Physics – Uspekhi **64** (7) 740 – 742 (2021)

PACS number: 01.30.Tt

New books on physics and related sciences

DOI: https://doi.org/10.3367/UFNe.2021.06.038992

Oganessyan Yu Ts, Penionzhkevich Yu E, Grigoryev V A ***Physics of Heavy Ions and Its Applications*** Textbook (JINR, UNTs-2019-60) (Dubna: JINR, 2021) 363 pp. ISBN 978-5-9530-0547-0.

The textbook is based on lectures delivered by the authors, professors at the National Research Nuclear University MEPhI. The textbook presents specific features of nuclear reactions with heavy ions. Classical research fields involving heavy ions at an energy of up to 100 MeV/nucleon are discussed. Heavy-ion accelerators and current methods of detecting nuclear reaction products and radiation are classified. Selected issues on the use of heavy ions in related areas of science are also given. The textbook is intended for senior students and postgraduates studying nuclear physics. It will also be useful for specialists engaged in experimental nuclear physics. (Publishing department of the Joint Institute for Nuclear Research: e-mail: publish@jinr.ru, URL: http://www.jinr.ru/publish)

Balashov V V, Dolinov V K ***A Course in Quantum Mechanics*** Textbook (A classical textbook at MSU) 3rd edition. (Moscow: URSS, 2021) 280 pp. ISBN 978-5-9710-8362-7.

The textbook covers material from a course on quantum mechanics that the authors delivered to students in the Division of Nuclear Physics at the Physical Faculty of M V Lomonosov Moscow State University. Vsevolod Vyacheslavovich Balashov is a professor at MSU, for over 15 years chief of the Division of Atomic Nucleus Physics and Quantum Theory of Collisions of the Physical Faculty of MSU, and founder of a large school of theoreticians. A distinctive feature of the course of quantum mechanics is an organic relation of the basic elements of teaching: lectures, seminars, and individual work. The exercises given at the end of each lecture are so chosen that, after a successive uptake of material, a student might do each of these without 'prompting'. At the same time, proficiency in solving all the problems concerning a given lecture is a necessary condition for passing to the next lecture. The book is meant for students and physicists already trained in general physics and mathematics within the scope of a general university program. It will also be useful to postgraduates, teachers, and scientific workers. (URSS Publishers: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: http://urss.ru/)

Uspekhi Fizicheskikh Nauk **191** (7) 781 – 782 (2021)
Translated by M V Tsaplina

Kotkin G L, Serbo V G ***Collection of Problems in Classical Mechanics*** 5th edition revised and supplemented (Ser. University textbooks and tutorials) (Moscow: Institute of Computer Sciences, 2021) 404 pp. ISBN 978-5-4344-0917-9.

The collection of problems is intended for students and physicists. The textbook covers material comparable in volume to the books *Mechanics* by L D Landau and E M Lifshitz and *Classical mechanics* by G Goldstein. The fifth edition contains new problems included in the program of the Physical Faculty of Novosibirsk State University, as well as problems added in editions in the Spanish and French languages. The book may also be useful to postgraduates and teachers of physics and mathematics. (Publishing house of technical literature: Institute of Computer Sciences: URL: http://shop.rcd.ru, e-mail: subscribe@rcd.ru, tel. +7(3412) 500-295.)

Acoustic Interactions in Gas Flows (Eds Vs N Emel'yanov, K N Volkova) (Moscow: Fizmatlit, 2020) 592 pp. ISBN 978-5-9221-1890-3).

Interest in creating models and methods of aeroacoustics is due to increasingly stringent requirements regarding the noise made by various industrial facilities. Results of theoretical, numerical, and experimental investigations of acoustic phenomena in gas flows are presented. The models and numerical methods underlying computational acoustics are reviewed. Particular attention is paid to the integral methods of noise computation in a far field and to specific features of numerical realizations of corresponding mathematical models. Recommendations are given for implementing developed approaches and interpreting the obtained information and for the graphical and statistical processing of computational and experimental results. Results of the complex numerical and experimental study of sub- and supersonic turbulent jet flows, as well as acoustic instability of operation in facilities with combustion, are discussed. Turbulence generation and suppression in gas flows under low- and high-frequency acoustic action and the related noise variation, as well as the influence of condensed-phase particles upon the acoustic characteristics of internal gas flows, are examined. The elaborated methods of numerical simulation of gas-dynamic and acoustic problems are tools for solving exploratory and engineering problems, serve as the basis for working out new methods and computational algorithms, and allow estimating the efficiency of some means for lowering jet flow noise. The book is meant for scientists and specialists in liquid and gas mechanics, acoustics, experimental and computational gas dynamics, thermal physics, and aerospace technology, as well as for high school teachers and researchers at scientific research organizations investigating and solving various problems of

gas dynamics and acoustics, senior students, and postgraduates of corresponding specialities. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Matvienko Yu G ***Two-Parameter Fracture Mechanics*** (Moscow: Fizmatlit, 2021) 208 pp. ISBN 978-5-9221-1899-6).

The book presents the main states, models, criteria, and experimental methods of two-parameter elastic and elastoplastic cutaway and cracked body fracture mechanics. Particular attention is given to modern concepts of asymptotical stress, deformation, and motion field in the neighborhood of a crack (cutaway) top. The results are given of a three-dimensional numerical investigation of the parameters of a local deformation restraint in problems of fracture mechanics. Models of two-parameter fracture mechanics are adapted to solving problems of fatigue and dynamical crack extension, evolution of the parameters of fracture mechanics in inhomogeneous fields of residual stress and damages, crack deceleration, and the search for crack trajectory. Formulated and illustrated are the main concepts and methods of deterministic and probability strength calculations according to the criteria of two-parameter fracture mechanics. The book is intended for seniors, masters students, and postgraduates of technical universities, as well as scientists and engineers interested in contemporary problems of the strength and fracture of solids and the safety, durability, and reliability of technical systems. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: http://www.fml.ru/, https://www.fmllib.ru/)

Smilga A V ***Quantum Field Theory for Lunch*** 2nd edition, revised (Moscow: MTsNMO publishers, 2020) 432 p. ISBN 978-5-4439-4124-0.

An attempt is made to explain at a heuristic level what quantum field theory is to (semi) laypeople. The book also describes our understanding today of elementary particle physics and the scientists who formed this area of physics. The book is suited to everybody interested in modern physics. The previous edition appeared in 2019. The author of the book is a theoretical physicist who had long worked at the Institute of Theoretical and Experimental Physics in Moscow. Since 1998, he has been a professor at the University of Nantes, France. (MTsNMO Publishers: tel. +7 (495) 745-80-31; e-mail: biblio@mccme.ru; URL: https://biblio.mccme.ru/)

Akhmedov E T, Gromov A V ***Pictures of Fundamental Physics*** (Quant Library issue 138. Appendix to the journal Quant 1/2020) (Moscow: MTsNMO publishers, 2021) 192 pp. ISBN 978-5-4439-1571-5.

The book is based on the series of popular scientific lectures delivered at the ARHE social-educational center. It consists of three lectures — on the Special Theory of Relativity, the General Theory of Relativity, and quantum mechanics. The principles underlying these theories are discussed. The myths and paradoxes associated with these theories are presented in detail. The presentation is meant for seniors in secondary schools. General theories are supplied with examples of their practical application. The book is intended for seniors in school, entry-level higher-ed students, and teachers of physics. It is included on the long list of the 2021 Prosvetitel' (educator) Prize. (MTsNMO Publishers: tel. +7 (495) 745-80-31; e-mail: biblio@mccme.ru; URL: https://biblio.mccme.ru/)

Lipunov V M ***In the World of Binary Stars*** (Masterpieces of popular scientific literature. Astronomy. Issue 12) (Moscow: URSS, 2021) 253 pp. ISBN 978-5-397-07596-1.

The book presents, in a down-to-earth form, discoveries, ideas, and hypotheses concerning investigations of binary stars. The order of the presentation corresponds to successive stages of the life (evolution) of a binary star. Each stage is described through an example of a particular observed binary system with a vivid history of its discovery and investigation. The essence of the main astrophysical methods for studying binary systems is laid out. Vladimir Mikhailovich Lipunov is a professor at M V Lomonosov Moscow State University, specialist in the field of relativistic astrophysics, and disciple of academician Ya B Zel'dovich. The book is meant for everyone interested in astronomy, including pupils, university students, and teachers. (URSS Publishers: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: http://urss.ru/)

Belokurov V V, Timofeevskaya O D, Khrustalev O A ***Quantum Teleportation. A Miracle that has Come True! The Path from Birth to Application in Real Technologies*** (Masterpieces of popular scientific literature. Physics, issue 249) 2nd edition revised and supplemented. (Moscow: URSS, 2021) 271 pp. ISBN 978-5-9710-8584-3.

The book is devoted to the latest problems in quantum theory: quantum logics, quantum teleportation, and quantum computers. The rapid development of these areas makes quantum mechanics the basis of technologies in the 21st century. This development is impossible without appealing to the essential issues of modern physics. Great attention is devoted to the history of the formation of quantum mechanics, which allows the reader to form an independent opinion about the fundamental problems of the theory and to gain a better insight into contemporary tendencies of the development of quantum technologies. The book is intended for a wide range of readers — students, postgraduates, scientists, and all those interested in the fundamentals of and new advances in quantum mechanics. (URSS Publishers: tel./fax: +7 (499) 724-25-45, e-mail: orders@URSS.ru, URL: http://urss.ru/)

Yakutenko I ***The Virus that Broke the Planet. Why is SARS-CoV-2 so Specific and What Shall We Do with It?*** (Moscow: Alpina non-fiction, 2020) 404 pp. ISBN 978-5-00139-382-5.

What do we know about SARS-CoV-2; why are some people killed by it and others are asymptomatic? We do not know whether the vaccine is harmless and when a remedy will be found, how doctors treat COVID-19 without drugs, and whether it is possible to fight the pathogen without locking down the planet. The book gives answers to these and many other questions. Although the pandemia has not yet ended and scientists are continually obtaining new data on the virus, the fundamental principles presented in the book serve as a framework on which the reader can build new knowledge. The book is written in a very simple language, but without unnecessary simplifications. Relying exclusively on confirmed scientific sources, the author presents the main facts

that have already been clarified concerning coronavirus, namely, how it is arranged, where it arose from, how it affects our body, and what can be done to protect ourselves and society as a whole. The book has been included on the long list of the 2021 Prosvetitel' (educator) Prize. The author is a molecular biologist, graduate of M V Lomonosov Moscow State University, a popularizer of science, the author of several hundred popular scientific papers, and the head of the Department of Science of the journal *Vokrug sveta* (Around the world). (Publishing house *Alpina non-fiction*: tel. + 7 (495) 980-53-54; e-mail: anf@alpina.ru; URL: https://nonfiction.ru/)

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