

New books on physics and related sciences

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Ginzburg V L *On Superconductivity and Superfluidity. Autobiography. Papers and Public Lectures* (Moscow: Izd-vo Fiziko-Matematicheskoi Literatury, 2006) 228 pp. ISBN 5-94052-107-X.

A collection by Academician V L Ginzburg, one of the laureates of the Nobel Prize in Physics 2003 for their “pioneering contributions to the theory of superconductors and superfluids”, includes the author’s Nobel Lecture delivered in Stockholm on 8 December 2003, a selection of papers reflecting his work in the field of superconductivity and superfluidity, and his basic seminal team-work with L D Landau, titled “On the theory of superconductivity” (1950). Two concluding papers, the “Nobel autobiography” (written at the request of the Nobel Foundation Directory) and “An attempt at a scientific autobiography”, also give an idea of Ginzburg’s research activity in other fields of physics. The book is intended for physicists — whether high school and higher education faculty, undergraduate and graduate college students, or research workers — as well as for historians of science. The edition was supported by the Theoretical Physics Division of the P N Lebedev Physics Institute. (Fiziko-Matematicheskaya Literatura Publ.: 119071 Moscow, Leninskii prosp. 15; tel. (7-495) 952-49-25; fax (7-495) 955-03-30; e-mail: fizmatlit@mtu-net.ru; URL: <http://www.fizmatlit.narod.ru/>)

Rubakov V A *Classical Gauge Fields: Bosonic Theories* A textbook. 2nd ed. revised and enlarged (Moscow: Editorial URSS, 2005) 296 pp. ISBN 5-484-00139-0.

This book is based on a lecture course delivered to third- and fourth-year undergraduate students majoring in theoretical physics at the Physics Department of Moscow State University. The first part of the book explains the basic ideas of the theory of gauge fields, examines the construction of gauge-invariant Lagrangians, and describes the spectra of linear excitations, including those above a nontrivial ground state. The second part is concerned with the construction and interpretation of solutions — such as solitons, ‘Euclidean bubbles’, instantons, and sphalerons — which totally depend on nonlinearity of field equations for their existence. The book’s material can be studied in parallel with quantum mechanics and, subsequently, quantum field theory, making the book useful for research workers and postgraduate students, as well as for senior university undergraduates. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the RAS Institute for Systems Analysis; tel./fax (7-495) 135-44-23, 135-42-16; e-mail: urss@urss.ru; URL: <http://www.urss.ru/>)

Rubakov V A *Classical Gauge Fields: Fermion Theories. Noncommutative Theories* A textbook. 2nd ed. revised and enlarged (Moscow: Editorial URSS, 2005) 240 pp. ISBN 5-484-00140-4.

This book is based on a lecture course delivered to third- and fourth-year undergraduate students majoring in theoretical physics at the Physics Department of Moscow State University. The first part of the book discusses a variety of effects due to the interaction of fermions with topological objects arising in scalar and gauge field theories — solitons, instantons, and sphalerons. The second part covers less traditional topics such as classical field theories on non-commutative spaces and solitons that arise in such theories. In the Appendix to the book, the role of instantons as the saddle points of the Euclidean functional integral in quantum field theory is discussed and some related questions are explored. The book’s material can be studied in parallel with quantum mechanics and, subsequently, quantum field theory, making the book useful for research workers and postgraduate students, as well as for senior university undergraduates. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 at the RAS Institute for Systems Analysis; tel./fax (7-495) 135-44-23, 135-42-16; e-mail: urss@urss.ru; URL: <http://www.urss.ru/>)

Krasnopevtsev E A *Mathematical Methods of Physics: Selected Topics* A textbook (Novosibirsk: Izd-vo NGTU, 2003) 244 pp. ISBN 5-7782-0357-8.

Topics in this book comprise the Fourier transform method; concept of generalized functions (Dirac delta, Heaviside, rectangle, signum and comb functions); methods for solving homogeneous differential equations of the hypergeometric type; basic special functions; Green’s function method, and second-order partial differential equations. The book also presents examples of problem solutions and features problems that can be used for self-tuition. The concise presentation of basic reference material, combined with the simplicity in explaining the whys and hows of the subject matter, makes the book appealing to students beginning to embark on a study of quantum mechanics, statistical physics, and theoretical optics. (Novosibirsk State Technical University Publishing–Printing Complex: 630092, Novosibirsk, prosp. K. Marksa 20; tel./fax (7-3832) 46-31-87; e-mail: office@publish.nstu.ru; URL: <http://www.publish.nstu.ru/>)

Babetskii V I *Applied Physics: Mechanics, and Electromagnetism* A higher educational institution textbook (Moscow: Vysshaya Shkola, 2005) 328 pp. ISBN 5-06-004764-4.

This book provides an easy-to-read introduction to the basic concepts and laws of physics and illustrates their application to practical problem solving. Although designed for students in higher technical education, the book can also be of interest and value to nontechnical students taking a general physics

course. (Vysshaya Shkola Publ.: 127994 Moscow, ul. Neglinnaya 29/14; tel. (7-495) 200-33-70; fax (7-495) 200-03-01; e-mail: info@v-shkola.ru; URL: <http://www.v-shkola.ru/>)

Kravchenko A F *History of Science and Technology* (Novosibirsk: Izd-vo SO RAN, 2005) 435 pp. ISBN 5-7692-0800-7.

The history of the mutual development of science and technology is traced from the earliest times to the present, with an emphasis on natural sciences and, especially, physics and electronics. Along with analyzing fundamental scientific discoveries and major technological advances, the book provides detailed accounts of the life and career of outstanding naturalists and scientists whose work has shaped the progress of humankind. Other topics addressed include the current thinking on the evolution of the Universe and of cosmic bodies; the biological view of the World; theories of the origin of life on Earth, and the origin of humans. The book will be useful and interesting for a wide range of young readers with an interest in the history of science and technology. (RAS SB Publ.: 630090, Novosibirsk, P.O.Box 187, Morskoi prosp. 2; tel. (7-3832) 30-84-66; fax (7-3832) 33-37-55; URL: <http://www-psb.ad-sbras.nsc.ru/>)

Fut'ko S I, Zhdanov S A *Chemistry of the Filtration Combustion of Gases* (Minsk: Bel. Navuka, 2004) 319 pp. ISBN 985-08-0611-7. Bibliography: 305 refs.

The new field of filtration gas combustion (FGC) is introduced. Chemical transformations occurring in FGC processes are detailed, and how the basic characteristics of filtration combustion are influenced by kinetic factors is examined — an important aspect for the design and operation optimization of a wide variety of apparatuses: from industrial waste burners to the targeted conversion of fuel to products based on energy-efficient and environmentally friendly processes. The book is the first to systematize and summarize chemical structure information on filtration combustion waves in depleted and enriched mixtures. Its detailed coverage includes nitrogen oxide formation, the way the macrocharacteristics of combustion waves depend on the kinetic properties of a mixture, the intensifying effect of turbulence, and the potential for achieving the efficiency limit of the regenerative thermodynamic cycle in FGC waves. Special attention is given to using filtration combustion in a variety of practical technological innovations, such as the thermochemical conversion of hydrocarbons into synthesis gas; radiative filtration heaters; methods for cleaning porous media from organic impurities; efficient urban waste utilization systems, and so forth. The book is intended for a wide range of research workers, engineers, and faculties in combustion, chemical technology, heat and mass transfer, heat power engineering, and related fields. It also benefits heat power engineering, thermal physics, and chemistry technology students taking a special course on the theory and practice of filtration combustion. (For orders and enquires communicate with s.o. through tel./fax (375-17) 284-22-12; e-mail: foutko@itmo.by)

Dirac P A M *Collected Works Vol. IV Gravitation and Cosmology. Recollections and Reflections. Lectures and Papers 1937–1984* ('Classics of Science' Series, Ed.-in-Chief A D Sukhanov; the volume is compiled and edited by A D Sukhanov) (Moscow: Fizmatlit, 2005) 784 pp. ISBN 5-9221-0613-9.

This is the fourth and final volume of the one-of-a-kind complete collection, which ultimately turned out to be the world's first, of the scientific works, lecture courses, recollections, and public lectures of one of the 20th century's greatest physicists. It should be noted that *The Collected Works of P A M Dirac, 1924–1948* (Cambridge, 1995, Ed. R H Dalitz) covers Dirac's published work up to 1949, leaving out about two thirds (i.e., more than a hundred) of his works, many of which are of fundamental significance and pioneer new directions for the theoretical and mathematical physics in the second half of the 20th century. The idea for a Russian edition was conceived back in the latter half of the 1980s, immediately following the death of Dirac in 1984. Crucially involved in getting the project off the ground were B V Medvedev and Ya A Smorodinskii, each both a noted theoretical physicist and a physical science historian. The two started selecting and preparing material for the academic edition but because of the financial problems the country and, in great particular, its science encountered at the time, nothing more than two collections of Dirac's works and a collection of review papers on his work were produced. It is only now that the project has finally materialized — thanks to support from the Russian Foundation for Basic Research and due to enthusiastic involvement of A D Sukhanov, B V Medvedev's student and the edition's editor-in-chief and compiler. Prepared as it is by professional theorists, the book arranges Dirac's work both chronologically and thematically — a researcher-oriented approach which makes the required information easier to find. Thus, the first volume, *Quantum Theory (monographs and lectures)*, contains Dirac's most famous monographs *The Principles of Quantum Mechanics* and *Spinors in Hilbert Space*, as well as his Nobel lecture, his *Lectures on Quantum Mechanics*, *Lectures on Quantum Field Theory*, and the lectures he delivered at the International Enrico Fermi School of Physics. This volume is quite suitable for undergraduate students beginning the study of quantum mechanics. The works collected in the second volume, *Quantum Theory (scientific papers 1924–1927)*, represent the period which is widely — and justly — regarded as the golden age of the scientist. It is these works which laid a firm foundation for the science of quantum physics. Papers numbered 8, 26, and 28, which are Dirac's milestone achievements of that period, are marked with a special feature, a facsimile image of the first page of the original. The same approach is used in all the other volumes as well. In Volume 3, *Quantum Theory (scientific papers 1948–1984)*, singled out in this way are three papers from the late 1940s, Dirac's 'silver age period' — to quote A D Sukhanov — which witnessed "a concentrated burst of creative activity" on the part of Dirac. Those papers pioneered the concept of a string and generalized Hamiltonian dynamics to describe constrained systems, including non-Abelian gauge theories. Although these papers have already played their heuristic role in the development of the Standard Model in the physics of particles and fields, the potential the author imparted to them is far from being exhausted. Volume IV, focusing primarily on Dirac's work on gravitation and cosmology, brings together for the first time thirty five of Dirac's papers which collectively aim to develop a formalism capable of optimally combining the requirements of Hamiltonian dynamics and relativity theory — thus nearing the solution of quantum gravitation problems. This theme was to become Dirac's swan song. The volume opens with a lecture series "Quantum Mechanics and Relativistic Field Theory" Dirac

delivered at the Tata Institute of Fundamental Research in Bombay, India, in early 1955. The lectures were transcribed by K K Gupta and E Sudarshan and have been archived as a mimeographed copy before becoming available to the Fizmatlit editorial board thanks to Anjan Kundu, an alumnus of the Russian People's Friendship University's Theoretical Physics Department and currently head of the Theoretical Physics Department at the Saha Institute in Calcutta, India. The first part of the lecture series provides a remarkably concise and comprehensive introduction to the fundamentals of quantum mechanics and gives the most detailed presentation known of the Hamiltonian dynamics of constrained fields. The formalism developed here is then applied to the theory of gravitation, which is the subject of the lectures on the theory of general relativity that follow. The lectures offer the reader an insight into the evolution of Dirac's cosmological thinking and the development of Hamiltonian formalism in the theory of gravitation. Given the ever-increasing importance of cosmological problems in recent years, it is hoped that the first complete works edition of the great physicist will be a source of inspiration for many today. It is indeed hoped that Dirac's works will also be a catalyst for the rebirth of physical science in Russia.

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