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New books on physics and related sciences

Grigolyuk É I, Fil'shtinskiĭ L A ***Regular Piecewise Homogeneous Structures with Defects*** (Moscow: Fizmatlit, 1994) 336 pp. Bibliography: 436 refs. RFBR project 94-01-01941.

Based on years of experience of the authors, their disciples and followers, this book provides an up-to-date presentation of the theory of piecewise homogeneous, defect-containing bodies, plates, and shells. In addition to algorithms for determining coupled mechanical and electrical fields in piezoceramic plates with cracks and inclusions, it also presents macroscopic models for fibrous composites with anisotropic and piezoceramic components and examines crack retardation effects in reinforced plates and shells, produced by stiffening ribs. The approaches used are developed theoretically, transformed into algorithms and then implemented numerically. The results so obtained are presented in analytical form and also summarized in graphs and tables to illustrate how mechanical and electrical fields and defect-tip stress intensity factors depend on the anisotropy, geometry, and rigidity of the material. For researchers, engineers and technicians as well as for undergraduate and post-graduate students interested in the mechanics of solid deformable bodies. (Fizmatlit contact phone number: (7-095) 955-0330)

Kanel' G I, Razorenov S V, Utkin A V, Fortov V E ***Shock-Wave Phenomena in Condensed Media*** (Moscow: Yanus-K, 1996) 408 pp. Bibliography: 768 refs. RFBR project 96-02-30062.

The monograph examines the current scientific literature on and presents the authors' own research into the elastoplastic, strength, and kinetic properties of various kinds of materials under shock-wave loading. It provides fundamentals of mechanics of continuous media, discusses existing experimental techniques, and summarizes both experimental and model calculation results on the viscoelastoplastic deformation and fracture of shocked materials of various classes, including metals and alloys, brittle ceramic materials and rocks, single crystals and glasses, polymers and elastomers. Important features of the book include key examples of shock-induced polymorphism; analysis of the mechanical impact of the interaction of laser and corpuscular radiation pulses with materials, and a review of the equations of state and decomposition kinetics of explosives under shock and detonation waves. The material of the book was selected and presented with the view of predicting theoretically the effects of explosion, high-velocity impact, and laser and corpuscular pulse beams. The inclusion of reference material makes this volume an all the more valuable guide for all those engaged in R&D work on new technologies in which high-power pulsed attacks found widespread application.

Uspekhi Fizicheskikh Nauk **169** (10) 1165 – 1166 (1999)
Translated by E G Strel'chenko

Aleksandrov A A, Grigor'ev B A ***Handbook of the Thermophysical Properties of Water and Water Vapor*** (Moscow: MEI Publ., 1999) 168 pp.

Recommended by the State Standard Reference Data Service (GSSSD R-776-98), this book provides tables of calculated data on the specific volume, enthalpy, entropy, isobaric heat capacity, speed of sound, surface tension, dynamic viscosity, heat conductivity, and Prandtl number of water and water vapor. All the values given in the tables were computed from the equations recommended by the International Association for the Properties of Water and Water Vapor for use in industrial applications. The tabled thermodynamic properties cover a temperature range of up to 800 °C and a pressure range of up to 100 MPa (up to 1000 °C for pressures below 10 MPa), including saturation states. The values of dynamic viscosity are presented for the same range of parameters. The temperature limit for the applicability of heat conductivity data ranges from 800 to 500 °C depending on the pressure. The text displays all the equations used in the computations, and an Appendix presents graphs showing how some of the thermophysical properties of water and water vapor depend on state parameters. (MEI Publ. regular mail address: 111250 Moscow, ul. Krasnokazarmennaya, 14)

Asalkhanov Yu I ***Ellipsometry of Submonolayer Coatings and the Near-Surface Layer in Solids*** (Ulan-Udé: BNTs SO RAN Publ., 1998) 208 pp. Bibliography: 38 refs.

This monograph is concerned with the molecular interpretation of the magnitude and variation of the ellipsometric parameters of solids in the field of submonolayer coatings. For solids modelled by an ensemble of linear harmonic oscillators, it is shown that the values of the optical constants are determined by the Maxwell – Boltzmann distribution of the electron gas in the near-surface layer. The author provides experimental evidence that at submonolayer coating thicknesses the variations in the ellipsometric parameters are determined by variations in the transparency and in the work function of surface barrier in solids. For a wide range of specialists in the physics of surface phenomena. (BNTs SO RAN Publ. regular mail address: Ulan-Udé, ul. Klyuchevskaya, 40a)

Shmyglevskiĭ Yu D ***Analytical Gas and Fluid Dynamics*** (Moscow: Editorial URSS, 1999) 232 pp. Bibliography: 113 refs. RFBR project 98-01-14006.

This book is a collection of papers written by the author over the period 1957 – 1998. It presents the variational principles for gas dynamics with a minimum of restrictive assumptions and for magnetic hydrodynamics with infinite conductivity; develops the full systems of laws of conservation for gas dynamics and the electromagnetodynamics of a perfect gas, and presents an analytical shape optimization solution for supersonic nozzles and for bodies in plane-parallel and axisymmetric gas flows. The author also constructs exact

solutions of the Navier – Stokes equations for steady incompressible flows, which exhibit such features as vortex rings, ring pairs, 'vortex destruction' structures and their chain arrays, etc. (Editorial URSS Publ. contact information: tel./fax (7-095) 135-4423, tel. (7-095) 135-4246, e-mail: urss@urss.isa.ac.ru)

Ternov I M ***The Spin of Relativistic Particles. An Introduction*** (Moscow: Moscow State University Publ., 1997) 240 pp. Bibliography: 41 refs.

The text addresses the spin theory of relativistic particles, the spin dynamics of particles moving in an external electromagnetic field, electron spin measurements, the measurement of the anomalous magnetic moment of the electron, and polarization and spin effects in electroweak interactions of fermions moving in an external electromagnetic field. The book also discusses spin engineering problems such as the creation of polarized particle beams and polarization control, and summarizes a number of major high-energy physics developments based on the application of relativistic spin-oriented beams. The text has developed from a lecture course on quantum mechanics given by the author to students at the MSU Physics Department over a number of years, and also includes the material from some special courses for students in theoretical physics. (MSU Publ. regular address: 103009 Moscow, ul. B. Nikitskaya, 5/7)

Brennan R P ***Dictionary of Scientific Literacy*** (Transl. from the English by B A Borisov) (Moscow: Mir, 1997) 368 pp. [New York: John Wiley & Sons Inc., 1992]

With its 700 or so alphabetically ordered entries giving an in-depth presentation of the most-up-to-date scientific concepts, terms, and definitions, this is a handy, easy-access reference source of an American author intended for a wide range of readers, including students, school teachers, and all those interested in science and technology. (Mir Publ. regular address: 129820, GSP, Moscow, I-110, 1st Rizhskiĭ per., 2)

The books listed above are currently available in the library stock of the MSU Department of Physics (lib@phys.msu.su)

Compiled by *E V Zakharova*