BOOK REVIEWS

Regge Poles and S-Matrix Theory. By Steven C. Frautschi. 200 pp. Benjamin, New York, 1963. Cloth $7.50, paper $3.95.
Reviewed by J. C. Polkinghorne, University of Cambridge.

Professor Gold used to liken cosmologists to a drunk looking for his lost key under a lamp post—it may not be the right lamp post but it is the best one he can find. Strong-interaction physics is an equally mysterious subject and, apart from symmetry principles, the two most used lamp posts have been potential theory and relativistic perturbation theory. In his introduction to the subject, Professor Frautschi has leaned most heavily on the former. The reviewer slightly regrets this, partly because he has spent more time encircling the other one, and partly because perturbation theory can represent the vital effects of crossing clearly.

However, since Regge poles were first found under the potential lamp post, it is ungenerous to complain—particularly of a book which presents so readable and useful an introduction to modern ideas. It falls into two halves, the one concerned with the Mandelstam representation and such notions as the strip approximation, the other dealing with Regge poles and high-energy behavior. Professor Frautschi is particularly successful in seeing that the reader understands what is going on and does not get lost in a welter of formalism. The book takes the subject up to the summer of 1962 and is an excellent addition to the "Frontiers in Physics" series.

Cosmical Electrodynamics. Fundamental Principles, (2nd ed). By Hannes Alfvén and Carl-Gunne Fälthammar. 221 pp. Oxford, New York, 1963. $9.60.
Reviewed by S. Fred Singer, University of Maryland.

Hannes Alfvén's *Cosmical Electrodynamics* was first published in 1950. It became a classic overnight. Nearly a generation of physicists has been brought up on it. It appeared at a crucial time in the development of physics. The fundamental ideas which were discussed in this first edition of 1950 have found application in two very important and growing areas: thermonuclear research and space research; one, the development and exploration of magnetohydrodynamics in the laboratory, the other, the investigation of magnetohydrodynamic conditions in the vicinity of the earth and in interplanetary space. We will probably never be able to estimate precisely to what extent Alfvén's book contributed to the rapid growth of these two fields, but there is no doubt that its influence was great. It is easy to show that the pioneer workers in these research areas, and the many students who were attracted into these fields, all used Alfvén's book as a primary reference.

The new edition of *Cosmical Electrodynamics* has been awaited with great interest, and it proves to be well worth the wait. Alfvén and his coauthor have made a very wise decision by concentrating this volume on fundamental principles only, and by not attempting to cover the vast areas of applications which now exist and are constantly developing. In essence, therefore, this book will not be outdated very soon. It serves as an excellent exposition of the phenomena which underlie laboratory and cosmic magnetohydrodynamics. Furthermore, the exposition is extremely direct and easy to follow. Therefore, the volume should also serve as an excellent textbook, in addition to its obvious purpose as a technical monograph.

The first four chapters of Alfvén's first edition have now been expanded into the thorough exposition of four general areas: (1) the motion of a single charged particle in a magnetic field; (2) magnetohydrodynamics; (3) plasmas without magnetic fields; and (4) the final long chapter on plasmas with magnetic fields. The selection of topics turns out to be complementary to the well-known monograph of Spitzer's. For example, Alfvén does not treat such topics as Landau damping, two-stream instabilities, etc.

It may be helpful to highlight those topics which are greatly expanded in this second edition as compared to the first edition: the connection between Störmer theory and the adiabatic methods; adiabatic invariants; acceleration in varying magnetic fields; expanded treatment of MHD waves, including dispersion relations; many applications of MHD, including isorotation, forcefree fields, stability problems, magnetic field generation mechanisms, runway electrons in plasmas; expanded discussions of plasmas in magnetic fields, particularly the topics of conductivity and diffusion.

One of the attractive features of the volume is its close adherence to experiments and experimental results wherever possible. Indeed this close relation between theory and experiments has characterized much of Alfvén's personal philosophy. In his laboratory were conducted some of the earliest magnetohydrodynamic experiments dealing with simulation of cosmic rays in the earth's magnetic field and with aurora. In the present second edition one sees results of experiments with plasma rings, with model experiments on magnetohydrodynamic instabilities, and with experiments on hydromagnetic waves (better known as Alfvén waves, although not referred to as such in this book).

The Moon, Meteororites, and Comets. Barbara M. Middlehurst and Gerard P. Kuiper, eds. Vol. 4 of The Solar System. 810 pp. Univ. of Chicago Press, Chicago, 1963. $15.00.
Reviewed by E. J. Opik, Armagh Observatory and University of Maryland.

The volume links with Vol. 3 of the same series in that it has the moon in common. In 22 chapters, each of which is a separate monograph written by experts of world-wide reputation, an exhaustive account is given of the structure of the moon's surface as obtained with optical, radio, and radar means; of meteorite falls; of meteorite craters from observed falls, recent falls, or fossils; of the empirical and theoretical aspects of impact cratering which has become an independent branch of mechanics bordering on astrophysics and engineering; of the physical, chemical, and mineralogical properties of meteorites; of the isotopic and dynamic evaluation of me-