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BOOK REVIEWS

Plasma Physics: Basic Theory with Fusion Applications, 3rd edition, by K. Nishikawa and M. Wakatani. Springer-Verlag, Berlin, 2000, 342 pages. ISBN 3 540 56845 X. £51.50.

This is a new edition of a book that was first published in 1990. It consists of two parts, the first of which deals with the basic properties of plasmas, such as kinetic theory and the properties of waves. The second part is more specifically concerned with fusion plasmas, and discusses confinement, magnetohydrodynamic stability and transport processes. A final chapter describes the current state of progress on fusion, both magnetic and inertial-confinement. The treatment is at a level appropriate for research students, or for use as a reference by workers in the field. There are problems at the end of each chapter, as well as a set of more extended problems in an appendix, so the reader has plenty of opportunity to test his or her understanding. There are also many references to the original literature.

Many readers will, of course, be familiar with earlier editions of this book, and will wish to know how the latest edition differs from previous ones. The answer is that the book is essentially the same as the 2nd edition, apart from the fact that the closing chapter on progress in fusion research has been brought up to date. This is a useful book, which has material, for example on parametric excitation and mode coupling, that does not always appear in texts at this level. Its continuing availability in print is to be welcomed, though I would say that those who are in possession of a copy of an earlier edition need not feel immediately obliged to acquire the latest edition.

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Fusion: A Voyage through the Plasma Universe, by H. Wilhelmson. Institute of Physics, Bristol, 2000, 158 + xxiii pages. £21.95, $35.

This delightful little book should really be entitled 'Fusion and Related Matters', since its scope is extremely wide. It not only deals with fusion in the cosmos (Part I), and on Earth (Part II), but also skates over related topics such as fluid flow, chaotic phenomena in general contexts, comets, etc. The reader is treated to a panorama of plasma physics problems, with heavy stress on magnetohydrodynamics and other fields that are strong in Sweden. Analogies of plasma phenomena with everyday life experience abound. The book is up to date, concluding with sections on inertial confinement, laser fusion, ion beam drivers and also a possible future fusion reactor.

Three classic papers are reproduced, including Hannes Alfvén's *Nature* paper of 1942, introducing the waves that bear his name, and that of

Chandrasekhar and Fermi on magnetic fields in spiral arms (1953). There is a glossary and a name index. A valuable overview.

However, this review would not be complete without pointing out a few slips. These could easily be put right in a second edition. The term 'atomic bombs' is not usually used for purely fusion devices (p. 14). The general word is 'nuclear', covering both kinds. The *Proceedings of the Royal Society* did not exist in 1733 (p. 46). The 1991 JET demonstration at Culham was *not* the first to demonstrate fusion reactions in a plasma (p. 118). However, when covering so much ground, mistakes are hard to avoid. When these errors are corrected, this book seems to be a good candidate for a paperback edition. The reduction in price would certainly be welcome.

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Dusty Plasmas: Physics, Chemistry and Technological Impacts in Plasma Processing, edited by A. Bouchoule. Wiley, New York, 1999, 408 pages. ISBN 0 471 97386 6. £90.

There has been a very rapid growth of literature in dusty plasma physics. Although four conference proceedings dealing with the physics of dusty plasmas have appeared on the market, a book on the physics and chemistry of dusty plasmas as well as the impact of dusty plasmas in plasma processing has not previously been available. A. Bouchoule has done a remarkable job of inviting eight physicists from the plasma processing community to write the comprehensive articles that are contained in this book. The book is divided into four chapters; there is no preface or foreword from the editor.

Chapter 1, by J. F. Boeuf and C. Punset, is very well written and organized. It contains the basic physics of the plasma sheath, charging processes, and various forces acting on dust particles. The results of Monte Carlo simulations and analytical models are presented. Furthermore, a brief summary of the plasma crystal is also found here. The materials in Chapter 1 are quite educational and informative for beginners, despite the fact that the authors neither mention the effect of an external magnetic field nor discuss the existing attractive forces for the charged dust grains that form dust lattices. Chapter 2, by J. Perrin and C. Hollenstein, focuses on sources and growth of particles. Analysis and modelling for coagulation or agglomeration into microscopic particles are presented. The material in Chapter 2 is rather pedagogical and is relevant for processing plasmas. Chapter 3, by L. Boufendi, W. Stoffels, and E. Stoffels, presents an overview of the various diagnostic methods for dusty particles and dusty plasmas. Theoretical, experimental, and innovative aspects of the diagnostic methods are discussed. Chapter 4, by A. Bouchoule, deals with the technological impacts of dusty plasmas. It discusses the physics of surface contamination, dust-free processing, and particle processing, and points out present and possible future applications of dusty plasma energetics in managing dusty plasma reactors. This book does not contain any information regarding collective interactions in dusty plasmas.

The book should be useful for students, researchers, and engineers who work

in processing plasmas, although some dusty plasma physicists might enjoy reading at least Chapters 1 and 4. This book is recommended for a departmental library, despite its high price.

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