

## New books on physics and related sciences: October 2023

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**Akaev A A, Sadovnichii V A** *Mathematical Models for the Prognosis of the Great Digital Era of the Development of Global Economics (2020–2050)*. (Works by outstanding scientists from MSU) (Moscow: Publishing House of Moscow University, 2023) 675 pp. ISBN 978-5-19-011746-2.

The book is published in accordance with the publishing program dedicated to the 270th anniversary of Moscow University. The mathematical foundations of the upcoming digital economy (2020–2050), representing the sixth Kondratiev Long Cycle (KLC) in the development of the world economy, are systematically presented for the first time. The first part of the book is devoted to the analysis of Schumpeter–Kondratiev innovative-cyclical theory of long-term economic development, optimal for the prognosis of nonequilibrium and unstable economic development. The mathematical models are presented to describe and calculate the trend trajectory of economic development within one KLC. Also presented is the nonlinear model of macroeconomic dynamics, which allows for the interaction between trend and cyclic fluctuations and describes this theory most adequately. The second part of the book contains mathematical models that have shown their effectiveness in practice and are intended for the short- and medium-term prognosis of crisis phenomena in the economy: bifurcation points and breakdown into recession. Long-term forecasting models are based on an information model for calculating and forecasting technological progress depending on the speed of information production. It is also shown that in the digital era the main driving force will be symbiosis of the human + intellectual machine (IM), with humans playing the leading role. The third part of the book gives examples of simulation and prognosis of national, regional, and global projects realizable in the digital epoch: the Chinese megaproject Belt and Road Initiative and the Russian project for the expansion and high-speed modernization of the Siberia and Far East railway networks and their influence on the economies of the countries of the Eurasian continent; strategies for innovative breakthroughs in the development of the Russian economy; the revolutionary role of the extensive use of IMs in the digital epoch, and the change from an ascending trend of global demographic dynamics to a descending one. All the above-listed models were worked out by the authors and verified for the fifth informational KLC (1982–2018). The authors of the monograph are academician of RAS Askar Akaevich Akaev and the rector of M V Lomonosov Moscow State University, academician of RAS Viktor Antonovich Sadovnichii. The book is intended for students, postgraduates, and research

workers interested in mathematical simulation and prognosis of the long-term development of nonequilibrium and unstable processes in the world dynamics. (MSU Publishing House, (Publishing House of Moscow University): e-mail: [zakaz@msupress.com](mailto:zakaz@msupress.com), URL: <https://msupress.com/>)

**Balashov V V** *Quantum Collision Theory: Textbook*. 3rd edition, revised (Classical University Textbook) (Moscow: Publishing House of Moscow University, 2023), in press, ISBN 978-5-19-011845-2.

The book is published in accordance with the publishing program dedicated to the 270th anniversary of Moscow University. The book presents the methods of stationary and nonstationary nonrelativistic collision theory and serves for gaining skills for their practical application to problems in modern physics. Particularly emphasized are the methods and notions used in collision theory involving compound systems. The material is divided into lectures; at the end of each lecture, exercises are given, chosen so that students, if mastering the material consistently, can do them on their own. The book will also be useful for postgraduate students and research workers specializing in atomic, nuclear, and particle physics. (MSU Publishing House (Publishing House of Moscow University): e-mail: [zakaz@msupress.com](mailto:zakaz@msupress.com), URL: <https://msupress.com/>)

**Pyt'ev Yu P, Shishmarev I A** *Probability Theory, Mathematical Statistics, and Elements of the Theory of Possibilities for Physicists*. 2nd edition, rev. and suppl. (Classical University Textbook) (Moscow: Publishing House, 2023) 410 pp. ISBN 978-5-19-011846-9.

This book is published in accordance with the publishing program dedicated to the 270th anniversary of Moscow University. It consists of three parts. The first presents all sections of probability theory for specialists in physics and mathematics. The limiting theorems of probability theory and the theory of random processes important for physical applications are considered in more detail. The second part presents the main sections of mathematical statistics and considers its applications in the theory of measuring and computing converters as a means of physical measurements and in the theory of statistical decisions. In the third part, the elements of the theory of possibilities are considered as an alternative theory of probability of the model of randomness, which allows empirically restoring mathematical models of objects, including stochastic ones, the probabilistic models of which cannot be built empirically. Considered are applications of the theory of possibilities in problems of decision optimization, analysis and interpretation of measuring experiments, etc. This book is addressed to students of physics and mathematics departments of universities. (MSU

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e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

**Efimova A I, Zaitsev V B, Kazantsev D V, Boldyrev N Yu** *Modern Infrared Spectroscopy: Fundamentals, Methods, Instrumentation. Textbook for Institutes.* (St. Petersburg: Lan, 2023) 356 pp. ISBN 978-5-507-45721-2.

The textbook is intended for undergraduate and postgraduate students majoring in physics or chemistry in classical universities, as well as a wide range of specialists using modern optical spectral equipment in the study of solid-state low-dimensional structures. It is recommended by the Federal Educational and Methodological Association in the higher education system for the enlarged group of specialties and areas of training, ‘Physics and Astronomy,’ as a textbook for students in basic educational programs of higher education in the physics training area at the bachelor’s and master’s levels and for specialists in fundamental and applied physics (LLC Publishing House Lan: e-mail: [lan@lanbook.ru](mailto:lan@lanbook.ru), URL: <https://lanbook.com/>)

**Belousov Yu I, Postnikov E S** *Infrared Photonics: Textbook for Higher Schools.* 2nd edition, reprinted from original (St. Petersburg: Lan, 2023) 340 pp. ISBN 978-5-507-46496-8.

The main task of the manual is to serve as a liaison between developers of infrared (IR) remote sensing devices and direct users of these devices who identify the meaning of semantic information from the results of thermal imaging observations in solving specific problems of different levels of complexity in military affairs, medicine, ecological monitoring, and industry. The textbook is intended for master’s student’s at higher technical schools and specialists involved in the use of IR devices for remote monitoring in various fields of their applications (LLC Publishing House Lan: e-mail: [lan@lanbook.ru](mailto:lan@lanbook.ru), URL: <https://lanbook.com/>)

**Vardanyan V A** *Waveguide Photonics. Examples of Computational and Graphic Work. Textbook for High Schools.* (St. Petersburg: Lan, 2023) 92 pp. ISBN 978-5-507-45282-8.

The textbook constitutes theoretical and didactic material for performing computational and graphic work on waveguide photonics, consisting of two sections: linear and nonlinear waveguide photonics. Each section includes four computational and graphic papers. Individual tasks have 36 implementation options. All the tasks are accompanied by theoretical material and methodological recommendations for calculations, which allows students to independently cope with the task, and the knowledge and practical skills acquired during the execution of the work create the basis for understanding the physical foundations of both current and promising technological trends in waveguide photonics. The manual can be used in a workshop, since the calculations given in the work are applicable to consolidate the theoretical material covered in practical classes. The textbook assumes students’ basic knowledge of physical and quantum optics, the physical foundations of optical communications, and constructing optical telecommunication systems. The textbook meets the current requirements of the Federal State Educational Standards of Higher Education and is intended for training bachelor’s and master’s students in the fields of photonics and optoinformatics and infocommunication

technologies and systems, and can also be useful to students interested in designing integral-optical systems and waveguide optical signaling (LLC Lan Publishers: e-mail: [lan@lanbook.ru](mailto:lan@lanbook.ru), URL: <https://lanbook.com/>)

**Bychkov I V, Gladkochub D P, Ruzhnikov G M** *Fundamentals, Methods, and Technologies of Digital Monitoring and Prognosis of the Ecological Situation in the Baikal Natural Environment.* (integration projects of the SB RAS, issue 48) (Novosibirsk: Publishing House of SB RAS, 2022) 345 pp. ISBN 978-5-6047889-4-3.

The collective monograph is based on the authors’ experience in the development and application of methods and technologies for integrated environmental monitoring of the Baikal natural territory based on digital platforms that provide collection, storage, processing, and analysis of large arrays of various spatio-temporal data, as well as for a complex of mathematical and information models, services, and machine learning methods. The research was carried out in six branches: the formation of a digital platform for ecological monitoring and prognosis, monitoring of extreme natural phenomena and anthropogenic emissions in the atmosphere, monitoring of hydrological regimes of water bodies, assessment of environmental risks of the state of vegetation, monitoring of extreme geological and ecologo-geochemical processes, and medical ecological and epidemiological monitoring. The monograph is intended for a wide range of readers: for specialists in the field of information technology and modeling of ecological systems, for researchers involved in the study of processes in the atmosphere, and in hydrology, biology, ecology, geochemistry, geology, and medicine, as well as for students and postgraduates. (Publishing House of the Siberian Branch of the Russian Academy of Sciences: e-mail: [sprice@sibran.ru](mailto:sprice@sibran.ru), URL: <https://www.sibran.ru/>)

**Lyapina L A, Grigorieva M E, Shubina T A, Obergan T Yu** *Basics of Physiology and Biochemistry of Blood Coagulation: Textbook for Higher Schools.* (Classical University Textbook) (Moscow: Publishing House of Moscow University, 2023) 159 pp. ISBN 978-5-19-011825-4.

The book is published in accordance with the publishing program dedicated to the 270th anniversary of Moscow University. As part of the curriculum, this book gives a basic idea of the main (including classical) physiological concepts and principles used in the study of blood coagulation systems. The application of modern biochemical approaches to solving the problem of physiological regulation of blood coagulation systems makes it possible to understand the mechanism of interrelation between coagulation and anticoagulation processes. The textbook consists of two parts, the first of which covers modern theoretical ideas about the physiological principles of blood coagulation processes in an organism and their interrelation with the function of the anticoagulative system. The second part is devoted to practical application of the obtained theoretical knowledge of hemostasis and includes performance of tasks aimed at the professional activity of students learning primary and plasma hemostasis, humoral agents of anticoagulative blood systems, and the interrelation between the coagulative and insular systems of the organism. This is the most important difference between this textbook and other books on blood coagulation physiology and biochemistry.

The textbook considers the current state of the hemostasis system and acquaints the reader with blood examination methods applied in physiological biochemical laboratories and in medical practice. It is intended for students and teachers in biological and medical institutes, research workers, and physicians. The authors of the book work at the department of human and animal physiology at of the Biological Faculty of M V Lomonosov Moscow State University. (MSU Publishing House (Publishing House of Moscow University) e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

**Zolotov Yu A *Analytical Chemistry at Moscow University.*** (The History of Moscow University) (Moscow: Publishing House of Moscow University, 2023) 239 pp. ISBN 978-5-19-011773-8.

The book is published in accordance with the publishing program dedicated to the 270th anniversary of Moscow University. The main subject is analytical chemistry as a science and an applied chemical analysis at M V Lomonosov Moscow State University. The central place is taken by the Department of Analytical Chemistry at the Chemistry Faculty, its scientific achievements and pedagogical activity, and its people. Research work at other departments and faculties of the university are also considered. Attention is paid to the training of highly qualified personnel and university graduates who have proven themselves in analytical chemistry. The author of the book is Yurii Aleksandrovich Zolotov, academician of RAS, an outstanding scientist in the field of analytical chemistry, and the leader in this area in our country. A list of books in analytical chemistry written by university staff is given, and awards received by the staff are named. (MSU Publishing House (Publishing House of Moscow University): e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

**Yurii Dmitrievich Tsvetkov and his Scientific School.** (Science of Siberia in Faces, compiled by I P Tsvetkova, chief editor V N Parmon) (Novosibirsk: Publishing House of SB RAS, 2023) 220 pp. + 44 pp. ISBN 978-5-6048597-0-4.

The book is a story about the creator of a scientific school of electron paramagnetic resonance (EPR), academician of RAS Yurii Dmitrievich Tsvetkov, a world-famous scientist, a prominent radio spectroscopist, a major specialist in chemical physics, one of the initiators of the development and extensive application of radio spectroscopy, and a laureate of the international E K Zavoisky Prize for an outstanding contribution to the development of EPR and, in particular, for his contribution to the application of pulsed EPR methods for investigation of the structure of disordered systems. This book is a tribute to the memory expressed sincerely by his colleagues, friends, and relatives. It contains reminiscences of those who were not indifferent to this talented scientist and extraordinary person, stories about the life of Yurii Dmitrievich, about his work and achievements in science, which he faithfully loved, about his associates — colleagues and disciples. It contains documents from the Moscow Institute of Physics and Technology and the secondary school of the city of Tver', pages of diaries and letters to relatives from his business trip to England in 1961–1962, selected original articles by Yu D Tsvetkov, a presenta-

tion of the last unread report of October 2, 2018 at the Institute of biochemical physics RAS, 'PELDOR of biologically important spin-labeled molecules,' and photographs from the personal archive of the scientist. The book is intended for a wide range of readers interested in the history of science. (Publishing House of the Siberian Branch of the Russian Academy of Sciences: tel. +7 (383) 330-17-58, e-mail: sprice@sibran.ru, URL: <https://www.sibran.ru/>)

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