of the Siberian school of theoretical physics, and Doctor of Physicomathematical Sciences, Yury Borisovich Rumer (1901–1985). The book is a collection of documents and reminiscences about the life, research work, and affections of Yu B Rumer. Using the extensive documentary arrays stored in several archives (Novosibirsk State University, Moscow State University, Scientific Archive of the Siberian Branch of RAS, Archive of the Russian Federal Security Service, as well as the family archives of Yu B Rumer's son and daughter and the Archive of D D Saratovkin) the reader is enabled to carry out their own investigation. The book gives an account of Yu B Rumer's development as a scientist and his contribution to theoretical physics, and relates the tragic events in his life. The book elucidates the role of Yu B Rumer in the development of Siberian science in the period of the creation of the Siberian Branch of the USSR Academy of Sciences, as well as his pedagogical and dissemination activities. The book is of interest for physicists, historians of science, teachers of physics and the history of science, students in physics, and a wide range of readers interested in the history of Russian science. The reviewers are the Academician A V Chaplik, the Corresponding Member of RAS V A Lamin, and the Corresponding Member of RAS I B Khriplovich. The book was published in the framework of the integration project of fundamental research of SB RAS M-48, "Open archive of SB RAS as an electronic system of accumulation, presentation, and storage of scientific heritage" 2012–2014. (ARTA Publishers: 39 ul. Russkaya, office 623-632, 630058 Novosibirsk, Russian Federation; tel. +7(383)328-30-59; e-mail: arta@arta.nsk.ru, URL: http://arta.nsk.ru/)

Frenkel V Ya, Chernin A D ***Georgii Gamow — A Giant of Three Sciences*****: *From Alpha-Decay to the Big Bang*** (Ser. "Science to all!" Masterpieces of popular scientific literature) 2nd edition revised and enlarged (Moscow: URSS Publ., 2013) 136 p. ISBN 978-5-3970-3506-4.

Nuclear physics and elementary particle physics, astrophysics and cosmology, and genetics are the fields of science to which the work of Georgii Antonovich Gamow, one of the outstanding theoretical physicists of the 20th century, made a brilliant contribution. The presented book narrates the most important of Gamow's scientific achievements, namely, the discovery of the quantum nature of alpha decay, the Big Bang theory, and the clue to the genetic code. A brief scientific biographical essay is presented, which is based on the USSR and USA archival materials. The first edition of the book

appeared in 1990, published by 'Znanie' Publishing House (in 'Physics' series). In the present edition, only several misprints were corrected, and a few small stylistic corrections and insertions offered by the publishers were made. The book is intended for a wide range of readers interested in the problems of fundamental science, the history of physics, and cosmology. (URSS Publishers: 117335 Moscow, 56 Nakhimovsky prosp.; tel. +7(499)724-25-45; e-mail: urss@urss.ru; URL: http://urss.ru)

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