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New books on physics and related sciences: September 2023

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Aksenov V L, Balagurov A M *Fundamentals of Neutronography* (Classical university textbook) (On the 270th anniversary of MSU. Biology. Physics. Chemistry) (Moscow: MSU Publishing House, 2023) 583 pp. ISBN 978-5-19-011827-8.

The physical foundations of low-energy neutron scattering methods for studying the structure and dynamics of matter in the condensed state are presented. The textbook is based on the lecture course delivered by the authors at the Physical Department at M V Lomonosov Moscow State University. The book consists of three parts. The first consistently presents the principles of the theory of low-energy neutron scattering. The second part concern methods of obtaining and forming neutron beams, as well as their registration. The third part is devoted to basic experimental methods of neutronography; a description is given of the principles of construction of experimental setups and measurements, as well as methods for interpreting experimental data based on the theory presented in the first part. The book will be useful to students, postgraduates, and researchers working or beginning to work on research on physical, chemical, and biological systems at the microscopic level (MSU Publishing House: e-mail: info@msupress.com, URL: https://msupress.com/)

Lipunov V M, Kornilov V G, Gorbovskoy E S, Tyurina N V, Kuznetsov A S *Astronomical Robotic Networks and Operational Multichannel Astrophysics* (*Using the Example of the MASTER Global Network*) (Works of outstanding MSU scientists). (On the 270th anniversary of MSU. Physics) (Moscow: MSU Publishing House, 2023) 591 pp. ISBN 978-5-19-011815-5.

This monograph presents the principles of work of robotic networks using the example of the MASTER Global Network (Mobile Astronomical System of TElescope-Robots). The first chapter concerns a brief history of the emergence of robotic optical telescopes in the world. The next four chapters are devoted to the principles of operation of individual robotic observatories and their interaction as part of the network united by a common goal and control. The subsequent six chapters are devoted to the most striking astrophysical discoveries made by the MASTER network in the study of extreme processes in the Universe. In real time, it is possible to observe the formation or collision of relativistic stars and relativistic processes occurring near them. After the discovery of polarization of inherent optical radiation, the MASTER network became the world leader in early observations of gamma-ray bursts, the most powerful electromagnetic explosions in the Universe. Its robots independently carried out localization of the source of gravitational waves with optical accuracy, a first in the history of astronomy. The MASTER network is a leader in the operative search for extragalactic sources of high-energy neutrinos. At the same time, its telescopes regularly survey the sky and have discovered thousands of explosions in the Universe and even potentially dangerous asteroids and comets. All the largest telescopes in the world observed the objects discovered by the MASTER system. (MSU Publishing House: e-mail: info@msupress.com, URL: https://msupress.com/)

Balashov V V *Quantum Collision Theory*. Third edition, revised. (Classical university textbook) (On the 270th anniversary of MSU. Physics). (Moscow; MSU Publishing House, 2023) ISBN 978-5-19-011845-2. In press.

This book introduces the methods of stationary and nonstationary nonrelativistic collision theory and serves to develop skills for their practical application to problems of modern physics. Particular emphasis was laid to the methods and representations used in the collision theory involving compound systems. The material is divided into lectures, at the end of each of which exercises are given, selected so that students, if mastering the material consistently, can do them on their own. The book will also be useful to postgraduate students and research workers engaged in atomic, nuclear, and particle physics. (MSU Publishing House: e-mail: info@msupress.com, URL: https://msupress.com/)

Kashkarov P K, Efimova A I, Zoteev A V, Kozlov S N *A Course of Lectures in General Physics for Chemical Departments of Universities* (Classical university textbook) (On the 270th anniversary of MSU. Physics). (Moscow: MSU Publishing House, 2023) ISBN 978-5-19-011863-6. In press.

This textbook includes the main sections of the general physics course delivered to students in the Chemistry Faculty of Moscow University: Mechanics, Electricity, Oscillations and Waves, and Optics. When presenting the material, the authors highlight the definitions of the concepts and formulations of laws. In the sections 'Oscillations and Waves' and 'Optics,' a unified approach to mechanical and electromagnetic oscillatory and wave processes is consistently implemented. Special attention is paid to issues of the greatest interest to future chemists, in particular, molecular vibrations and optical phenomena employed in modern experimental research methods (refractometry, spectroscopy, polarization methods, and others). The book is intended for students of chemical departments of universities and may also be useful for a wide range of students in chemical and physical specialties of institutes with a natural sciences profile. (MSU Publishing House: e-mail: info@msupress.com, URL: https://msupress.com/)

Uspekhi Fizicheskikh Nauk **193** (9) 1021–1022 (2023)
Translated by A N Tsaplin

Ledentsov L S, Somov B V *Lectures on Plasma Astrophysics*: *Classical Foundations of the Theory*. (Classical university textbook) (On the 270th anniversary of MSU. Physics). (Moscow: MSU Publishing House, 2023) 424 pp. ISBN 978-5-19-011830-8.

This book contains a lecture course on the classical foundations of plasma astrophysics, a fundamental science studying primarily electromagnetic processes and phenomena in cosmic plasma. The lectures demonstrate common features and fundamental differences in the plasma properties caused by electromagnetic and gravitational interactions. The idea of this lecture course is atypical for most textbooks on plasma astrophysics. It presents a consistent consideration of physical principles, starting with the most general and most accurate, and simplifying assumptions that make it possible to find simple ways to describe plasma under astrophysical conditions. On the way from general to specific, the textbook everywhere specially outlines the boundaries of the applicability area of the next, simpler approximation from the physical viewpoint and from the viewpoint of its possible applications. (MSU Publishing House: e-mail: info@msupress.com, URL: https://msupress.com/)

Semenov V E, Dorozhkina D S *Lectures on Statistical Physics and Thermodynamics with Examples and Problems*. 2nd edition (Dolgoprudnyi: Intellekt, 2023) 248 pp. ISBN 978-5-91559-311-3.

This textbook is based on the lecture course Statistical Physics and Thermodynamics which is being delivered at the department, Higher School of General and Applied Physics of the National Research Nizhny Novgorod N I Lobachevsky State University. Special attention is paid to the axiomatic construction of theoretical thermodynamics and statistical physics, based on a comparison of mathematically formalized and intuitive approaches to provisions in the theory. A large number of examples and problems with answers are given. For some problems, solutions are given to supplement the theoretical sections. Two chapters are added in the second edition. One is devoted to methodology for calculating fluctuations in simple systems, the other, to a thermodynamic description of multicomponent systems based on the concept of chemical potential. The textbook is addressed to students and postgraduates in physical studies and specialties. (Publishing House Intellect: e-mail: solo@id-intellect.ru, URL: http://www.id-intellect.ru/)

Yunakovsky A D *Basic Elements of Computational Methods for Physicists. From Traditional to Wavelet Analysis*. (Dolgoprudnyi: Intellekt, 2023) 320 pp. ISBN 978-5-91559-309-0.

Currently, various software packages are widely used, but they cannot be employed completely and effectively without a deep understanding of the numerical methods on which the included programs are based. The main goal of the book is to consider understandable and fairly easy-to-write algorithms, which will primarily be aimed at solving typical problems of theoretical physics and will, of course, be a necessary part of the arsenal of any theoretical physicist. A relatively small number of methods have been selected that have proven themselves in practical work. When describing certain methods, on the one hand, special attention is paid to identifying the range of tasks for which they are most effective and, on the other hand, possible pitfalls are indicated. In practical applications, the problem of speed and efficiency of numerical algorithms arises. The fast Fourier transform and the wavelet transform are considered. The book is intended for a wide range of specialists involved in computer modeling physical processes, as well as for postgraduates and senior university students. (Publishing House Intellect: e-mail: solo@id-intellect.ru, URL: http://www.id-intellect.ru/)

Grines V Z, Gurevich E Ya *Problems of Topological Classification of Multidimensional Morse–Smale Systems* (*Mathematics and Mechanics Series*) (Moscow–Izhevsk: Institute of Computer Science, 2022) 292 pp. ISBN 978-5-4344-0941-4.

Morse–Smale systems are structurally stable (rough) dynamical systems on manifolds with a nonwandering set consisting of a finite number of orbits. The class of rough systems was introduced in the classical work by A A Andronov and L S Pontryagin in 1937, who studied systems of two differential equations given in a limited portion of a plane. The same year, E A Leontovich-Andronova and A G Mayer posed a problem of classifying such systems up to topological equivalence. The class of systems, later called Morse–Smale systems, was introduced on closed manifolds of arbitrary dimension by S Smale, who took as a basis the properties of rough flows on a plane, discovered by Andronov and Pontryagin. To date, very comprehensive results have been obtained on the topological classification of Morse–Smale flows and cascades on manifolds of dimensions not exceeding three. The obtained results for discrete dynamical systems on manifolds of dimensions two and three are presented in the book by V Z Grinez and O V Pochinka, published in 2011 by the publishing house Regular and Chaotic Dynamics. In the last 20 years, significant progress has been made in the study of Morse–Smale systems on manifolds of dimensions four and higher induced by a number of remarkable facts in multidimensional topology. The book is devoted to the presentation of the results obtained in this area. (Publishing house of technical literature Institute of Computer Science: e-mail: mail@rcd.ru, URL: https://shop.rcd.ru/)

Chernous'ko F L, Bolotnik N N *Dynamics of Mobile Systems with Controlled Configuration*. (Moscow: Fizmatlit, 2022) 464 pp. ISBN 978-5-9221-1957-3.

This monograph is devoted to problems of the dynamics and control of motion of mobile robots and other systems capable of moving in different media due to configuration variations. The book is addressed to specialists — researchers and engineers — in theoretical and applied mechanics, robotics, control theory, and biomechanics, and also to students and postgraduates studying the above-mentioned disciplines. (Publishing Fizmatlit: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, http://www.fmllib.ru/)

Georgievsky D V *Models of the Theory of Viscoelasticity*. (Classical MSU Textbook Series) (Moscow: URSS, 2023) 144 pp. ISBN 978-5-9710-3458-2.

This book presents the fundamentals of the theory of defining relations of deformable solid mechanics as applied to linear and nonlinear models of viscoelasticity. Analyzed are the

properties of rheonomic mechanical models that relate stress and deformation in both one-dimensional and three-dimensional cases. The models are different in the degree of complexity and involvement of the mathematical apparatus of the operator theory, integral equations, functional analysis, and computational mechanics. Statements are given and methods for solving boundary problems of viscoelasticity theory are described, such as the Laplace–Carson transformation method, Volterra's principle, Ilyushin approximation method, the method of numerical realization of the Pobedry elastic solution, and others. An approach to the axiomatics of two thermodynamic postulates in phenomenological continuum mechanics is proposed. The material is arranged in the form of twenty separate lectures. The book will be useful for specialists in deformable solid mechanics, postgraduates, and senior students of mechanics and mathematics departments at classical universities. (URSS publishing group: e-mail: urss@URSS.ru, URL: https://urss.ru/)

Gazaryan K G, Tarantul V Z *Genome of Eukaryotes*: *Molecular Organization and Expression*. 2nd edition, suppl. (Moscow: URSS, 2023) 320 pp. ISBN 978-5-9710-6407-7.

This monograph analyzes and summarizes the achievement of molecular biology and molecular and biochemical genetics in the study of genome organization, as well as mechanisms and regularities of its expression in eukaryotes. The structural organization of the genome, the types of nucleotide sequences, and their evolution and function are considered in detail. The characteristics of known structural genes and their primary structure and intragenomic organization are given. The first edition was published in 1983 by MSU publishers. The second edition has been supplemented by a compact but fairly complete presentation of the knowledge gained over the 40 years that have passed since the first edition about such a complex system as genomes of the three kingdoms of the eukaryotic world, unicells, plants, animals, and especially humans. For specialists in molecular biology and genetics. (URSS publishing group: e-mail: urss@URSS.ru, URL: https://urss.ru/)

Krivoshapko S N, Ivanov V N *Encyclopedia of Analytic Surfaces*. Stereotypic publication. (Moscow: URSS, 2023) 560 pp. ISBN 978-5-9710-4889-3.

In the world of scientific and technical literature, practically no books are devoted to a systematic review of the entire variety of surfaces important in various fields of science and technology. This book is the most complete encyclopedia of analytic surfaces. It contains over 500 surfaces of 38 classes, whether widely known and well studied or known only to a narrow circle of specialists. A large number of varieties of surfaces were first proposed by the authors. At the end of the book, there is a subject index and a Russian–English–French–German glossary of surfaces and curves. The book is intended for mathematicians, engineers, architects, builders, and specialists dealing with issues of strength, hydro-aeromechanics, optics, etc. It will be useful to university teachers, schoolteachers, postgraduates, and students. (URSS publishing group: e-mail: urss@URSS.ru, URL: https://urss.ru/)

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