

New books on physics and related sciences: December 2024

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Sagdeev R Z *Selected Works* in 2 volumes. (Editorial Board: Prof. B N Breizman, Academician V E Zakharov, Academician L M Zelenyi, Academician D D Ryutov, Academician M P Fedoruk) (Novosibirsk: IPC Novosibirsk State University, 2024) ISBN 978-5-4437-1527-8.

Vol. 1. *Plasma Physics and Controlled Thermonuclear Fusion*. 584 pp. ISBN 978-5-4437-1528-5.

Vol. 2. *Space Physics. Science in the Modern World*. 444 pp. ISBN 978-5-4437-1530-8.

This is a two-volume collection of selected works by Roald Zinnurovich Sagdeev, an outstanding Soviet, Russian, and American scientist. The first volume includes Sagdeev's research in the field of plasma physics and controlled thermonuclear fusion, including anomalous diffusion, collisionless shock waves, weak turbulence theory, neoclassical transport, and parametric instabilities. Many articles are provided with comments written by celebrated physicists to explain the historical context and subsequent progress in the field. The first two chapters in the first volume are provided with comments by the author and offer invaluable material on the history of the development of the theory of anomalous diffusion and collisionless shock waves in the 1950s. The second volume of Sagdeev's selected works reflects his outstanding contribution to the development of space science. This includes the theory of plasma phenomena in near-Earth and distant space, and the realization of many satellite experiments. In particular, he was the head of the historic VEGA project, which involved sending two spacecraft to study Halley's comet from a short distance. The final chapters contain articles on international space projects at the time of the collapse of the Soviet Union and on the responsibility of scientists to society. In the interests of historical accuracy, the articles are printed in the language of the original publication, i.e., in Russian or English, with the diversity of the bibliography styles preserved. For articles in Russian, a link to the English translation is provided. Comments are published in English. The two-volume work will be of interest to physicists, students, and teachers, as well as historians of science. (Address for requests: Sofya Viktorovna Isakova, Deputy Director, the Publishing and Printing Center of NSU, 630090 Novosibirsk, Pirogova St. 2, office 108, e-mail: ed@post.nsu.ru. In the request, please indicate: mailing address with postal code, customer's full name, telephone number, e-mail, number of copies of the two-volume edition, payment method, and whether requested by a private person or an organization (for purchases by an organization, provide details necessary for concluding an

agreement). The cost of the two-volume edition is 2869 rubles plus shipping.)

Antonets I V, Shavrov V G, Shcheglov V I *Waves in Multilayer Structures. Part 3. Calculation Methods: Algorithmic, Energy Balance, Finite Differences*. (Moscow: Fizmatlit, 2024) 448 pp. ISBN 978-5-9221-1992-4.

This is a presentation of the fundamentals of methods for calculating the propagation of one-dimensional and electromagnetic waves through multilayer structures. In part 3, the parameters of propagating waves and the energy reflection and transmission coefficients are determined via algorithmic, energy balance, and finite-difference methods. The focus is on the algorithmic method, which is quite universal in nature and allows simple automated implementation for structures with an arbitrary number of layers. The balance and energy fluxes of propagating waves are discussed in detail for media with complex parameters, including with the interference flux taken into account. A scheme for using the finite-difference method in the time domain to calculate wave propagation in layered structures is given. Some applied problems are solved. Many examples are adduced, and methodological suggestions are given for students' independent work. The book is intended for experts working in the field of wave physics, electrodynamics, magnetic phenomena, and acoustics, for engineers and designers of microwave, optical, and acoustic equipment, as well as for students and postgraduates in the relevant fields. The first part of the monograph, "Calculation Methods: Direct, Averaging, and Matrix" was published in 2022 (see *Physics–Uspekhi* **193** 573 (2023)), and the second part, "Calculation Methods: Impedance, Elimination, and Re-reflections," was published in 2023 (see *Physics–Uspekhi* **194** 679 (2024)). (Fizmatlit Publishing House: tel. +7(495)005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Semikhatov A *One Hundred Years of Withholding: Quantum Mechanics for Everyone in 25 Essays*. (Moscow: Alpina Non-Fiction, 2024) 372 pp. ISBN 978-5-00223-174-4.

Quantum mechanics is the most accurate way known to humankind to describe the world at the fundamental level that defines its structure but is itself inaccessible to direct observation. Quantumness underlies the existence of atoms, people, stars, and nearly everything else. Manifestations of quantum effects already harnessed by technologies are as close to miracles as can be. But, by virtue of its inherent structure, quantum mechanics evades explanations regarding the behavior of quantum objects and the structure of reality. At the dawn of the second quantum century, Alexei Semikhatov, author of the bestseller, *Everything That Moves: Walking Across the Restless Universe, from Cosmic*

Orbits to Quantum Fields, offers a systematic review of the current state of quantum mechanics. What are the fundamental features of the quantum world and what is the cost of reconciling them with our intuition? By what rules do quantum systems develop in time and how do probabilities interfere with this development? How do various interpretations of quantum mechanics tempt us into positing inherently philosophical maxims about the possible structure of reality—from parallel universes to disruptions in perception? And how does our normal reality arise from the foreign quantum one? What exactly does a quantum computer do, what is quantum entanglement and how can it be harnessed, and why are quantum objects forced to exist without certain properties? It turns out that quantum mechanics can be discussed in depth using lucid language and that addressing its intricacies makes this discussion only more exciting. (Alpina Non-Fiction: 8 (800) 550-53-22, +7 (495) 120-07-04, e-mail: shop@alpinabook.ru, URL: <https://alpinabook.ru/>)

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