New books on physics and related sciences

Boĭko A V, Grek G R, Dovgal' A V, Kozlov V V *Onset of Turbulence in Near-Wall Flows* (Novosibirsk: Nauka. Siberian RAS Company, 1999) 328 pp. Bibliography: 611 refs. RFBR projects 96-15-96310, 97-01-14189. ISBN 5-02-031348-3

This monograph examines the stability of laminar near-wall flows and the onset of turbulence. The topics covered include excitation processes, linear and nonlinear development of disturbances, and the origin of intermittency and turbulent spots in shear flows such as the boundary layer, channel flow, laminar flow separation region, etc. The book pays particular attention to the effects of various factors on the processes under study, including the heightened scale of turbulence in the incident flow, the cooling and heating of surfaces, acoustic pulsations, suction for stability, and the transition to turbulence. Various scenarios of such transitions are discussed. The book is intended for researchers and engineers in the fields of aero- and hydrodynamics as well as for teachers and undergraduate and post-graduate students in turbulence and in wave phenomena in continuous media. (Siberian publishing, printing, and book-trade company 'Nauka', SB RAS regular mail address: 630077 Novosibirsk, ul. Stanislavskogo 25)

Frisch U *Turbulence. The Legacy of A.N. Kolmogorov* (Mathematician's Library Series. Issue No. 4) (Translation from the English by A N Sobolevskiĭ, Ed. M L Blank) (Moscow: FAZIS, 1998) xiv + 346 pp. Bibliography: 586 refs. ISBN 5-7036-0049-9. RFBR project 97-01-14057.
[Original publication in English (Cambridge: Cambridge University Press, 1995)]

Andreĭ Nikolaevich Kolmogorov is the central figure in this book on turbulence. The revision of Kolmogorov's half-a-century-old work was one of the objectives of the lectures which were given to third-year students specialized in turbulence and dynamical systems at the Nice – Sofia – Antipolis University and which formed the basis for the book. Special emphasis is placed on such key concepts in the field of dynamical systems as symmetry breaking and deterministic chaos. The last chapter of the book offers guidelines for further reading and provides additional historic information. The book will be of interest to a wide range of readers, from third-years students in mathematics, physics, astrophysics, geophysics, or engineering to researchers and engineers. It is intended primarily for those interested in the fundamentals of turbulence and to those wishing to refresh their memory on the subject. Much of its material on the probability theory and on fractals and multifractals is applicable beyond hydrodynamics, in parti-

cular, in solid rock geophysics. (FAZIS Publ. regular mail address: 123557 Moscow, Presnenskiĭ val 42-44; e-mail: phasis@aha.ru)

Semenov A P *The Ion-Beam Sputtering Technique* (Ulan-Udé: BNTs SO RAN Publ., 1996) 120 pp. Bibliography: 181 refs. ISBN 5-7623-1110-4.

This book provides an introduction to the technique of ion-beam sputtering. It covers the physical principles governing the creation of sputtering ion beams using steady-state cold-cathode discharges; describes the basic processes involved in the thin film growth by ion beam sputtering, and provides the design details of the electronic devices needed. The author draws upon experience he gained at the Buryat Institute of Natural Sciences, Siberian Branch of the Russian Academy of Sciences in the production and application of sputtering ion beams and in thin film growth. For researchers, engineers, and students specializing in physical electronics and ion technology. (RAS SB BSC Publications and Edition Department regular mail address: 670042 Ulan-Udé, ul. Sakh'ya-novoĭ 8)

VIth International Symposium on Atmospheric and Marine Optics (23 – 26 June 1999, Tomsk) (Tomsk: IOA SO RAN Spektr Publ., 1999) 140 pp.

This book presents Proceedings of the Sixth International Symposium on Atmospheric and Marine Optics, held in Tomsk, Russia in June 23 – 26, 1999. The papers are grouped in the following sections: absorption of optical waves in gaseous and condensed media; optical wave scattering in the atmosphere and in the ocean (clouds, aerosols and hydrosols), and radiation conditions in the atmosphere; propagation of optical radiation in randomly inhomogeneous media, transfer and processing of images and signals, adaptive optics, influence of nonlinear effects on optical wave propagation in the atmosphere and aqueous media; optical sensing of clouds, aerosols, and the ocean, remote monitoring of ozone and other atmospheric gases, radar probing and acoustic sounding techniques; technologies and instrumentation for atmospheric and marine optical studies; ecological monitoring of air and aquatic systems using optical methods, and, finally, models, databases, and software for current problems in atmospheric optics. (RAS SB IOA Spektr Publ. regular mail address: 634055 Tomsk, pr. Akademicheskiĭ 1)

Proceedings of the 12th International Conference on Electrostatic Accelerators (Obninsk, November 25 – 28, 1997) (Ed. by V A Romanov, I O Konstantinov) (Obninsk: GNTs RF FEI Publ., 1999) 282 pp.

The theme of the conference was the state-of-the-art in electrostatic accelerator technology and in the application of these accelerators to fundamental and applied studies. Over

160 researchers from Russia and abroad took part in the meeting. Users of beam technologies and operators of electrostatic accelerators will find this to be a valuable book. (GNTs RF FEI Publ. regular mail address: 249020, Obninsk, Kaluga region, pl. Bondarenko 1; Internet: http://www.ippe.rssi.ru/department/Ins)

Osipov Yu S, Vasil'ev F P, Potapov M M *Fundamentals of Dynamic Regularization* (Moscow: Moscow State University Publ., 1999) 237 pp. Bibliography: 160 refs. ISBN 5-211-04085-6.

This textbook is based on the lectures being given by the authors to students in Computational Mathematics and Cybernetics Department at Moscow State University. It focuses on the method of dynamic regularization, developed by Yu S Osipov and his disciples for solving unstable inverse problems for systems of ordinary differential equations, equations in partial derivatives, etc. To make the exposition logically autonomous, auxiliary material from functional analysis is given, which is employed in the book for the rigorous mathematical formulation of the inverse problems studied and for substantiation of the convergence problems associated with the dynamic regularization method. The book is recommended by the Ministry of General and Professional Education of the Russian Federation for college and university students in applied mathematics. (MSU Publ. regular mail address: 103009 Moscow, B. Nikitskaya ul. 5/7; tel.: (7-095) 939-3323, (7-095) 229-7541; fax: (7-095) 203-6671)

Problems of Atmosphere Physics Collection of papers [Ed. Board: V N Aref'ev, L P Semenov (Ed.-in-Chief), V V Smirnov, A G Petrushin] (St. Petersburg: Gidrometeoizdat, 1998) 516 pp. ISBN 5-286-01348-1.

This Academician O A Volkovitskiĭ memorial publication is a collection of papers which were written by the disciples and colleagues of the Russian scientist and people who worked for years with him and which mainly focus on those research areas where he was directly involved. These are the linear and nonlinear optics of the atmosphere, spectroscopy of atmospheric gases, unconventional elemental analysis applications of nonlinear spectroscopy, and laser probing of the atmosphere. A number of papers address convective and vortex motions, hydrodynamic instabilities, ozone layer changes, concentration evolution of ice nuclei, and dust migration. Methods for making radioactive contamination predictions and for performing ecological risk assessment are also discussed. For specialists in applied ecology and in the physics and optics of the atmosphere. (Gidrometeoizdat regular mail address: 199397 St. Petersburg, V. O., ul. Beringa 38)

Pavel Alekseevich Cherenkov: *The Man and the Discovery* (Exec. Ed. and Compil.: A N Gorbunov, E P Cherenkova) (Series 'Scientists of Russia: Essays, Memoirs, Documents') (Moscow: Nauka, 1999) 233 pp. ISBN-02-003641-2.

This book commemorates the prominent Russian physicist P A Cherenkov — Academician, member of the National Academy of Sciences of the USA, the winner of major national awards, and, above all, of the Nobel Prize in physics 'for the discovery and explanation of the Cherenkov effect'.

Memoirs by A M Baldin, V I Gol'danskiĭ, A N Skrinskiĭ, E I Tamm, I M Frank, by the colleagues, friends, disciples, and relatives of P A Cherenkov, provide a vivid portrait of the scientist, the science organizer, and the man. The book also includes a chapter on the history of the scientific discovery, with papers by S I Vavilov, P A Cherenkov, and I M Frank, among others. Intended for researchers, students of all levels, and for all those interested in the history of science and how scientists live and work. (Nauka Publ. regular mail address: 117864 GSP-7, Moscow V-485, Profsoyuznaya ul. 90; tel. (7-095) 334-9859)

Belavin A A, Kulakov A G *Lectures on Theoretical Physics* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1999) 180 pp.

Two parts of the Theoretical Physics course — field theory and quantum mechanics — are included in this edited version of the lectures given to third-year students at Moscow Independent University. The book's distinctive feature is the up-to-date exposition style and the detailed discussion of the physical meaning of the results obtained. A valuable resource for a wide circle of teachers and students in physics disciplines as well as for anyone interested in the current views of nature. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Belokurov V V, Timofeevskaya O D, Khrustalev O A *Quantum Teleportation*: *Ordinary Miracle* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2000) 256 pp.

This book addresses quantum logic, quantum teleportation, and quantum computers — cutting-edge research areas whose rapid growth is transforming quantum mechanics into the cornerstone of 21th-century technology, unthinkable without the most fundamental aspects of modern physics being invoked. The book devotes readers attention to the historical development of quantum mechanics, allowing the reader to develop his own view about the fundamental problems in the field and thus to orientate himself freely in current trends towards quantum technology. For a wide range of readers, including researchers, post-graduate and undergraduate students, and all those interested in the fundamentals of and most recent developments in quantum mechanics. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Zhuravlev V A *Thermodynamics of Irreversible Processes*: *Problems and Solutions* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1998) 152 pp. ISBN 5-7029-0292-0.

This is the first attempt to present the basic principles of the thermodynamics of irreversible processes by providing a selection of thematical problems and commented solutions. Over a hundred problems concerning general and specialized aspects of linear and nonlinear irreversible thermodynamics are included. For theoretical physicists and for students and post-graduate students in physics and mathematics. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Polyakov A M *Gauge Fields and Strings* (Translated from the English by M I Getmanskaya; edited by A A Belavin) (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1999) 312 pp. ISBN 5-7029-0322-6.
[Original publication in English: in 'Contemporary Concepts in Physics' Series, Vol. 3 (Chur: Harwood Acad. Publ., 1987)]

Drawing on his scientific diaries, a prominent theoretical physicist specializing in quantum field theory presents his subjective view of the major problems in theoretical and mathematical physics, such as quark confinement, instantons, magnetic monopoles, strings, and critical phenomena. The thread which runs through the collection as a whole is the desire to understand the behavior of quantum field systems in the strong coupling region, where perturbation theory does not hold. The book gives a lucid and absorbing account of the subtle and complex methods of current quantum field theory and provides an excellent supplementary to conventional courses in field theory and elementary particle physics. It is intended for physicists and mathematicians in various fields and for undergraduate and post-graduate students, but can also serve as a text for special courses such as nonperturbative methods of quantum field theory, critical phenomena, etc. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Shapiro I S, Ol'shanetskiĭ M A *Lectures on Topology for Physicists* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1999) 132 pp. ISBN 5-7029-0311-0.

This textbook, part of the edited course of lectures that were given by I S Shapiro to a group of ITEF physicists in 1977–1978, provides an introduction to the theory of homologies and is intended for theoretical physicists and for undergraduate and post-graduate students in the physics and mathematical disciplines. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Markeev A P *Theoretical Mechanics.* Textbook for students in mechanical and mathematical disciplines 2nd ed., revised and enlarged (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1999) 572 pp. ISBN 5-88711-126-7.

This rigorous, comprehensive, and concise exposition of the basic problems and methods of theoretical mechanics differs importantly from other theoretical mechanics textbooks in both the selection of the material and in the way it is presented. The major emphasis is on those parts of dynamics and those methods of analytical mechanics which are most important in terms of theory and applications; statics is studied as a part of dynamics, and the chapter on kinematics contains a discussion of the general principles underlying the kinematics of a system; some of the author's methodological ideas are new in teaching practice. For students in mechanics and applied mathematics, for teachers of mechanics and post-graduate students. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Rabinovich M I, Trubetskov D I *An Introduction to the Theory of Vibrations and Waves* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2000) 560 pp. ISBN 5-7029-0311-1.

Rather than focus on the formal and methodological aspects of the contemporary theory of vibrations and waves, this book concentrates on the related phenomena and effects occurring in medicine, biophysics, hydrodynamics, radio electronics, plasma physics, and other areas of research and technology. This new edition incorporates advances made in the field since the first edition of 1984. For researchers and undergraduate and post-graduate students concerned with vibrational and wave processes. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Leffler A-Ch *Sof'ya Kovalevskaya* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 2000) 140 pp. ISBN 5-7029-0372-2.

This book is published to coincide with the 150th anniversary of S V Kovalevskaya's birth and presents the recollections of Anna Charlotta Leffler, her close friend. In accord with Kovalevskaya's last will, the book was written immediately after her death and first published in a limited edition in Russia in 1893. It contains interesting and lesser known facts of the great mathematician's biography and is currently a bibliographic rarity. Intended for a wide circle of readers. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Borisov A V, Mamaev I S *Poisson Structures and Lie Algebras in Hamiltonian Mechanics* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1999) 464 pp. ISBN 5-7029-0329-3.

This comprehensive reference examines one of the most active areas in modem theoretical physics, Poisson structures and their applications to various problems of Hamiltonian mechanics, which arise in dynamics of rigid bodies, celestial mechanics, vortex theory, and cosmological models. The book also discusses nonlinear Poisson structures determined by infinite-dimensional Lie algebras and considers typical situations in which they appear. New cases of integrability of the equations of dynamics and of isomorphism between various integrable problems are indicated. For researchers in mechanics and mathematics concerned with the theory of dynamical systems, for undergraduate and post-graduate students. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Golubev V V *A Talent Uprooted* (Izhevsk: NITs 'Regulyarnaya i Khaoticheskaya Dinamika', 1999) 120 pp. ISBN 5-89238-023-8.

January 15, 2000 marks the 150th anniversary of the birth of S V Kovalevskaya. This book, written by the prominent Russian mathematician and mechanic, traces the life and career of his famous countrywoman and presents fragments

of her correspondence with other mathematicians. Appendix includes two papers written by N E Zhukovskiĭ. For a wide range of readers. (Science Publishing Centre 'Regular and Chaotic Dynamics' regular mail address: 426057 Izhevsk, ul. Pastukhova 13; Internet-shop: http://rcd.ru)

Compiled by *E V Zakharova*