

New books on physics and related sciences

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Bisnovatyi-Kogan G S *Relativistic Astrophysics and Physical Cosmology* (Moscow: URSS, 2011) 376 pp. ISBN 978-5-396-00276-0.

This monograph presents those problems of relativistic astrophysics and cosmology, which are currently at the center of interest in studying the structure of the observable Universe. The book discusses a number of aspects of the formation of relativistic objects and outlines their properties: white dwarfs, neutron stars, black holes, and relativistic star clusters. The theory of accretion onto relativistic objects and their observable properties are presented. Friedmann solutions are discussed, describing the properties of the hot, homogeneous, expanding Universe, taking into account the cosmological constant and inflation. The results are given of observations of the cosmic microwave background that survived after the primary explosion, and of the analysis of the fluctuations observed, which made it possible to draw the conclusion about the dominance of dark energy and dark matter in the modern era. The book discusses baryogenesis and nucleosynthesis, gravitational instability, and the formation of the large-scale structure of the Universe, as well as the properties of various material components of the modern Universe. The book is intended for experts in physics and astrophysics, and for a wide circle of readers wishing to learn more about the structure of the surrounding world. (URSS Publ. Group: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the Institute of Systems Analysis of the RAS; tel./fax +7 (499) 135-44-23; e-mail: urss@URSS.ru; URL: http://urss.ru/)

Bochkarev M N, Vitukhnovskii A G, Katkova M A *Organic Light-Emitting Diodes (OLED)* (N. Novgorod: Dekom, 2011) 360 pp.

The monograph is devoted to organic light-emitting diodes (OLEDs)—that is, devices converting electrical energy into light. The physical processes are outlined that occur in organic semiconducting materials when electric current flows through them. The basic types of devices, methods of their manufacture, operating principles, performance characteristics, and advantages and disadvantages are given. Considerable attention is paid to functional materials utilized for the construction of OLEDs. The book provides insight into the current and potential implications of the devices and circuits based on organic light-emitting diodes. It is intended for students and postgraduates in physical, chemical, and technological majors, as well as for practising engineers, research workers, and professionals working in the

field of LED production and in the research and manufacture of special purpose materials.

(Dekom Publ.: 603000 Nizhny Novgorod, ul. M Gor'kogo 107; tel./fax (7-831) 428-54-74; e-mail: izdat@dekom.nnov.ru; URL: http://dekom.nnov.ru/)

Aleshkevich V A, Dedenko L G, Karavaev V A *General Physics Course: Mechanics* (Ed. V A Aleshkevich) (Moscow: Fizmatlit, 2011) 472 pp. ISBN 978-5-9221-1271-0.

This textbook is the first part of the series 'University Course of General Physics', intended for students of physics orientation in higher education. This course is specific in that it realizes a multilevel concept of presentation of the most important experimental facts and foundations of the theory of physical phenomena in the light of modern scientific achievements. The textbook includes the following sections: kinematics and dynamics, the basics of relativistic mechanics, solid state mechanics, mechanics of continua, and oscillations and waves. The book is intended for university students specializing in physics. Reviewed by Professor S F Borisov (Chair of General and Molecular Physics of Ural State University) and Professor A V Aganov (Chair of General Physics of Kazan State University). (Publishing company 'Fiziko-Matematicheskaya Literatura' MAIK 'Nauka/Interperiodika': 117997 Moscow, ul. Profsoyuznaya 90; tel. (7-495) 334-74-21; fax: (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: http://www.fml.ru/)

Voronov V K, Podoplelov A V, Sagdeev R Z *Physical Foundations of Nanotechnologies* ('Physics on the Verge of New Millenia' series) (Moscow: URSS, 2011) 432 pp. ISBN 978-5-397-01660-5.

This tutorial describes the physical foundations of nanotechnologies. The book consists of three relatively independent parts. Part I is concerned with physical phenomena and laws describing them, and propositions dealing with the plasma state of matter. Another field of principal importance for the development of nanotechnologies is also included in the textbook—the physics of the condensed state of matter in nanoscale volumes of space. What this means is nanostructures as such and nanostructures incorporated into macroscopic specimens, primarily at the surface of solids. The seminal ideas ruling the physics of micro- and nanoworld of solid and liquid material objects are reflected in Part II of the textbook. Part III presents new theoretical and experimental methods for studying many-electron systems. The textbook was written on the basis of the material selected from review articles published in the journal *Uspekhi Fizicheskikh Nauk (Physics–Uspekhi)*. References are listed at the end of each part. In many cases, the lists cite those publications whose material has not been

included at all or, if included, then in very small amounts. The authors' reasoning behind this was that the reader must first acquire knowledge about an overall picture of the discussed branch of physics. The most natural approach to composing such a picture appears to be building it up from a specific publication (or publications). At the next stage, the reader can become acquainted with the relevant section of knowledge at a deeper level that includes considerations of a problematic nature. For example, the first section of Chapter 1 of Part III of the textbook was written on the basis of the review by Yu A Izyumov and E Z Kurmaev, "Materials with strong electron correlations" (see the bibliography for Part III). In the authors' opinion, the material presented in this review article allows its adaptation to the requirements of those readers (primarily students, undergraduates, and postgraduates) who are unfamiliar with the physics of strongly correlated Fermi systems. It is obvious, nevertheless, that in-depth understanding of the structure and behavior of such systems requires reading other sources, too. In this sense, the authors of the textbook consider it very advisable to work through the review paper "Universal behavior of strongly correlated Fermi systems" (by V R Shaginyan, M Ya Amusia, K G Popov) (see bibliography for Part III). The book is intended for senior-year students majoring in fields that train future engineering and technical staff of industrial facilities. It can also be used for other specializations in university education in natural science and technologies requiring courses on the physical phenomena in the material world at the nano- and micro-scales; it will be useful to teachers of the relevant subjects, as well as to anyone who is keen on physics and is interested in its current frontiers. (URSS Publ. Group: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the Institute of Systems Analysis of the RAS; tel./fax +7 (499) 135-44-23; e-mail: urss@URSS.ru; URL: <http://urss.ru/>)

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