for various astrodynamic calculations. Although the author makes the point that a long and tedious list of references does not serve the student, I have found that such material gives the student a valuable key to the literature which allows him to extend his research beyond the classroom. Nor does the author supply a comprehensive list of notation and symbols for the benefit of the student.

Some subjects that are included are as remarkable as those that are excluded. Chapter 8, for example, treats the dynamics of the rocket problem, a subject usually covered in texts on ballistics or propulsion. Attention is also given to thrusting transfer orbits and to stabilized platforms and accelerometers, again subject matter that is ordinarily treated in texts on space mechanics, optimization theory, and guidance and control. The introduction of such material, which many astrodynamicists may consider extraneous and outside the scope of the astrodynamics specialty, actually increases the value of the book. Such material shows the student the wide interdisciplinary nature of astrodynamics and demonstrates its interrelationship with the other astronautical sciences.

Despite the inadequacies noted in the foregoing comments, I intend to use the book as a reference source in the courses that I teach and to encourage its utilization by other instructors in astrodynamics. It also should take a place on the shelves of all practicing astronautical engineers and serious students of astrodynamics.

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Plasma Physics

Controlled Thermonuclear Reactions. L. A. Artsimovich. Translated from the first Russian edition (Moscow, 1961) by P. Kelly and A. Peiperl. A. C. Kolb and R. S. Pease, Translation Eds. Gordon and Breach, New York, 1964. xvi + 405 pp. Illus. $19.50.

This work, which appeared in Russian in 1961, is devoted to a complete and critical survey of experimental work in the controlled release of fusion energy. The author, for many years one of the leading figures in the Soviet controlled fusion program, is an experimental physicist with remarkably keen physical insight and a complete dedication to the new field of basic physics that has emerged from this program. The book strongly reflects his personal point of view, and emphasizes the physical knowledge and understanding yielded by controlled fusion research.

After a brief first chapter on thermonuclear reaction rates, and the conditions which a reactor generating useful power must satisfy, the next three chapters provide a simple, understandable introduction to plasma theory. The emphasis in these chapters is on the physical clarity of each topic discussed, rather than on the formal elegance of the deductive theory. The remaining four chapters deal with experiments.

Chapter 5 treats fast high-power discharges, in which the magnetic pressure is offset by the inertial reaction of the plasma. The author's views on "the technological hopelessness of power generation from thermonuclear reactions in short-term pulsed devices" may not be shared by all, but there should be general agreement that the observations and their interpretation are of independent value in plasma physics. The next chapter discusses slow electrical discharges, mostly those stabilized by strong solenoidal magnetic fields. The British Zeta and the Soviet series of Tokomak devices are treated in considerable detail.

The final two chapters deal with "magnetic traps," in which the confinement of plasma is carried out by an externally produced magnetic field and does not require any plasma currents. Chapter 7 discusses some of the physical principles underlying these traps, while chapter 8 describes the stellarator and magnetic mirror programs in considerable detail, with some attention also to other, less thoroughly explored, magnetic configurations.

Without question this book is a clear, balanced, and authoritative description of the controlled fusion program. In the 5 years since 1960, when the manuscript was virtually complete, the experimental picture has become much more detailed and complete. As a result, the broad area of plasma physics now forms a mature field of investigation, with that mixture of theory and observation which characterizes all good science. In much of the earlier work the contact between theory and observation was limited. However, the major concepts and programs today are still sufficiently similar to the description provided by Artsimovich so that the book will provide a useful reference for any scientist seriously interested in this field.

The book serves an additional useful function at the present time by stressing both the long-range character and the many difficulties of controlled fusion. It is evident from the many eloquent passages in the book that Artsimovich is at the same time a passionate advocate of controlled fusion research, with its goal of unlimited power for mankind, and also a convincing supporter of a long time scale for the program "which surpasses in difficulty all the technical problems to which the scientific advances of the twentieth century have yet given rise."

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Weighing and Its Instruments

Scales and Weights: A Historical Outline (Yale Studies in the History of Science and Medicine, vol. 1). Bruno Kisch. Yale University Press, New Haven, Conn., 1965. xxi + 297 pp. Illus. $15.

This volume presents for the first time in English a comprehensive outline history of weighing and its instruments, ranging from the earliest known examples, which date from the millennia before Christ to modern times. Of three early inventions of the human mind—counting, measuring, and weighing—Bruno Kisch, the author, not only describes weighing as the most recent and sophisticated but also points out that it was the last to be accepted and integrated by society, even in the field of the natural sciences. He approaches the subject as historian, metrologist, artist, and collector.

The author, a physiologist and cardiologist, has served for many years at the Yale University School of Medicine as curator of the Edward Clark Streeter Collection of Weights and Measures (which will be cataloged in volume 2 of this series). He is particularly well qualified to write this book, bringing to the task his considerable knowledge based on long experience and study in the field of scales and weights. This knowledge