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New books on physics and related sciences: June 2024

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Ishkhanov B S, Kapitonov I M, Tutyn' I A ***Nucleosynthesis in the Universe*****.** 4th edition revised and suppl. (Ser. The Foundation of the Future: Jubilee series in honor of 270th anniversary of M V Lomonosov MSU; Ser. Classical MSU textbook) (Moscow: URSS, 2024) 200 pp. ISBN 978-5-00237-031-3.

The book provides an overview of modern ideas about nucleosynthesis — the formation of atomic nuclei in natural conditions. All main stages of the Universe's development from the Big Bang to the present day are considered. Particular attention is paid to nuclear reactions in stars. The book is based on a university course in physics and general concepts of quantum mechanics, the physics of the atomic nucleus, and elementary particles. It can be considered an introduction to nuclear astrophysics. The book contains extensive factual material and can be used as a reference book. It is intended for physicists of quite different qualifications — for students, postgraduates, researchers, as well as nonspecialists interested in nucleosynthesis and processes in the Universe. (Publishing group URSS: e-mail: urss@URSS.ru, URL: https://urss.ru/)

Gallyamov M O ***Methods of Optical and Electron Microscopy*****.** (Classical university textbook) (Moscow: Moscow University Press, 2024) 224 pp. ISBN 978-5-19-011963-3.

The book is published in accordance with the publishing program devoted to the 270th anniversary of Moscow University. It is approved by the Academic Council of the Physics Department of M V Lomonosov MSU. The textbook discusses the design principles of modern optical and electron microscopes, image formation in them, operation modes, achievable resolution, analytical capabilities, and methods of sample preparation. Particular attention is paid to a recent promising development that has opened up essentially new possibilities in the observation of polymer objects of synthetic or natural origin, as well as nanomaterials. The textbook is intended for senior students of physical departments of universities (the area of study is Physics and specialty 03.05.02, Fundamental and Applied Physics) and other natural-science departments. Marat Olegovich Gallyamov is a doctor of physical and mathematical sciences, professor of RAS, and professor in the Department of Polymer and Crystal Physics of the Physical Department of MSU. (Moscow University Press: e-mail: zakaz@msupress.com, URL:https://msupress.com/)

Uspekhi Fizicheskikh Nauk **194** (6) 679–680 (2024)
Translated by A N Tsaplin

Sazhina O S ***Fundamentals of Mathematical Processing of Observational and Experimental Data for Astronomers*****.** Textbook. (Classical university textbook) (Moscow: Moscow University Press, 2024) 286 pp., ISBN 978-5-19-011930-5.

The textbook contains information from mathematical statistics for primary processing of observational and experimental data and contains examples, including those from the author's research. Derivations of formulas typically not presented in such kind of literature are given. The textbook is supplemented with materials on the probability theory, combinatorics, and linear algebra, which are necessary for solving a wide range of applied statistical problems. The textbook is addressed to students of physical departments of universities within the area 03.00.00, ''Physics and Astronomy'' (03.05.01 ''Astronomy''), and to researchers. Olga Sergeevna Sazhina is a doctor of physical and mathematical sciences, leading researcher at the Department of Relativistic Astrophysics at Shternberg Astronomical Institute, Lomonosov Moscow State University, associate professor in the Department of Celestial Mechanics, Astrometry, and Gravimetry of the Physical Department of MSU. (Moscow University Press: e-mail: zakaz@msupress.com, URL: https://msupress.com/)

Pyt'ev Yu P ***Methods of Mathematical Simulation of Measuring Computational Systems*****.** Textbook. 4th edition. (Works of outstanding scientists of MSU) (Moscow: Moscow University Press, 2024) 431 pp. ISBN 978-5-19-011967-1.

The book considers the elements of the mathematical theory of measuring and computing systems (MCSs) as measuring instruments, based on the mathematical formalism of measurement reduction, which allows, based on the results of measurements in the system 'measured object–environment–measuring device,' obtaining the most accurate description of the unobservable system 'studied object–environment' undistorted by measurements. The MCSs theory makes it possible to formulate requirements for the measuring MCSs component, ensuring the highest quality of MCSs as a measuring instrument, to evaluate the adequacy of the mathematical measurement model using MCSs, consistency of the parameter values of the object under study obtained at its output, estimation of errors, etc. The book will be useful for scientists and engineers in the field of physics and mathematics. Yuri Petrovich Pyt'ev is a doctor of physical and mathematical sciences, a well-known specialist in informatics and mathematical simulation, the author of fundamental studies concerning mathematical methods of analysis and interpretation of measurements, image processing and recognition, fuzzy and indefinite fuzzy mathematics, and subjective mathematical modeling. (Moscow University Press: e-mail: zakaz@msupress.com, URL: https://msupress.com/)

Antonets I V, Shavrov V G, Shcheglov V I *Waves in Multilayer Structures*. Part 2. Methods of calculation: impedance, exclusion, rereflections. (Moscow: Fizmatlit, 2023) 408 pp. ISBN 978-5-9221-1980-1.

The book is devoted to fundamentals of the methods for calculating the propagation of one-dimensional electromagnetic waves through multilayer structures. Parameters of propagating waves and the reflection and transmission coefficients were determined using the impedance, exclusion, and rereflection methods. The main focus is on the methods of impedance and the method of exclusion, which have a sufficiently universal character and allow a simple machine algorithmization for structures with an arbitrary number of layers. A scheme of the re-reflection method, which is of significant value for some specific cases, is presented. Several applied problems are solved. Many examples and methodological recommendations for students' independent work are given. Reviewers: Doctor of Physical and Mathematical Sciences, Professor A K Zvezdin and Doctor of Physical and Mathematical Sciences, Professor V N Prudnikov. The monograph is intended for specialists working in the field of the physics of wave processes, electrodynamics, magnetic phenomena, and acoustics, for engineers and designers of microwave, optical, and acoustic equipment, as well as for undergraduate and graduate students in corresponding specialties. For information about the first part of the book, see "New Books on Physics and Related Sciences: May 2023," https://doi.org/10.3367/UFNr.2023.04.039351. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Shibkov V M *Supersonic Plasma Aerodynamics* (Classical university textbook) (Moscow: Moscow University Press, 2924) 567 pp.

The book is published in accordance with the publishing program devoted to the 270th anniversary of Moscow University. The monograph generalizes and systemizes results on the fundamental problem of plasma physics related to investigation of physical processes in low-temperature nonstationary multicomponent gas-discharge plasma produced by microwave and transverse-longitudinal discharges in high-speed flows of chemically active mixtures. This new field of plasma physics includes both a fundamental investigation of the mechanisms and kinetics of atomic-molecular transformations in plasma and applied aspects of optimization of plasma-chemical processes in supersonic air and air-hydrocarbon flows. The book is aimed at researchers, postgraduates, and students specializing in aerodynamics, plasma physics, and chemical and physical kinetics. Valeriy Mikhailovich Shibkov is a doctor of physical and mathematical sciences, professor in the Department of Physical Electronics of the Physical Faculty of MSU. (Moscow University Press: e-mail: zakaz@msupress.com, URL: https://msupress.com/)

Vinogradova O I *Colloidal Systems*: *Colloidal 'Chemistry' for Physicists*. Textbook. (Classical university textbook) (Moscow: Moscow University Press, 2024) 207 pp. ISBN 978-5-19-011962-6.

The book is published in accordance with the publishing program devoted to the 270th anniversary of Moscow University. The science of colloids and surfaces studies heterogeneous systems whose properties and behavior are determined by interactions between phases and/or phenomena at interfaces. Most objects around us are colloidal systems, from agricultural soils, food products, cosmetics, and medicines to biological cells and viruses. The aim of the textbook is to provide an interdisciplinary understanding of the main phenomena determining the behavior of such systems and underlying both traditional and modern applications and to help those investigating colloid-surface phenomena to master the main theoretical methods and relations of this science. The manual includes sections devoted to capillarity and wetting, interphase hydrodynamics, surface forces, stability of colloids and thin films, and electrokinetic phenomena. The book is intended for senior students and postgraduates in physical, technical, chemical, and biological specialties, and for a wide range of researchers and engineers. Olga Igorevna Vinogradova is a doctor of physical and mathematical sciences, professor of the Faculty of Polymer and Crystal Physics of MSU (Moscow University Press: e-mail: zakaz@msupress.com, URL: https://msupress.com/)

Poklonsky N A, Vyrko S A, Poklonskaya O N *Physics of Semiconductor Systems. Basic Concepts*. (Minsk: Belaruskaya Navuka, 2023) 311 pp. ISBN 978-985-08-3053-1, https://elib.bsu.by/handle/123456789/306923.

The book contains the basic concepts of the physics of semiconductor materials and elements of device structures based on them. This book is based on experience in implementating projects of the Belarusian Republican Foundation for Fundamental Research and lectures delivered at the Physical Faculty of Belarusian State University and at the University of the National Academy of Sciences of Belarus by the corresponding member of Belarusian NAN, Professor N A Poklonsky. Briefly formulated are the concepts of states and processes with the participation of electrons, holes, phonons, and atomic defects of crystal matrices in semiconductor systems of different dimensions, and in discrete semiconductor devices. The minimum information from statistical thermodynamics and quantum mechanics necessary for understanding the terms (basic concepts) is presented. The book will be useful to students and postgraduates and to researchers specializing in physics and the technology of semiconductor systems of different dimensions. Reviewers: Academician of Belarusian NAN S V Gaponenko and Doctor of Physical and Mathematical Sciences A P Saiko. (Publishing House Belaruskaya Nauka: ul. F Skoriny, 40, 220084, Minsk, Belarus, tel. +375 17368 74 02, e-mail: info@belnauka.by)

Petrov I B *Lecture Notes on Computational Mathematics*. (Moscow: Fizmatlit, 2023) 192 pp. ISBN 978-5-9221-1965-8.

Computational methods for solving problems in physics (in particular, mechanics, including continuum mechanics), as well as various applied problems, are considered. The book includes elements of functional analysis, methods for exact solutions of difference equations, theoretical minimum questions in computational mathematics for physicists, and problems for computational workshops. The book is intended for university students (faculties of physics and mathematics) and students in technical institutes. Igor

Borisovich Petrov is a corresponding member of the Russian Academy of Sciences, head of the Department of Informatics and Computational Mathematics at the Moscow Institute of Physics and Technology (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Kislov A V *Climatology with Basic Principles of Meteorology*. Textbook. 2nd edition revised and suppl. (Classical university textbook) (Moscow : Moscow University Press, 2023) 225 pp. ISBN 978-5-19-011812-4.

The book is published in accordance with the publishing program devoted to the 270th anniversary of Moscow University. The textbook contains information about the atmosphere and specific features of the thermal regime and moisture conditions, circulation systems, the climate system, climate classifications, climate geography, mechanisms of change, and climate forecasts. The book is recommended to undergraduate students studying in the fields of geography, hydrometeorology, ecology and environmental management, and cartography and geoinformatics. Aleksandr Viktorovich Kislov is a doctor of geographic sciences, head of the Department of Meteorology and Climatology of the Faculty of Geography of MSU, honored professor at MSU. (Moscow University Press: e-mail: zakaz@msupress.com, URL: https://msupress.com/)

Golitsyn G S *Life, Science, and Human Connections*. (Moscow: Fizmatlit, 2024) 232 pp. ISBN 978-5-9221-1985-6.

This book is a historical, scientific, and socio-political essay on the motives of a long and productive life for more than 65 years. It consists of four sections. The first is family, origin, and various moments in the country's history. The second is scientific activity, accompanied by recognition in Russia and abroad, consisting in the development of the theory of circulation of planetary atmospheres, elucidation of the probabilistic and analytical structure of natural processes, earthquakes, hurricanes, floods, tornadoes, etc. based on A N Kolmogorov's 1934 work "Random Movements." The third section includes episodes of social activities in Russia and abroad, such as chairmanship of the Governing Council of the International Institute of Applied System Analysis in Austria, participation in the development of the concept of climate change, for example, as a result of consequences of a global nuclear war, in the fight against turning around the flow of northern rivers, etc. The last section is a description of various interesting episodes of life here and abroad. Georgii Sergeevich Golitsyn is an academician of RAS, member of the Division of Earth Sciences, a prominent scientist in the field of the theory of climate and its variations, the dynamics of Earth and planet atmospheres, statistics of natural processes, as well as application of these sections in various fields of science and technology, an honorary chairman of the Climate Council of RAS, chief researcher at the A M Obukhov Institute of Atmospheric Physics RAS, and the author of over 250 publications, including several papers in the *Uspekhi Fizichekikh Nauk* (*UFN*) journal (*Phys. Usp.*), https://ufn.ru/en/authors1140/golitsyn-georgii-s/; see, for instance, the recent methodical note: Golitsyn G S "The 1934 work of A N Kolmogorov as the basis for explaining statistics of natural phenomena in macroworld" *UFN* **194** 86 (2024) (English translation: *Physics-Uspekhi* **67** 80 (2024)) https://doi.org/10.3367/UFNr.2023.05.039355. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

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