

New books on physics and related sciences

DOI: <https://doi.org/10.3367/UFNe.2021.07.039016>

Shalimova K V *Physics of Semiconductors* 5th ed., stereotyp. (Moscow: URSS, 2021) 400 pp. ISBN 978-5-9710-8260-6.

This textbook, which has already become classical, considers model representations of the electric conductance mechanism, presents the basis of the semiconductor band theory and the lattice oscillation theory, gives statistics on electrons and holes, considers the mechanisms of charge carrier scattering, generation, and recombination of charge carriers, diffusion, and drift of nonequilibrium charge carriers, and describes contact and surface phenomena in semiconductors and their optical and photoelectric properties. Owing to her perennial pedagogical experience, the author deliberately avoids excessive congestion of the material with complicated mathematical calculations preventing students from understanding the physical meaning of the described phenomena and gives a clear and strict reasoning. Klavdiya Vasil'yevna Shalimova is a doctor of physico-mathematical sciences, professor, and specialist in semiconductor physics. Forty-five candidate theses have been defended under her guidance. K V Shalimova's textbook, *Physics of Semiconductors* (first edition Moscow: Energiya, 1971), has been reissued many times and translated into foreign languages. The textbook will be useful to students, postgraduates, and teachers of physical and technical specialties, to engineers and technicians, and to those engaged in semiconductor physics. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: <http://urss.ru/>)

Kolachevsky N N *Magnetic Noises* 2nd ed. (Moscow: URSS, 2022) 136 pp. ISBN 978-5-9710-9145-5.

This book, first published in 1971 by Nauka publishers, was the first monograph devoted to fluctuations in ferromagnetic cores upon cyclic magnetization reversal. The book presents a review of theoretical and experimental magnetic noise studies by Russian and foreign authors. The continuously increasing interest in the study of magnetization fluctuations in ferromagnets is first of all due to the fact that the analysis of the physical mechanism of fluctuations provides additional information on magnetization and magnetization reversal dynamics. The second aspect of this interest concerns applications. The application of ferromagnets in engineering is increasingly widening, and a specimen is frequently handled under conditions where, under repeated magnetization reversal, it must very accurately preserve its properties (magnetic amplifiers, ferroprobes, parametrons, and some SHF systems), and in these cases, magnetization fluctuations

impose restrictions on the application of systems with ferromagnetic cores. The book is recommended to scientists and technicians working in instrument engineering and instrumentation, and also to students and postgraduates studying the physics of magnetic phenomena. Nikolai Nikolaevich Kolachevsky is a doctor of physico-mathematical sciences and professor, and taught for 60 years at the Moscow Institute of Physics and Technology, where he was in close contact with S M Rytov in the Department of Radio Physics. He delivered a lecture course in statistical radio physics. N N Kolachevsky's studies are devoted to the physics of magnetic materials and to magnetization and magnetization reversal processes, fluctuation processes, and magnetic noises. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: <http://urss.ru/>)

Shved G M *Introduction to the Dynamics and Energetics of the Atmosphere* (St. Petersburg: Publishing House of St. Petersburg University, 2020) 396 pp. ISBN 978-5-288-06029-8.

The book presents basic information on all types of atmospheric motion at all altitudes, including turbulence, nonuniformly scaled convective motions, macrovortices, planetary jets, tropic oscillations, and mesoscale and global waves and the circulation systems formed by these waves. Energy transformation and transport of angular momentum of the atmosphere, consequences of all these processes, as well as heat balance in the atmosphere are considered. Processes in Earth's atmosphere are compared with those in atmospheres of other planets. The book is based on the lectures on dynamics and energetics of the atmosphere the author delivered for many years at the Physical Department of St. Petersburg State University to students in the Department of Atmosphere Physics. The book will be useful to students and postgraduates specializing in meteorology, physics, and the chemistry of the atmosphere, and in other sciences related to the study of the surrounding medium, and to researchers engaged in the above-mentioned fields. (Publishing House of St. Petersburg State University: tel. +7 (812) 328-44-22, e-mail: publishing@spbu.ru, URL: <https://publishing.spbu.ru/>)

Syshchenko V V *Electrodynamics for Beginners* (Series University Textbooks and Tutorials.) (Moscow–Izhevsk: Institute for Computer Research, 2020) 356 pp. ISBN 978-5-4344-0878-3.

The textbook is intended for a first acquaintance with electrodynamics in the framework of the course in theoretical physics. It contains a large number of problems and exercises for unsupervised work. For students in the field of physics and teachers. Vladislav Vyacheslavovich Syshchenko is a doctor of physico-mathematical sciences, professor in the Department of Theoretical Physics at Belgorod State

National Research University. (Publishing House of Technical Literature Institute for Computer Research: <http://shop.rcd.ru>, e-mail: subscribe@rcd.ru, tel. +7 (3412) 500-295.)

Zwiebach B *A First Course in String Theory* 3rd ed., revised (Translated from the English language by A V Berkov, K B Alkalaev, ed. I Ya Aref'yeva, V I Sanyuk.) (Moscow: URSS, 2021) 863 pp. ISBN 978-5-9710-8676-5. Translation of the second extended and supplemented English edition: *Zwiebach B A First Course in String Theory* (Cambridge: Cambridge Univ. Press, 2009).

A First Course in String Theory by Barton Zwiebach is unique in the form and style of presentation. It will allow beginning researchers to avoid the sense of despondency and despair that frequently accompany a comprehension of traditional tomes—it is not at all a secret that string theory has a reputation as a fairly sophisticated science. On each page of the book, the author follows his aim to make the theory accessible to any physicist who is eager to extend their knowledge in this field. The book covers practically the whole spectrum of string theory. The material is presented in a closed form, and to understand it, the reader should only possess a sound knowledge of the fundamentals of mechanics and some elements of quantum theory. The author tries to educe the reader's intuition by supplying a formal presentation with plenty of illustrative examples. The monograph reflects the state of the art of the theory. To this end, the second edition includes topical problems, such as ads/cbt compliance, strings on orbifolds, module stabilization, string theory landscape, and others. A brilliant distinctive feature of the book is the large number of exercises—warm-ups (nearly 300) both for practice and requiring thinking and a creative approach. The book will be useful to students, postgraduates, teachers of corresponding disciplines, and also to specialists in theoretical and mathematical physics. Barton Zwiebach is a well-known specialist in string theory, professor of physics at Massachusetts Institute of Technology (USA). B Zwiebach's main achievements refer to string field theory, where he obtained several important results in open string field theory and later developed closed string field theory; he also made a considerable contribution to the study of D-branes with exceptional symmetries and tachyon condensation. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: <http://urss.ru/>)

Blekhman I I *Synchronization in Nature and Engineering* Ed. stereotyp. (Moscow: URSS, 2021) 427 pp. ISBN 978-5-9710-8483-9.

Synchronization is the motion of two or several objects agreed in time, without which many technical systems cannot operate. The most interesting of them, and one not yet finally clarified in nature, is frequency (Huygens) self-synchronization: objects of very different origin produce a mutual rhythm of joint motion despite different individual rhythms and an often quite weak interconnection. Synchronized are a pendulum clock, organ pipes, celestial bodies, electric, electromagnetic, and quantum generators, mechanic vibration excitors in vibratory devices, turbine blades, a community of cells and other elements of living organisms, living organisms themselves in collectives (lightning bugs, birds in

flight, and fish in schools, applauding or marching people). So, synchronization is of a universal character; it is one of the most important cases of self-organization. The trend towards synchronization finds reflection in the property of nonlinear differential equations of a certain form to allow stable periodic solutions. The most striking manifestations of self-synchronization and its different applications are described. A general formulation of problems is given, a working mathematical apparatus is briefly presented (mainly without proof), the key points and results of synchronization theory are described, and some unsolved problems are mentioned. The first edition of the book was published by Nauka publishers in 1981; the second edition (Moscow: URSS, 2015) was greatly supplemented with a brief version of new results, in particular, a general definition of synchronization and corresponding references. The book is intended for a wide range of specialists who face problems related to nonlinear oscillations, in particular, mathematicians, mechanical engineers, physicists, chemists, medical professionals, and biologists. It may be used by postgraduates and students of corresponding specialties. Il'ya Izrailevich Blekhman is a doctor of physico-mathematical sciences and professor, was head of the Joint Laboratory of Vibrational Mechanics of the Institute for Problems in Mechanical Engineering of RAS and NPK Mekhanobr Tekhnika (St. Petersburg), is a specialist in the field of applied mathematics and mechanics, nonlinear oscillation theory, the dynamics of machines and vibration engineering, was a founder of a scientific school in the field of vibration processes and machines, and a laureate of the RF Government Prize, A von Humboldt Prize, Al-Horesmi Prize, and P L Chebyshev Prize. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: <http://urss.ru/>)

Dudareva L V *Biological Effect of Low-Intensity Laser Radiation: Methods of Regulation of Plant Metabolism* (Novosibirsk: Publishing House of SB RAS, 2021) 135 pp. ISBN 978-5-6046078-0-0.

Material illustrating the possibility of applying low-intensity laser radiation to stimulate biological processes in living organisms—in fungi, microorganisms, animals, and humans—is presented in this monograph on the basis of a critical analysis of literature sources and the results of the author's own studies. Particular attention is directed to plants, including seeds and plant tissue culture. Considered are possible He–Ne laser operation mechanisms, of which one may be associated with phytochrome reversion induction to the active form inducing rapid phytohormone balance variation. Results are presented of a study of the influence of low-intensity He–Ne laser radiation on the initiation of callusogenesis and morphogenetic processes in cereal tissue culture, and qualitative and quantitative analysis of irradiation-initiated biochemical variations in cultivated tissues. The book is intended for specialists in biophysics, photobiology, plant biochemistry and physiology, and agrobiolgy; it can as well be used as a tutorial for students and postgraduates in biology departments of higher education institutions. (Publishing House of Siberian Branch of the Russian Academy of Sciences: tel. +7 (383) 330-17-58, e-mail: sprice@sibran.ru, URL: <https://www.sibran.ru/>)

Khurgin Ya I *Yes, No, or Maybe... Tales of Statistical Control and Experiment Theory* (Science for Everyone! Masterpieces of Popular Scientific Literature. Mathematics, no. 223) 3rd ed. (Moscow: URSS, 2021) 207 pp. ISBN 978-5-9710-7941-5.

The book presents an attractive story about statistical control and experiment theory — a scientific discipline at the interface of several sciences: control theory, mathematical statistics, and the theory of experiment. Basic points of control and experiment theory, modern principles of the construction of mathematical models and the processing of observational results, and statistical verification of hypotheses and design of experiments are described and explained in an accessible form using examples of different fields of science and technology, favorite literature stories, and real-life situations. The first edition of the book was published in 1983 by Nauka publishers. Yakov Isaevich Khurgin is a doctor of physico-mathematical sciences. He was a professor at the Gubkin Russian State University of Oil and Gas for more than 40 years. The range of his scientific interests involves pure and applied mathematics in its concrete applications—in radio engineering and radio physics, communication theory and cybernetics, neurophysiology, medicine, geology, geophysics, hydromechanics, exploitation of oil and gas fields, refining, petrochemistry, economics, and other areas of science and engineering. The book is addressed to a wide range of readers with an inquiring mind and interest in applied mathematics. It will also be useful to specialists somehow engaged in experiment, especially in probability theory and its applications (engineers, geologists, chemists, biologists, physicians, and economists). (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: <http://urss.ru/>)

Abramov A I *History of Nuclear Physics* (Science for Everyone! Masterpieces of Popular Scientific Literature. Physics, no. 247) 4th ed., revised (Moscow: URSS, 2021) 232 pp. ISBN 978-5-9710-8438-9.

The history of the development of the concepts of atoms from ancient times to the end of the 20th century is briefly considered. The main focus is on the history of nuclear physics proper, which began with the discovery of radioactive emission by the French physicist Becquerell. The use of theoretical and experimental results in practice in nuclear technologies is shown. The appendices present brief biographic information on outstanding scientists, a chronological list, and a detailed bibliography. The book was conceived as a tutorial for students in courses on nuclear physics and for all readers interested in this subject. From 1952 to 1990, Aleksandr Ivanovich Abramov worked in the city of Obninsk at the Institute for Nuclear Power Engineering, holding positions from senior laboratory assistant to head of laboratory. Since 1990, he has been a professor in the Department of Nuclear Physics at Obninsk State Technical University for Nuclear Power Engineering. (URSS Publishing Group: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: <http://urss.ru/>)

Pinevich A V, Sirotkin A K, Gavrilova O V, Potekhin A A *Virology*. Textbook. 2nd ed. suppl. (Ed. A V Pinevich) (SPb.: Publishing House of St. Petersburg University, 2020) 442 pp. ISBN 978-5-288-06011-3.

The book appears against the background of a critical shortage of Russian manuals—and a complete lack of translated materials—on virology. Viruses are represented here not only as agents of disease, but also as a global component of biological variety playing a great role in biocenoses and taking a key place in organic evolution. The textbook contains two sections: the section on general virology (Ch. 1) contains: (1) a history of the discovery and investigation of viruses; (2) a conceptual explanation of the nature of viruses; (3) the morphology and composition of viral particles; (4) the ontogenesis of viruses; (5) types of viral infections and natural protection from them; (6) systematics of viruses; (7) ecological meaning, origin, and evolution of viruses. The section on special virology (Chs 2–6) provides insight into the variety of viruses; along with traditional subjects of virology (bacteriophages, viruses of higher plants and animals), viruses of archaea, protists, fungi, and algae are described for the first time in a textbook. The textbook is intended for students, postgraduates, and teachers. It may also be of use for researchers in different fields of biology and other natural sciences eager to extend and organize their knowledge in virology. (Publishing House of St. Petersburg State University: tel. +7 (812) 328-44-22, e-mail: publishing@spbu.ru, URL: <https://publishing.spbu.ru/>)

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