

New books on physics and related sciences

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Fridman A M, Khoperskov A V *Physics of galactic disks* (Moscow: FIZMATLIT, 2011) 640 pp. ISBN 978-5-9221-1291-8. RFBR project 09-02-07032.

The book treats the physical processes determining the dynamics and spatial structure of astrophysical disks (stellar and gaseous disks of galaxies). The dynamics of small perturbations and stability problems for collisionless and gas dynamic systems (including accreting ones) are consistently investigated. The physics of numerous instabilities is analyzed in detail. The main nonlinear results are evaluated, based on numerical (simulation) experiments. The book discusses some of the formation mechanisms of the spiral structure of galaxies. Approaches are described for determining the parameters of the dark mass within galaxies and in their immediate neighborhoods. The results are presented of the discovery in recent years of new galactic structures: vortices, slow bars, and the soliton structure of spiral arms; the physics of these phenomena is discussed in detail. The book is intended for researchers and undergraduate students specializing in physics and mathematics. (Publishing Company ‘Fiziko-matematicheskaya literatura’ MAIK ‘Nauka/Interperiodika’: 117997 Moscow, ul. Profsoyuznaya, d. 90; tel. (7-495) 334-74-21; fax: (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Lev Al'tshuler's Extreme States (Ed. by B L Al'tshuler and V E Fortov). (Moscow: FIZMATLIT, 2011) 616 pp. ISBN 978-5-9221-1304-5. RFBR project 09-02-07017.

Lev Vladimirovich Al'tshuler was an outstanding scientist and one of the founders and leaders of a new scientific discipline—dynamic high-pressure physics based on studying the behavior of matter in strong shock waves at ultrahigh pressures and temperatures. The results of the studies by L V Al'tshuler and his staff were used to create the first Soviet atomic bomb, tested in 1949. L V Al'tshuler, along with E I Zababakhin, Ya B Zel'dovich, and K K Krupnikov, generated one of the fundamental ideas in the development of the atomic bomb. Later on, L V Al'tshuler actively participated in the development of improved atomic bomb charges which were successfully tested in the 1950's and 1960's. He was a man of extremes by his character, and his life was extraordinary; it can be said that he never lost his inner freedom and was able to openly state his opinions and to defend them to the end in any situation and under any historical circumstances. The book outlines L V Al'tshuler's biography and his scientific output and other publications and reports; it quotes the memoirs of his friends and relatives,

colleagues and students, and, in particular, many renowned scientists, as well as some archival documents and letters. The book is intended for a broad range of readers interested in the history of scientific progress and the history of the Soviet Atomic Project. (Publishing Company ‘Fiziko-matematicheskaya literatura’ MAIK ‘Nauka/Interperiodika’: 117997 Moscow, ul. Profsoyuznaya, d. 90; tel. (7-495) 334-74-21; fax: (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Zheleznyakov V V *Selected Works: On His 80th Birthday* (Nizhny Novgorod: RAS IAP, 2010) 688 pp.

This collection of selected works by Academician Vladimir Vasil'evich Zheleznyakov covers major publications that appeared over the 55 years of his scientific career. Part I of the book, “Electromagnetic waves in anisotropic media”, treats processes of radiation, absorption, and linear interaction of waves in plasma. This part also contains results on the linear interaction in liquid crystals. Part II, “Instability of electromagnetic waves in nonequilibrium media”, carries papers on the instability of electron beams in plasma, involving instability in the region of the anomalous Doppler effect, cyclotron instability associated with the double plasmon resonance and Bernstein modes, and cyclotron instability in a weakly relativistic plasma. This part also includes a paper dealing with the effect of synchrotron instability, in which Zheleznyakov posed the problem of searching for synchrotron space masers. These are followed by papers on the quantum and classical superradiance effects. Part III, “Sporadic solar radio emission”, analyzes the question of the origin of such radiation. This part of the collection is supplemented with papers on the effect of linear interaction in a quasitransverse magnetic field and in neutral current layers in the corona on the characteristics of polarization of observed solar radio emission. In Part IV, “Astrophysical plasma in extreme conditions”, the papers cover problems of interaction of radiation with plasma in the vicinity of magnetic white dwarfs and neutron stars-pulsars, and in relativistic jets. The last paper in the book discusses the issue of detection of synchrotron space masers. The author dedicated the volume to the memory of Vitaly Lazarevich Ginzburg. The book was commissioned by the Editorial and Publication Council of the RAS Institute of Applied Physics and is expected to be useful for specialists in plasma physics, radio astronomy, and astrophysics. (RAS Institute of Applied Physics: 603950 Nizhny Novgorod, ul. Ul'yanova 46; tel. (7-831) 416-49-97; URL: <http://www.ipfran.ru/publication.html>)

Fortov V E, Popel' O S *Power Engineering in the Modern World* (Dolgoprudnyi: Intellect, 2011) 168 pp. ISBN 978-5-91559-095.

The book uses a unified standpoint to discuss in generally comprehensible terms the current status of power engineering in the world and in Russia in particular, as well as some of the most pressing scientific and technological aspects of the modernization of energy production and consumption. It considers the specifics of promising technologies for the generation of electricity using natural fuels, water power engineering, nuclear power engineering, 'hydrogen-based' energy production, and renewable sources of energy. It also analyzes the problems of the accumulation of electric energy and achievements in this area, the development of smart grids, the possibility of improving the efficiency of heat supply systems, including the use of heat pumps, and the environmental aspects of power engineering. The book contains a large amount of illustrative material. It is intended for students and faculty of engineering physics and power engineering departments of universities, researchers, developers, and practising power engineers. A lucid presentation of the above aspects makes the book accessible and interesting for a wide circle of readers. (Izdatel'skii dom Intellect: 141700 Dolgoprudnyi, Moskovskaya obl., Promyshlennyy proezd 14; tel. (7-495) 408-76-81; e-mail: lfs@id-intellect.ru; URL: <http://www.id-intellect.ru/>)

Grosberg A Yu, Khokhlov A R *Polymers and Biopolymers From the Point of View of Physics* (Translated from English by A A Aerov) (Dolgoprudnyi: Intellect, 2010) 304 pp. ISBN 978-5-91559-087-7.

The first publication in Russian of the famous textbook — the monograph on the physics of polymers and biomolecules. It presents the most profound description in the world literature of the role of polymers in living nature, fractal models in the mathematics of the polymer coil, the coil-to-globule transitions, the physics of high elasticity, polymer solutions and polymer melts and their hydrodynamic properties, and the question of prebiotic evolution. The book is intended for students and teachers in physics, chemistry, and biology departments of universities and for specialists in the physical chemistry of polymers and in molecular biology. (Izdatel'skii dom Intellect: 141700 Dolgoprudnyi, Moskovskaya obl., Promyshlennyy proezd 14; tel. (7-495) 408-76-81; e-mail: lfs@id-intellect.ru; URL: <http://www.id-intellect.ru/>)

Kul'chin Yu N, Voznesensky S S, Bezverbnii A V, Dzyuba V P *Photonics of Biominerals and Biomimetic Structures and Materials* (Moscow: FIZMATLIT, 2011) 224 pp. ISBN 978-5-9221-1313-7. RFBR project 10-02-02002.

This monograph presents the analysis of the current status and the results of integrated studies of natural biominerals, and approaches to their biomimetic modeling needed to design new nanocomposite structures and materials with the desired properties and characteristics. The book summarizes years of research by the authors and allows a unified look at the problems of biomineralization in nature and the search for ways to achieve its biomimetic modeling with regard to prospects for the development of such a promising research area as nano- and microphotonics. This monograph may be equally useful to novice researchers and to professionals working in the field of biophysics, photonics, and nano- and biotechnologies. (Publishing Company 'Fiziko-matematicheskaya literatura' MAIK 'Nauka/Interperiodika': 117997 Moscow, ul. Profsoyuznaya, d. 90; tel. (7-495) 334-74-21; fax:

(7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Studies in the History of Physics and Mechanics: 2009–2010 (Exec. Ed. G M Idlis; Compiling Ed. N V Vdovichenko) (Moscow: FIZMATLIT, 2010) 480 pp. ISBN 978-5-94052-202-7. RFBR project 10-06-07-130.

This collection brings together materials marking the 150th anniversary of the birth of Max Planck; the life history and activities of A G Stoletov; the history of the creation of the first synchrotron in Dubna; a large array of materials collected by one of the oldest employees of the Kurchatov Institute of Atomic Energy, K N Mukhin, in connection with his impressions of meeting many of the most outstanding Soviet and some foreign physicists, and interesting details concerning the creation of the *Great Soviet Encyclopedia*. Included is a letter written by S E Khaikin related to the ideology-based persecutions of the 1940s–1950s at Moscow State University. A large section of the book is devoted to the memory of Academician V L Ginzburg, one of the oldest members of the editorial team (who died in 2009) for the collected volume *Studies in the History of Physics and Mechanics*. The book is intended for experts in the fields of physics, mechanics, and the history of science, and for a wide range of readers interested in the history of science. (Izdatel'stvo Fiziko-Matematicheskoi Literatury (Fizmatlit): 123182 Moscow, ul. Shchukinskaya 12, korp. 1; tel. (7-499) 720-41-53; e-mail: fizmatlit@narod.ru)

Kotel'nikov V A *A Life That Mirrors the Century* In 2 volumes. Vol. 1. *Memoirs by Colleagues* (Moscow: FIZMATLIT, 2011) 312 pp. ISBN 978-5-9221-1309-0. RFBR project 07-06-02001.

The first volume of memoirs about the great Russian scientist, educator, engineer, and science administrator, Academician V A Kotel'nikov, includes notes written over the years by people whose fate happened to bring them into professional contact with this extraordinary person, of whose scientific work we know very little, by virtue of the specific type of his responsibilities. The publication of these memoirs, which follow the three-volume *Collected Works of V A Kotel'nikov* published earlier, marks the 100th anniversary of the birth of the scientist. The book is intended for students, postgraduate students, engineers, and all those interested in the glorious history of Russian science in the 20th century. (Publishing Company 'Fiziko-matematicheskaya literatura' MAIK 'Nauka/Interperiodika': 117997 Moskva, ul. Profsoyuznaya, d. 90; tel. (7-495) 334-74-21; fax: (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Braude S Ya, Kontorovich V M *Radio Waves Tell the Story of the Universe* 3rd ed. (Moscow: FIZMATLIT, 2011) 240 pp. ISBN 978-5-9221-1262-8.

The subject of the book is the recent progress in modern radio astronomy. Observational and theoretical data on radio galaxies, quasars, pulsars, space masers, and other objects in space which emit radio waves are presented in popular form. The book discusses the evolution paths of stars, supernova explosions, and radio emission from their remnants; the emergence of white dwarfs and neutron stars, and the phenomena taking place in galactic centers and the coales-

cence of galaxies which are responsible for the emergence of radio galaxies and quasars. Solar radio emission, and specifically that connected with solar flairs, and radio emission from planets are also discussed. The current understanding of the evolution of the Universe is explained, as is the origin of the cosmic microwave background left behind by the Big Bang and of its anisotropy. A separate chapter is devoted to characterizing radio telescopes. The book is intended for students, teachers, and anyone interested in problems facing modern science. (Publishing Company 'Fiziko-matematicheskaya literatura' MAIK 'Nauka/Interperiodika': 117997 Moscow, ul. Profsoyuznaya, d. 90; tel. (7-495) 334-74-21; fax: (7-495) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

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