Book Reviews

Fundamentals of Plasma Physics. By V. E. Golant, A. P. Zhilinsky, and I. E. Sakharov. John Wiley and Sons, Inc., New York (1980). 405 pp. $55.95.

Few phenomena in plasma physics are more deserving of the adjective "fundamental" than Landau damping, and few equations are more fundamental than the Vlasov equation. Strangely enough, neither of these significant Russian contributions appears in the volume by the three Soviet authors. Lest they be accused of anti-Soviet bias, I should hasten to add that one would look in vain in this book for Alfven waves, ion waves, beam plasma instabilities, and a host of other fundamentals of plasma physics. Selected topics in plasma physics would probably be a more appropriate title.

Having thus criticized their selection of topics, I should point out that the phenomena that are covered in this volume are thoroughly and intelligently treated, and the mathematical treatment is often complemented by physical insights.

About two-thirds of the book treats collisional plasmas in the presence of neutrals. Elastic as well as inelastic collisions, including ionizing collisions, are discussed in detail, and a brief description is given of the interaction of charged particles with solid surfaces. Then the kinetic equation and its consequences of interest to gas discharge type plasmas, like distribution functions in electric fields and ionization equilibria, are given. Chapter 6 treats the moment equations, and Chap. 7 transport processes in the absence of magnetic fields.

The discussion of topics of interest to the fusion-oriented plasma physicist commences in Chap. 8 with the description of single particle motion in magnetic fields. This chapter also deals with some basic phenomena of collisionless plasmas like plasma diamagnetism, polarization, and motion across magnetic field lines. It also contains a good description of banana orbits in tokamaks and single particle motion in a mirror geometry. Chapter 9 deals with transport processes in both weakly and strongly ionized plasmas in magnetic fields. This chapter even contains a dispersion relation (there should have been many more) for a collisional drift wave.

The last chapter treats magnetohydrodynamic equilibria and a few instabilities, like the flute and interchange modes. The stabilized z pinch with a thin surface current is also adequately discussed.

It may be the different interest of the three authors that is responsible for the somewhat schizophrenic nature of this book. Is it addressed to the gas discharge physicist or the student of magnetic confinement fusion? While I cannot speak for the former, the latter is certainly shortchanged.

The book was used as a textbook at the Leningrad Kalinin Polytechnic Institute. It contains no problems for the students.

The translation is adequate except for occasional lapses like "motion equation" instead of equation of motion, or "Sydem criterion" instead of Suydam criterion.

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Structure Shielding Against Fallout Gamma Rays from Nuclear Detonations. L. V. Spencer, A. B. Chilton, and C. M. Eisenhauer. NBS Special Publication 570, U.S. National Bureau of Standards (Sep. 1980). For sale by Supt. of Documents, U.S. Government Printing Office, Washington, D.C. 20402. 967 pp. $20.

It is only occasionally that an exhaustive treatise on a shielding subject is published. We have one now in the nearly 1000-page book *Structure Shielding Against Fallout Gamma Rays from Nuclear Detonations* by L. V. Spencer, A. B. Chilton, and C. M. Eisenhauer.

All of the authors have been leading researchers in shielding, especially fallout shielding, for many years. Spencer and Eisenhauer are especially well known for their development and application of the moments method for gamma-ray penetration and, with N. FitzSimons, of the so-called "Standard Method" for fallout shielding analysis developed in the 1960s. Chilton is especially well known for his research on gamma-ray reflection and other problems related to shelter shielding design. Although very few people are engaged these days in fallout shielding analysis, the motivation for it has not entirely disappeared, considering the nuclear arsenals in various parts of the world. There is the possibility, too, of some spinoff—the technology can also be used for analysis of reactor accident fallout.

Most shielding calculations nowadays generally employ one or more of the popular methods—discrete ordinates, Monte Carlo, or point-kernel integration—but this book describes an altogether different approach. Like the point kernel-kernel method, the engineering standard method starts with infinite-medium moments-method data, but unlike the point-kernel method, it makes extensive use of angular