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# New books on physics and related sciences

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**Kadomtsev B B** ***Selected Works*** In two volumes (Ed. by V D Shafranov; compiled by M B Kadomtsev, O P Pogutse, A V Timofeev, and V D Shafranov) (Moscow: Fizmatlit, 2003) 560 pp. ISBN 5-9221-0365-2. RFBR project 02-02-3001.

The first volume of Academician Boris Borisovich Kadomtsev's selected works offers a collection of his original papers, most of them dealing with high-temperature plasma physics. In these, plasma oscillations and plasma stability are examined, the theory of plasma turbulence and of related transport processes is developed, and problems associated with the tokamak type fusion reactor are addressed. Studies on the properties of substances in a superstrong magnetic field (pulsar matter) and those on quantum mechanics problems are also included. (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/)

***Viktor Yakovlevich Frenkel' (1930 – 1997): Last Works, Reminiscences by Colleagues and Friends*** (Ed. Board: Zh I Alferov (chair), V E Golant, V G Grigor'yants, B B D'yakov, A G Zabrodskiĭ, B P Zakharchenya, O V Cherneva; editor/compilers: V G Grigor'yants, B B D'yakov, O V Cherneva) (St. Petersburg: Fiziko-Tekhnicheskiĭ Institut im. A F Ioffe, 2002) 356 pp. ISBN 5-93634-003-1. RFBR project 01-02-30027.

This collection pays tribute to Viktor Yakovlevich Frenkel', Doctor of Physical and Mathematical Sciences, a prominent Russian scientist and scholar, a historian of physics. The collection opens with a brief review of V Ya Frenkel's scientific and literary activities and includes memories of encounters and work with him. Five scientific and popular science works, some of them previously unpublished, give an idea of the last stage of his creative life and of the methods he used in his historical studies of physics. The second part contains the reminiscences of Viktor Yakovlevich's colleagues and friends from among Russian and foreign scientists. The book contains necessary reference material which, although not exhaustive, will nonetheless help the reader (especially a younger one) to find his bearings in the wide range of persons and events Frenkel' wrote about. The collection will be of interest to research workers, undergraduate and post-graduate students in mathematics and physics, and also those involved professionally or just interested in the history of science. (RAS A F Ioffe Physico-technical Institute Publ.: 194021 St. Petersburg, ul. Politekhnicheskaya 26; tel: (7-812) 247-22-45; URL: http://www.ioffe.rssi.ru/)

*Uspekhi Fizicheskikh Nauk* **173** (7) 797 – 800 (2003)
Translated by E G Strel'chenko

**Kruglov V V, Dli M I** ***Intellectual Information Systems: Computer Support of Fuzzy-Logic and Fuzzy-Conclusion Systems*** (Moscow: Izdatel'stvo Fiziko-Matematicheskoĭ Literatury, 2002) 252 pp. ISBN 5-94052-022-7.

In this book, the basic apparatus of so-called illegible or fuzzy logic, the theory of fuzzy-conclusion systems and some of its application aspects, as well as software for implementing, testing, and employing such systems in various fields of science and engineering are discussed. The book is intended for a wide range of readers interested in modern computer technologies and for senior undergraduate students attending the course of lectures on intellectual information systems at engineering and economics colleges. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

**Menskiĭ M B** ***Method of Induced Representations: Space-Time and the Concept of Particles*** 2nd ed. (Moscow: Éditorial URSS, 2003) 288 pp. ISBN 5-354-00315-6.

This book discusses the theory of induced representations of groups and its particle physics applications. The first part presents a physicist-oriented account of the theory and of the methods it yields for constructing the irreducible representations of noncompact groups. As practically important examples, unitary irreducible representations of Poincaré, Lorentz, and de Sitter groups are constructed. In the second part of the book, the role of induced representations in describing quantum systems with symmetry groups is elucidated, allowing a theory of particle interactions in spacetime with geometrical structure for Galilei or Minkowski or de Sitter (constant curvature) space to be developed. These models are analyzed within a unified framework of what can be called the quantization principle deprived from the notion of quantized field. The list of references at the end of the book makes no claims to comprehensiveness and mainly covers the literature directly used in writing the book. If needed, the bibliographies contained in the books and papers cited in the text can be used by the reader. The book is based on a lecture course the author has taught at the MSU Physics Department since 1970. Even though the material of the lectures was revised significantly for the book, it proved necessary to retain the lecture style presentation in many cases so that a wide range of topics relevant to the main subject could be covered properly. The fact that the book is intended

primarily for theoretical physicists determined the choice of purely mathematical material and the level of rigour with which it is presented. The author has tried to omit or to present as concisely as possible what can be found in numerous group theory books written for physicists, and at the same time to examine in detail topics which are either not touched upon at all or mentioned only casually in such books. (Éditorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203 in the RAS Institute for Systems Analysis; tel./fax: (7-095) 135-44-23, 135-42-46, e-mail: urss@urss.ru; URL: http://www.urss.ru/)

**Stefan V, Prokhorov A M** (Eds) ***Diamond Science and Technology*** (Stefan University Press Series on Frontiers in Science and Technology) Vol. 1. ***Diamond Applications. Diamond in the Jewelry Industry*** Vol. 2. ***Laser Diamond Interaction. Plasma Diamond Reactors*** ISSN: 1543-4028. 2nd ed. (La Jolla, CA: Stefan University Press, 2002) Vol. 1 — 157 pp. ISBN 1-889545-23-6; Vol. 2 — 195 pp. ISBN 1-889545-24-4.
**Stefan V, Basov N G** (Eds) ***Semiconductor Science and Technology*** (Stefan University Press Series on Frontiers in Science and Technology) Vol. 1. ***Semiconductor Lasers*** Vol. 2. ***Quantum Dots and Quantum Wells*** ISSN: 1543-4028. 2nd ed. (La Jolla, CA: Stefan University Press, 2002) Vol. 1 — 161 pp. ISBN 1-889545-11-2; Vol. 2 — 173 pp. ISBN 1-889545-12-0.

These two volumes are published within the Stefan University Press Series on Frontiers Science Research Conferences founded by V Stefan. The editors A M Prokhorov and N G Basov won the Nobel Prize in Physics 1964 along with C Townes. The series is based on symposia organized by La Jolla International School of Science and The Institute for Advanced Physics Studies, where invited contributors are asked to go beyond the narrow particulars of their work and reflect on larger questions, problems, and trends. In the collection *Diamond Science and Technology*, which is the outgrowth of the ''Frontier Science Research Conferences: Diamond Science and Technology'', October 12 – 16, 1998, La Jolla, CA, USA, the research in diamond science and technology worldwide is covered. A wide range of topics is included: laser probing of the gas phase environment during diamond chemical vapor deposition, simulation of surface processes during diamond and c-BN growth, plasma chemical vapor deposited fine grain diamond and tetrahedral hydrogenated carbon films, *in situ* Raman spectroscopy and confocal Raman imaging for the analysis of CVD diamond films, analysis of surface kinetics in time-dependent Monte Carlo simulation of diamond growth, fabrication of nanopatterns in diamond and diamond-like carbon films by focused ion beam, nanocrystalline diamond for medicine, and more. In the collection *Semiconductor Science and Technology*, the outgrowth of the ''Frontier Science Research Conferences: Semiconductor Science and Technology'', September 7 – 11, 1998, La Jolla, CA, USA, the research in semiconductor science and technology worldwide is covered. A wide range of topics is included: 2D high-power laser diode arrays, optical multiplexing technologies based on monolithic vertical-cavity surface-emitting laser arrays, photons in three dimensionally structured semiconductor microcavities, progress in semiconductor lasers pumped by cathode rays, II – VI semiconductor distributed Bragg reflectors: fabrication and characterization, self-assembled In(Ga)As/Ga(Al)As quantum dots: high speed lasers and novel quantum dot detectors and transistors, growth of InAs quantum dots on silicon, characteristics and physical processes in InAs/GaAs self-organized quantum dot lasers, MBE growth of InAs edge-emitting quantum dot lasers, and more. The applied nature of the papers presented makes these volumes the ultimate research resource to active researchers in the field. They can be used by post-graduate students, by faculty and research staff at universities and research institutions, by research workers in industry and national laboratories, and by staff of science-supporting agencies and science foundations. (Publisher ''Stefan University Press'': 1010 Pearl Street, La Jolla, CA, USA, 92038-2946; e-mail: press@stefan-university.edu; URL: http://www.stefan-university.edu/STEFAN-UNIVERSITY-PRESS/) [1]

**Morozov A D** ***Introduction to Fractal Theory*** 2nd ed. (Izhevsk: Institute for Computer Studies, 2002) 160 pp. ISBN 5-93972-172-9.

This book covers the fundamentals of the theory of fractals and consists of two parts and an appendix. The first and second parts cover, respectively, constructive and dynamic fractals, and the appendix contains complementary material. Constructive fractals are built using a fairly simple recursion procedure, have a 'fine' structure (i.e., contain arbitrarily small scales), and possess self-similarity. Such fractal sets are too irregular to be described in traditional geometrical language. Numerous examples of constructive fractals of the Kantor, Koch, Minkowski, Serpinskiĭ, Levy, etc. types are considered and analyzed using linear transformations and fractal dimension calculations. The exposition is accompanied by historical commentary. The second part addresses the fractals that appear in discrete nonlinear dynamical systems. These are sets whose Hausdorff (or fractal) dimension is larger than the topological dimension. These fractals include the one-dimensional complex endomorphisms considered by Julia and Fatu early in the 20th century. The book presents the fundamentals of the modern theory of such endomorphisms. Julia, Mandelbrot, and Newton fractals are used as examples to illustrate the exposition. New results on hypercomplex dynamics are included in the book. In the appendix, supplementary mathematical material on the theory of sets is presented, the definition of the line is discussed, and the fundamentals of the theory of dimension — primarily of Hausdorff's dimension — is covered. The book can be used as a manual on fractals and is primarily targeted at students in physics and mathematics departments of universities. High-school students will find the first part of the book understandable. (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/)

**Chulichkov A I** ***Mathematical Models of Nonlinear Dynamics*** 2nd ed. revised (Moscow: Fizmatlit, 2003) 296 pp. ISBN 5-9221-0366-0.

[1] Stefan University Press welcomes orders for publications in the 'Russian Science and Technology' book series (ISSN: 1543-446X). SUP publishes books by Russian authors in any field of science and technology. Monographs, collections of papers, selected thematic papers, proceedings of Russia-held conferences, and reviews and essays on Russian science and technology may be submitted. For further information: Stefan University Press, POBox 2946, La Jolla, CA 92038, USA; e-mail: press@stefan-university.edu.

Known methods for the mathematical modeling of nonlinear dynamical systems are summarized and new ones are proposed. The mechanisms of initiating dynamic chaos, self-organization, etc. are illustrated with simple examples. A fundamentally new approach to modeling dynamical systems is proposed based on the theory of possibilities and fuzzy mathematics. The method is oriented to the description of dynamics under the conditions of uncertainty and is an alternative to stochastic modeling. Dynamics prognosis methods for a system observed with error-introducing techniques are proposed. This book is for specialists in mathematical modeling as well as for senior undergraduate and post-graduate students in engineering, physics, and mathematics disciplines at colleges and universities. (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/)

**Repik E U, Sosedko Yu P** ***Controlling Flow Turbulence Level*** (Moscow: Izdatel'stvo Fiziko-Matematicheskoĭ Literatury, 2002) 244 pp. ISBN 5-94052-055-3.

The generation and natural degeneration processes of gas flow turbulence are covered. Refined, physically grounded relations for the turbulence degeneration rate are proposed. An original approach to the deturbalization problem of flow in a wind tunnel is considered, and the optimum deturbalization conditions are determined. A new effect, the enhancement of large-scale perturbations interacting with a small-scale turbulence, is established experimentally. The effect of flow turbulence on the results of wind tunnel experiments is examined. Practical recommendations on including this effect are given. The influence of the high level of turbulence on the integrated characteristics of turbulent boundary layer (surface friction, heat transfer, Reynolds analogy) and on the readings of thermo- and pneumometric measuring devices are considered. Effective experimental data processing techniques for turbulent flow studies are suggested, which make experimental results easier to generalize. An engineering hydraulic resistance calculation method is developed for exotically shaped turbulence generation (suppression) systems (honeycombs, punched plates). The book is suited to a wide range of specialists, both experimenters and theorists, working in the field of turbulent fluid and gas flows. The book will be of particular interest for the comparative analysis of wind tunnel data obtained for incoming flows of a different level of turbulence. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

**Batygin V V, Toptygin I N** ***Modern Electrodynamics*** Pt. 1 ***Microscopic Theory*** (Izhevsk: RKhD, 2003) 736 pp. ISBN 5-93972-164-8.

This is a new type of a manual, combining the stylistic manner of a concise textbook with the content of a problem book (with answers and some worked examples). All in all, more than 850 problems and examples are collected in the first part of the book. The book satisfies the requirement for multilevel and more fundamental higher education, for which purpose the material of varying degrees of complexity is included for training third- and fourth-year bachelor students, as well as persons working for the degree of master and post-graduate students. The basic material assumes a knowledge of higher and computational mathematics and classical mechanics at the level of a standard university course, and for some sections acquaintance with the fundamentals of quantum mechanics, mathematical physics, thermodynamics, and statistical physics and kinetics is also required. (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/)

**Tsipenyuk Yu M** ***Physical Principles of Superconductivity*** 2nd ed. (Moscow: Izd. MFTI, 2003) 160 pp. ISBN 5-89155-099-7.

This book is designed as a textbook on a rapidly developing area of physics, in which quantum mechanical laws manifest themselves dramatically on the macroscopic scale. Theoretical fundamentals and experimental material are covered, and the practical applications of superconductivity discussed. It can be used for a course in general physics, as well as for teaching special disciplines. (MFTI Publ.: 141700 Dolgoprudnyĭ, Moscow region, Institutskiĭ per. 9; tel.: (7-095) 408-76-81)

**Lipnitskiĭ Yu M, Krasil'nikov A V, Pokrovskiĭ A N, Shmanenkov V N** ***Nonstationary Aerodynamics of Ballistic Flight*** (Moscow: Fizmatlit, 2003) 176 pp. ISBN 5-9221-0345-8.

In this book, the modern approach to the hypersonic aircraft flight problem, in which dynamics, aeromechanics, and heat exchange are considered simultaneously, is presented, with emphasis on the nonstationary aerodynamic characteristics of axisymmetrically shaped aircraft. Methods for determining damping characteristics, which are based on both approximate approaches (Newtonian theory, method of curved bodies) and rigorous linear theory for bodies of finite thickness, are presented. The important role of viscous effects (the boundary layer, blow-in, laminar-to-turbulent regime transition) in determining nonstationary aerodynamic characteristics of thin blunted bodies in their hypersonic motion is demonstrated. The book is intended for research workers and engineers specializing in the field of nonstationary aerodynamics, boundary layer theory, and flight dynamics of space and rocket technology products. It can also serve as a textbook for undergraduate and post-graduate students at universities and technical colleges. (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/)

**Dmitriev A S, Panas A I** ***Dynamic Chaos: New Information Carriers for Communications Systems*** (Moscow: Izdatel'stvo Fiziko-Matematicheskoĭ Literatury, 2002) 252 pp. ISBN 5-94052-066-9.

Dynamic chaos (chaotic vibrations) constitutes irregular motion which occurs in deterministic nonlinear dynamical systems and cannot be predicted for long time periods. This irregularity and unpredictability result from the dynamics of the system itself rather than from noise and external

disturbing factors. The past decade has seen great interest in utilizing chaos for transmitting information as either carrier vibrations or vibrations modulated by useful signals. This interest is due to dynamic chaos having attractive properties for communications applications and because the development of communications technologies and systems themselves tends to call for new ideas for creating an 'information society' and solving other large problems. Studies in Russia and abroad have shown that dynamic chaos can be used as information carrying vibrations in communications systems, and its properties have been found to differ substantially from those of such traditional information carriers as harmonic vibrations, so that there is every reason to call dynamic chaos a new type of information carrier for communications systems. The book is intended for research workers and senior undergraduate and post-graduate students in related disciplines. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

**Bykov V P, Silichev O O** ***Laser Cavities*** (Moscow: Fizmatlit, 2003) 320 pp. ISBN 5-9221-0297-4.

The basic methods of laser cavity analysis — namely, matrix, integral equation, and optical geometry methods — are presented in this book. Major attention is given to practically constructing cavity schemes capable of imparting to laser radiation the necessary power, small beam divergence, stability or other special properties for the particular active medium and laser operating conditions. A large number of practically important examples are considered. The material in the book is based on a lecture course the authors have been teaching at Moscow State University and MFTI. The book is fully understandable to senior undergraduates at technical colleges and is intended primarily for those specializing in laser physics and engineering. (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/)

**Shifrin E I** ***Three-Dimensional Problems in the Linear Fracture Mechanics*** (Moscow: Izdatel'stvo Fiziko-Matematicheskoĭ Literatury, 2002) 368 pp. ISBN 5-94052-059-6.

This book covers boundary pseudodifferential equations for static and dynamic problems of the theory of elasticity for a space weakened by a flat crack. The numerical and analytical methods the author developed for solving these equations are described, and the calculated results are presented. The qualitative features of the solutions to the equations derived are examined. The book is intended for research workers specializing in fracture mechanics and mathematical physics. Undergraduate and post-graduate students following programs in these fields can also benefit from this book. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit. narod.ru/)

**Khrennikov A Yu** ***Non-Kolmogorov Probability Theories in Quantum Physics*** (Moscow: Izdatel'stvo Fiziko-Matematicheskoĭ Literatury, 2003) 208 pp. ISBN 5-94052-060-7.

Attempts at new versions of probability theory axiomatics, different from the currently-accepted Kolmogorov version, are examined. The subject is topical due to the challenges modern probability theory encounters in describing some phenomena in quantum mechanics. The book will be of interest to undergraduate and post-graduate students and research workers specializing in various areas of theoretical physics and in the probability theory. (Fiziko-Matematicheskaya Literatura Publ.: 117071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

**Lobikov E A** ***Modern Physics and the Atomic Project*** (Izhevsk: RKhD, 2002) 165 pp. ISBN 5-93972-217-2.

This book presents an account of the US and USSR atomic projects, their history, the science and engineering behind them, and various kinds of nuclear and thermonuclear weapons their practical realization brought to life. The clear presentation of the often complex subject matter makes the book ideal for a wide range of readers. (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/)

**Il'ina V A, Silaev P K** ***Numerical Methods for Theoretical Physicists*** Pt. 1 (Izhevsk: RKhD, 2003) 132 pp. ISBN 5-93972-231- 8.

This textbook is based on lectures and practical sessions on numerical methods for future theoretical physicists. The aim of the book is to consider sufficiently simple and easy-to-write algorithms intended primarily for solving typical problems of theoretical physics, which are undeniably necessary in the arsenal of any theoretical physicist. (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/)

**Kudryavtsev L D** ***A Concise Course in Mathematical Analysis*** In two volumes. Vols 1, 2. 3rd ed. revised (Moscow: Fizmatlit, 2002) Vol. 1 — 400 pp. ISBN 5-9221-0184-6; Vol. 2 — 424 pp. ISBN 5-9221-0185-4

Vol. 1: Differential and integral calculus of functions of one variable. Vol. 2: Differential and integral calculus of functions of many variables. Harmonic analysis. The traditional branches of mathematical analysis — differential and integral calculus of functions of one and many variables, and the theory of series — are covered. 1st ed. (1989); 2nd ed. (1998). (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-74-21, 334-76-20; e-mail: fmlsale@maik.ru; URL:http://www.fizmatlit.ru/)

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