

New books on physics and related sciences

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Dirac P A M *Collected Treatises* Vol. 2 *Quantum Theory (scientific papers 1924–1947)* (Moscow: Fizmatlit, 2003) 848 pp. ISBN 5-9221-0381-4.

The publication of the *Collected Treatises* by the Nobel Laureate P A M Dirac — one of the creators of quantum mechanics and quantum field theory (including its gauge-invariant formulation) — is being undertaken for the first time. The second volume contains Dirac's 1924–1947 quantum theory papers which were of vital importance in the formation of nonrelativistic quantum mechanics, quantum field theory, and elementary particle theory. The book is intended for undergraduate and postgraduate students, teachers, and research workers (physicists, mathematicians, and science historians). (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Profsoyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

Fock V A *Fundamentals of Quantum Mechanics* (Izhevsk: RKhD, 2003) 376 pp. ISBN 5-93972-247-4.

Written by a renowned theoretical physicist, this book is an original systematic course in quantum mechanics. A good few of the book's chapters bear the stamp of the scientific creativity of the author himself, a great contributor to the construction and development of quantum theory. For the present (reprint) edition, the author has revised and greatly extended the book's content by introducing the results of his latest work on quantum mechanics. Extended discussion is given to the epistemological foundations of quantum mechanics, in particular, a number of subsections are added to consider concrete issues that deepen the understanding of the theory. A chapter on Pauli theory is added, as is a chapter focusing on the solution of multielectron problems with application to the theory of the atom. (Research and Publishing Center 'Regular and Chaotic Dynamics': 426034 Izhevsk, ul. Universitetskaya 1, UdSU, RKhD; tel./fax (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://www.rcd.ru/>)

Khrustalev A V *Principles of Modern Mechanics and the Wave Properties of Particles* (Moscow: MATI–RGTU im. K É Tsiolkovskii, 2001) 168 pp. ISBN 5-93271-045-4.

The manual consists of two parts. Part 1 concentrates on the basic physical ideas and principles underlying current

mechanical conceptions of classical mechanics, special theory of relativity (STR), and quantum mechanics, and shows that the dualistic approach to consideration of the motion of objects, with both the corpuscular and wave aspects of motion taken into account, is playing an increasing role. Part 2 introduces a methodologically new wave approach to STR, which takes into account the presence of wave properties in moving particles. For senior students of physics, postgraduate students, and college and university teachers of physics disciplines. (Internet shop 'Fizmatkniga': URL: <http://www.fizmatkniga.ru/catalog>)

Zelevinskii V G *Lectures in Quantum Mechanics* (Novosibirsk: Izd. NGU, 2002) 499 pp. ISBN 5-94087-021-X.

This textbook is an extended exposition of a set of lectures in quantum mechanics the author has delivered at the Physics Department of Novosibirsk State University. Unlike standard college and university courses, the textbook covers the fundamentals of radiation theory and relativistic wave mechanics and gives a feeling of how diverse the ideas and methods of quantum theory are. Examples of practical application mostly refer to atomic and nuclear physics. A large number of problems with solutions are included directly in the text of the lectures. The exposition of the material starts from the very basics of the subject. The pragmatic orientation of the book makes the language of quantum mechanics clear and familiar, preparing the student to work confidently with the most intricate literature on the topic. (Internet shop 'Fizmatkniga': URL: <http://www.fizmatkniga.ru/catalog/>)

Balashov V V, Dolinov V K *A Course in Quantum Mechanics* (Izhevsk: RKhD, 2001) 336 pp. ISBN 5-93972-077-3.

The textbook covers the material of the first half of the full-year course in quantum mechanics given to students following the standard programme at the Nuclear Physics Department of the MSU Physics Faculty. The book is distinctive in that all the basic aspects of education — lectures, seminars, and personal study — are logically connected. At the end of each lecture exercises are presented, which are selected such that the student can solve each of them 'without hints'. At the same time, the student must be able to solve all the problems in a given lecture before passing to the next one. (Research and Publishing Center 'Regular and Chaotic Dynamics': 426034 Izhevsk, ul. Universitetskaya 1, UdSU, RKhD; tel./fax (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://www.rcd.ru/>)

Faddeev L D, Yakubovskii O A *Lectures in Quantum Mechanics for Students of Mathematics* (Izhevsk: RKhD, 2001) 256 pp. ISBN 5-93972-035-8

This book is based on lectures given for a number of years to students of mathematics disciplines at the Mathematics and Mechanics Department of Leningrad State University. Because the book is mainly oriented toward a mathematical audience, the general aspects of quantum mechanics and its mathematical apparatus (theory of group representations, quantum scattering theory) are given the most attention. Besides students of mathematics, the book is useful for students specializing in theoretical physics, to whom it will give a new perspective on quantum mechanics. (Research and Publishing Center ‘Regular and Chaotic Dynamics’: 426034 Izhevsk, ul. Universitetskaya 1, UdSU, RKhD; tel./fax (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://www.rcd.ru/>)

Kholevo A S *Probabilistic and Statistical Aspects of Quantum Theory* (Izhevsk: Institute for Computer Studies, 2003) 410 pp. ISBN 5-93972-254-7.

The book covers the fundamentals of quantum mechanics and those of its aspects that heavily rely on probabilistic and statistical ideas. In recent years, much progress has been made in this area, largely stimulated by new applications of quantum theory. Probabilistic interpretation, the hidden parameter problem, quantum-mechanical symmetries, theory of canonical permutation relations and Gaussian states, uncertainty relations, and other fundamental limits on the accuracy of quantum measurements are discussed in an accessible yet rigorous style. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: <http://www.ics.org.ru/>)

Khinchin A Ya *Mathematical Foundations of Statistical Mechanics* (Izhevsk: RKhD, 2003) 128 pp. ISBN 5-93972-273-3.

The author sets as his goal to acquaint the reader with the problem of how a mathematically substantiated statistical mechanics can be derived from the modern concepts of probability theory using the full power of the theory’s analytical apparatus. The mathematician, the book’s primary intended reader, is introduced to the circle of statistical mechanics problems in the atmosphere of clear-cut logic, beyond which the very spirit of such a reader’s science prevents him or her from perceiving and working and which, unfortunately, is almost universally absent in existing texts written on the basis of physical concepts. This is a reprint (original edition was published by OGIZ-GITTL Publ., Moscow–Leningrad in 1943). (Research Publishing Center ‘Regular and Chaotic Dynamics’: 426034 Izhevsk, ul. Universitetskaya 1, UdSU, RCD; tel./fax (7-3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://www.rcd.ru/>)

Sorochenko R L, Gordon M A *Recombination Radio Lines. Physics and Astronomy* (Moscow: Fizmatlit, 2003) 392 pp. ISBN 5-9221-0433-0.

Recombination radio lines (RRLs) produced at radiation transitions between highly excited atomic states were discovered in Russia in 1946 by the methods of radio astronomy. It was found that under space vacuum conditions atoms can occupy Rydberg states with principal quantum numbers ranging up to about 1000 and have

sizes on the order of 0.1 mm, and that the cosmic radiation spectrum contains RRLs over the entire radio wave range. The book summarizes research on RRLs, demonstrating once again the close relation between physics and astronomy. It considers the processes determining the width and intensity of RRLs and discusses the key aspects of the physics of highly excited atoms. The reasons why excited states with the principal quantum number $n \sim 1000$ are limiting ones for atoms in the galaxy are explained. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, ul. Profsoyuznaya 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fizmatlit.ru/>)

Pikovskii A, Rozenblyum M, Kurts Yu *Synchronization: A Fundamental Nonlinear Phenomenon* (Moscow: Tekhnosfera, 2003) 496 pp. ISBN 5-94836-020-2.

The phenomenon of synchronization is widespread in science, nature, engineering, and society. The tendency toward synchronized behavior is observed in systems as diverse as clocks, chirping grasshoppers, cordial pacemakers, neurons generating action potentials, and an applauding audience. These effects are universal and can be explained within a unified approach based on current advances in nonlinear dynamics. Classical results on the synchronization of periodic self-oscillations are presented, as are the latest developments in the study of chaotic systems, large ensembles, and vibrating media. The monograph appeals to a wide audience, from undergraduate students to qualified researchers in physics, applied mathematics, engineering, and the natural sciences. (RITs Tekhnosfera Publ.: Moscow, ul. Tverskaya 10; tel.: (7-095) 234-01-10; fax: (7-095) 956-33-46; e-mail: knigi@technosfera.ru; URL: <http://www.technosfera.ru/>)

Katsnel’son M I, Trefilov A V *Crystal Lattice Dynamics and Thermodynamics* (Moscow: IzdAT, 2002) 384 pp. ISBN 5-86656-127-1.

This monograph contains a rather complete and self-contained exposition of the state of the art in the physics of phonons. It examines the basic methods for studying the crystal lattice dynamics (neutron scattering, Mössbauer effect, optical and acoustical methods) and discusses the thermodynamical and elastic properties of crystals. For the first time in the monographic and educational literature, the theory of anharmonic effects in crystals is systematically presented. General statements are illustrated by examples for real systems, first and foremost for metals. The monograph is intended for research workers — theoreticians and experimenters alike — in condensed state physics as well as for senior undergraduate students and postgraduate students in related disciplines (Atomic Science and Engineering Publishing (IzdAT) of the International Association of Unions ‘Chernobyl’-Atom’: 123182 Moscow, ul. Zhivopisnaya 46; tel.: (7-095) 190-90-97)

Zhuravlev V A *Lectures in the Quantum Theory of Metals* (Izhevsk: Institute for Computer Studies, 2002) 240 pp. ISBN 5-93972-124-9.

This book presents a set of lectures in the electron theory of metals, given to senior undergraduates in physics disciplines.

The course introduces the audience in a natural way to the system of ideas underlying the current quantum theory of metals. Throughout the book, one sees the author striving to be clear in presenting all the derivations and calculations necessary — however, the way the course is conceived, it only aims at a qualitative description of the electronic structure and properties of metals. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: <http://www.ics.org.ru/>)

Maslov V P *Quantization of Thermodynamics and Ultrasecondary Quantization* (Izhevsk: Institute for Computer Studies, 2001) 384 pp. ISBN 5-93972-082-X.

Since the 1938 discovery of superfluidity, the problem of finding a temperature distribution which could produce a nonzero energy at zero temperature should have been addressed. The old thermodynamics stopped any motion. It appears that only with thermodynamics quantized in a manner suggested by the author is it possible to obtain such a distribution in the most general case — as well as to solve a whole series of other old problems. This book will be of interest to both the researchers and undergraduate and postgraduate students. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: <http://www.ics.org.ru/>)

Aminov L K *Theory of Symmetry (lecture notes and problems)* (Izhevsk: Institute for Computer Studies, 2002) 192 pp. ISBN 5-93972-157-5.

This manual is compiled based on the following sources: a lecture course ‘Advanced topics in mathematics’ the author has taught for many years to undergraduate students majoring in theoretical physics; the optional third-year course ‘Theory of symmetry’, and the physics department master’s degree course ‘Advanced topics in mathematics and applications’. The content of the lectures is mainly represented in short synopsis form; a more detailed discussion is given for those themes for which laboratory assignments are performed. Problems in each chapter are solved by students in practical sessions or personal studies. By and large, the manual is designed to help students in their out-of-classroom work with the recommended literature. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@rcd.ru; URL: <http://www.ics.org.ru/>)

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