

New books on physics and related sciences

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Fortov V E *The Equations of State of Matter: From an Ideal Gas to a Quark–Gluon Plasma* (Moscow: Fizmatlit, 2012) 492 pp. ISBN 978-5-9221-1415-8. RFBR Project 12-02-07006.

This monograph presents a comparative analysis of various thermodynamic models of equations of state. Fundamental ideological prerequisites are discussed for theoretical methods and experiments. The focus is concentrated on the description of states holding the greatest interest for high-energy-density physics that have been either established in laboratory conditions, or might be created in the foreseeable future under controlled terrestrial conditions, or are known to exist in astrophysical objects at different stages of their evolution. The author also discusses ultraextreme astrophysics and nuclear physics applications where relativism, powerful gravitational and magnetic fields, the emission of thermal radiation, conversions of nuclear particles, the neutronization of nucleons, and the deconfinement of quarks produce a significant impact on the thermodynamics of matter. The book is intended for a wide range of specialists working on equations of state of matter and high-energy-density physics, as well as for undergraduate and postgraduate students. (Izdatel'stvo Fizmatlit: ul. Profsoyuznaya 90, 117997 Moscow, Russian Federation; tel. +7 (495) 334-74-21; fax +7 (495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Physics of Nuclear Explosions in 5 volumes (Chairs of the Scientific Editorial Board: S F Pertsev, V E Fortov) Vol. 3 *Reproduction of Blast Factors* (Editorial Board: V M Loborev, S F Pertsev, V V Sudakov, V E Fortov, B A Shilobreev) (Moscow: Publ. House 'Literature of physics and mathematics', 2013) 472 pp. ISBN 978-5-94052-219-5.

This monograph has been compiled by the team of authors at the 12th Central Research Institutes of Russian Federation Defense Ministry. It is based on the results achieved by research and development conducted in collaboration with institutes of the Russian Academy of Sciences. Volume 3 describes the most important methods of reproduction in laboratory conditions of the battle-field parameters of nuclear-explosion damaging factors and the parameters of primary effects created in the objects by the action of these factors. As the nuclear explosion cannot be regarded as a source of reproduction of the explosion itself, the problem of creating the acceptable sources (imitators) and justification of the adequacy of imitator-reproduced field parameters and the primary effects of the explosion arose for nuclear explosions. The book is intended for experts, postgraduates, and undergraduate students working in atomic and radio physics, mechanics, solid state physics,

and plasma physics, as well as historians of science. (Izdatel'stvo Fiziko-matematicheskoi Literatury: ul. Shchukinskaya 12, korp. 1, 123184 Moscow, Russian Federation; tel. +7 (499) 720-41-53; e-mail: fizmatlit@narod.ru; URL: <http://fizmatlit.narod.ru/>)

Lyapunov A M *Work on Theoretical Mechanics. From Hand-Written Legacy 1882–1894* (Moscow–Izhevsk: RKhD Publ., 2010) 460 pp. ISBN 978-5-93972-840-9.

This collection contains a number of A M Lyapunov's papers on some problems of theoretical mechanics and fluid dynamics that remained unpublished in his lifetime. They were mostly written between 1882 and 1894—the years when A M Lyapunov's creative life began in Petersburg University, and later, when he was with Kharkov University Department of Mechanics. These manuscripts were never included either in the *Collected Works* or in any other posthumous edition of the works of Lyapunov. The papers analyze, among other subjects, Euler–Poisson equations describing the motion of a heavy solid body around a fixed point in space; the Kirchhoff equation governing the motion of a solid body in a fluid, and equations of motion of a body with cavities filled with ideal fluid. (Nauchno-izdatelskii Tsentr Regul'yarnaya and Khaoticheskaya Dinamika: ul. Universitetskaya 1, 426034 Izhevsk, Russian Federation; tel. +7 (3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://shop.rcd.ru/>)

Steklov V A *Work in Mechanics 1902–1909: Translation from French* (Moscow–Izhevsk: Izhevsk Institute for Computer Studies, 2011) 492 pp. ISBN 978-5-4344-0018-3.

This collection contains translations of V A Steklov's papers on mechanics, never before published in Russian. The papers were issued in French journals in the period 1902–1909 and are mostly connected with problems arising in the motion of a solid body through a fluid, the dynamics of rotating fluid masses, and the theory of vortices. This work constitutes an important part of V A Steklov's scientific legacy and continues to be important from the standpoint of the modern theory of dynamical systems and the qualitative theory of differential equations. The ideas and problem formulations contained in his papers are undoubtedly of interest for today's experts and lay the groundwork for further research. Interconnection and mutual enrichment are traced between the work of V A Steklov and that of M A Lyapunov, which characterize the peculiarities and close creative relationships between these two outstanding personalities. (Nauchno-izdatelskii Tsentr Regul'yarnaya and Khaoticheskaya Dinamika: ul. Universitetskaya 1, 426034 Izhevsk, Russian Federation; tel. +7 (3412) 50-02-95; e-mail: subscribe@rcd.ru; URL: <http://shop.rcd.ru/>)

Kryukov P G *Ultrashort-Pulse Lasers and Their Applications* (Dolgoprudnyi: Intellekt Publ. House, 2012) 248 pp. ISBN 978-5-91559-091-4.

This book is devoted to the problem of the generation of laser radiation shaped into ultrashort pulses whose length grows closer to the period of one lightwave, i.e., approach several femtoseconds. This is one of the most important and topical branches of contemporary laser physics. A brief history is outlined of the work which led to the creation of femtosecond laser sources. Principles of operation are discussed that made it possible to produce pulses of femtosecond length and to amplify their power to the petawatt level. It is explained how the duration of such extraordinarily short laser pulses can be measured. Descriptions of certain existing laser systems are given. Some of the most spectacular applications in research, engineering, and medicine are described, based both on the shortest possible lengths of laser pulses and on the ultrahigh intensity of laser emission. Among other achievements, the book treats the latest application of femtosecond lasers — the high-precision measurement of optical frequencies and the possibility of creating an ultraprecise and compact optical clock implementing this principle. The book will be equally valuable to undergraduate students and postgraduate students going into laser physics, and to experts already working in this field. (Izdatel'skii dom Intellekt: Promyshlennyyi proezd 14, 141700 Dolgoprudnyi, Moscow region, Russian Federation; tel. +7 (495) 579-96-45; fax +7 (495) 617-41-88; URL: <http://www.id-intellect.ru/>)

Saleh B, Teich M *Optics and Photonics: The Principles and Applications* In two volumes (Translated from English by V L Derbov) Vol. 1 (Dolgoprudnyi: Intellekt, 2012) 760 pp. ISBN 978-5-91559-038-9; Vol. 2 (Dolgoprudnyi: Intellekt Publ. House, 2012) 784 pp. ISBN 978-5-91559-135-5.

A relatively new term ‘photonics’ was introduced by analogy to the quite familiar ‘electronics’. This is a modern science dealing with the interaction between light and matter and with numerous technological applications. The term reflects the quantum (photon) nature of light. Photonics studies a broad range of physical phenomena, techniques, and devices we use to generate light, control its properties, transfer and record light beams, modify the properties of matter by the light irradiation, and conduct optical diagnostics of material media. There is no book in the educational literature at the moment in Russian intended for students of physical and engineering specializations that covers the range of subjects outlined above. This gap was to be filled by publishing the translation into Russian of the second edition of this textbook written by two well-known American specialists. The table of contents includes the optics of rays, waves, and beams; Fourier optics; the electromagnetic theory of light; polarization optics, the optics of photonic crystals; optical fibers and resonators; elements of statistical and quantum optics; the interaction between photons and atoms; laser amplifiers and lasers, the optics of semiconductors; semiconductor sources and receivers of photons; acousto- and electro-optics; the fundamentals of nonlinear optics, including the optics of ultrashort pulses of light, and basic information on optical communication systems and their elements, i.e., optical connectors and switches. Beginning with the basics of elementary optics, the authors bring the reader fairly quickly to the top level of modern optics, its achievements, and its technical solutions. The mathematical apparatus is presented briefly but with sufficient rigor, and a large number of illustrations maintain sufficient visual clarity. Each section of the book includes a well-designed set of problems, making

it very valuable both for lecturers and for students’ personal studies. The huge amount of material covering all sections of optics necessitated this book’s being printed in Russian as a two-volume set. Translated from: Saleh B E A, Teich M C *Fundamentals of Photonics* 2nd ed. (Hoboken, N.J.: Wiley Interscience, 2007). (Izdatel'skii dom Intellekt: Promyshlennyyi proezd 14, 141700 Dolgoprudnyi, Moscow region, Russian Federation; tel. +7 (495) 579-96-45; fax +7 (495) 617-41-88; URL: <http://www.id-intellect.ru/>)

Petrov A N *Gravitation: From Crystal Spheres to Wormholes* (Fryazino: Vek 2, 2013) 320 pp. ISBN 978-5-85099-190-6.

This book takes an in-depth look at the evolution of the concept of gravity in the history of science. In describing the current status of gravitation theory, the focus is on the general theory of relativity, but other theories are also given attention. Discussion is conducted of the formation and structure of black holes, generation and detection of gravitational waves, the evolution of the Universe from the Big Bang onwards, to the current epoch, and possible scenarios for the future. Both theoretical and observational options for the development of gravitational science are covered. The book is included in the library list of the Dynasty Foundation, which is the fund for supporting the publication of modern popular science books selected by scientists-experts. (Izdatel'stvo Vek 2: ul. Barskie pr. 5-232, 141195 Fryazino, Moscow region, Russian Federation; tel./fax +7 (496) 567-82-35; e-mail: vek2@vek2.ru; URL: <http://www.vek2.ru/>)

Bentsion Moiseevich Vul: Life, Memories, Documents (Composed by V M Berezanskaya, ed. by A A Gippius) (Moscow: LENAND Publ., 2013) 296 pp. ISBN 978-5-9710-0565-0.

This collection of papers pays tribute to Bentsion Moiseevich Vul, Full Member of the USSR Academy of Sciences, an outstanding specialist in the physics of dielectrics, semiconductors, and quantum electronics, and one of the founding fathers of the P N Lebedev Physical Institute (FIAN). He began his life in science at FIAN as its Learned Secretary (1932–1935), and in 1934 set up his laboratory and guided it until his last days. The book gives an overview of the key events in Bentsion Moiseevich’s biography gleaned from archival documents, magazines, newspapers, memoirs and oral stories left by those who knew him. Most of the materials selected for this collection have never been published before. In addition to memorabilia left by his colleagues and by B M Vul’s closest relatives, materials found in the archives of the Russian Academy of Sciences were used, as were those in the FIAN archive, the FIAN library, and the personal archive of E B Vul (daughter of the scientist). FIAN’s staff members T I Galkina, V B Kuznetsova, V F Sennikov, V N Osipova, S N Maksimovskii, and G A Kalyuzhnaya helped very much with the work on the book. (Izdatel'skaya gruppa URSS: Nakhimovskii prosp. 56, 117335 Moscow, Russian Federation; tel./fax +7 (499) 724-25-45; e-mail: orders@URSS.ru; URL: <http://urss.ru/>)

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