the same subject matter. Even a topologist might enjoy reading Markushevich's chapter on Riemann surfaces in which he develops the general theory of such surfaces by using topological tools.

After a descriptive and historical introduction, the author discusses mainly fundamental notions of the theory in the first three chapters. Complex numbers and operations on them, point-sets in the plane, complex functions, differentiation, and integration are considered, and geometrical interpretations as well as hydromechanical interpretations are given. The third chapter also contains ramifications of Cauchy's theorem. A very nice proof of Cauchy's integral theorem is given in Chapter 5. The author discusses Cauchy's integral formula, Liouville's theorem, Morera's theorem, Weierstrass' theorem, the Poisson integral, and Schwartz' formula in Chapter 6. The remaining four chapters cover in detail—and again with various examples—Laurent series, isolated singularities, entire and meromorphic functions, residues and their applications, the principle of the argument, analytic functions, Riemann surfaces, elliptic functions, and the Christoffel-Schwartz formula.

This book represents indeed a welcome addition to the library of any mathematician, physicist, or engineer who is interested in the theory of analytic functions and its many beautiful applications.

Atomic Spectra and the Vector Model. (2nd ed.). By Chris Candler. 412 pp. Van Nostrand, Princeton, N. J., 1964. $18.50.
Reviewed by William F. Meggers, National Bureau of Standards.

After the lapse of a quarter century since the publication of a major treatise on atomic spectra, the present decade has already produced at least five, viz., *Quantum Theory of Atomic Spectra* by J. C. Slater in 1960 (reviewed in *Physics Today*, May 1961, p. 40); *Atomic and Molecular Spectroscopy* by M. A. El'yashevich in 1962; *Atomic Spectra* by H. G. Kuhn in 1962 (reviewed in Physics Today, December 1962, p. 64); *Optical Spectra of Atoms* by S. E. Frish in 1963; and *Atomic Spectra and the Vector Model by* Chris Candler in 1964.

The last is a complete revision of a two-volume first edition published in 1937. In both editions Candler has omitted the heavy mathematics of quantum mechanics and striven to hang the immensely complicated facts of atomic spectra on the easily comprehended vector model. For justification, he quotes the following letter from Michael Faraday to Clerk Maxwell: "There is one thing I would be glad to ask you. When a mathematician engaged in investigating physical actions and results has arrived at his own conclusions, may they not be expressed in common language as fully, clearly, and definitely as in mathematical formulae? If so, would it not be a great boon to such as we to express them so—translating them out of their hieroglyphics that we also might work upon them by experiment." Furthermore, a dozen physicists and probably a hundred chemists use the spectrograph for every one who is interested in the theory of atomic energy states. In particular, a spectrochemist wishing to make rational choices of analysis lines requires experimental information primarily concerning wavelengths (or wavenumbers), relative intensities, quantum numbers, and observed excitation energies.

Candler's *Atomic Spectra and the Vector Model* gives relatively few of these data but it is almost unique in explaining their importance and where they can be found. All phases of atomic spectroscopy, from Absorption Spectra to Zeeman Effect (except Stark Effect), are presented in twenty chapters, each ending with a brief bibliography and selected references, frequently to first announcements, but also including some dated 1964. This second edition, like the first, contains a profusion of figures and tables, but eight photographic plates that aptly illustrated the first have been omitted from the second. This omission of photographed spectra is regretted, in view of what Confucius is reputed to have said about a picture.

This volume includes five appendixes: 1. Natural Atomic Units (in mks and Atomic Units); 2. General Bibliography; 3. Rydberg Term Table (recomputed with the modern value of the Rydberg constant); 4. Grotrian Diagrams; and 5. Tables of Protonic Nuclei, Neutronic Nuclei and Deuteronic Nuclei; it ends with a 10-page general index. Among the appendixes, simplified Grotrian diagrams of 82 spectra characteristic of 72 chemical elements (excluding lanthanons and actinons) are original and unique; they give the wavelengths of intense radiations arising mainly from transitions of one excited electron to the ground (or to a metastable) level of the atom or ion.

Candler's pragmatic account of atomic spectra will certainly appeal to all applied spectroscopists and to students who are frightened by quantum mechanics.

Physical Chemistry (2nd ed.). By E. A. Moelwyn-Hughes. 1334 pp. (Pergamon, Oxford) Macmillan, New York, 1964. $12.50.
Reviewed by Victor W. Bolie, Autonetics Division, North American Aviation.

It is unfortunate that so many textbooks in physical chemistry are amateurish in mathematics and thus hazy in theoretical foundation. An exception is this well-written, comprehensive text which presumes the reader is fluent in applied mathematics through the level of partial differential equations and boundary-value problems.

The result is a carefully woven net of rigorous, but modestly bounded, theory around which the host of experimental facts of physical chemistry are fitted. The few typographical errors remaining in the new edition (e.g., the axis labels in the illustration on page 81, and the designation of gram instead of gram-mole on page 99) are trivial and do not detract from the concise style of presentation.

The book begins with the mathematical and experimental foundations of molecular kinetics and the quantum theory and then goes on to a discussion of periodicity and radioactivity, thermodynamics, intermolecular energy, partition functions, light dispersion and absorption, triatomic molecules, and the Raman effect. The various states of matter, including the crystalline, gaseous, metallic, liquid,

dissolved, ionic, and interfacial states are covered in six chapters in a highly systematized fashion. The last part of the text discusses chemical equilibria and reaction kinetics of both homogeneous and heterogeneous systems. The book ends with several brief appendices which include a short list of the more important physicochemical constants, and derivations of some mathematical relationships pertinent to earlier parts of the text.

In this reviewer's opinion, this treatise is an excellent example to the next generation of textbook authors who, in an age of almost-overwhelming rate of expansion of knowledge, will find that the tedium and discipline of learning mathematics is really worth the effort after all.

An Introduction to Discharge and Plasma Physics. Summer School (U. of New England, Armidale, Australia, Jan.-Feb., 1963) S. C. Haydon, ed. 509 pp. Department of University Extension, The U. of New England, Armidale, Australia, 1964. £A3 10s.
Reviewed by L. Talbot, University of California, Berkeley.

Summer institutes have become increasingly popular as a means for providing a concentrated exposé of a topical subject. One of the obvious virtues of a summer course (apparently, even if it is held in January and February, the summer months down under) is that it makes possible the assembling together of a number of authorities whose combined expertise far exceeds that of any single individual who might be available to teach a regular university or industry course. Of course, having a group of experts deliver a series of lectures is no guarantee that the program taken as a whole will be well-organized, coherent, or even particularly informative. In the present instance, I am pleased to report that the effort met with conspicuous success.

The intent of this summer course was, quoting from Editor Haydon's preface, ". . . to outline in a systematic manner the fundamental properties of ionized gases and to provide the basic physics required for a discussion of engineering problems which involve discharge and plasma phenomena." The thirty-five chapters of the volume represent the formal lectures of fourteen participants, plus one post-course contribution. The subject matter of these lectures encompasses a wide range of topics, including kinetic theory and collision processes, surface phenomena, electrical breakdown in gases and liquids, plasma properties and interactions with fields, and glow, arc, and spark discharges. The emphasis, as Haydon indicates, is on engineering, and almost without exception, the contributions contain good physical descriptions of the phenomena under discussion and examples of technical application. Although in some cases the presentations are brief, they are not superficial. Each chapter is followed by a list of general references in addition to the particular sources referred to in the text, which should easily enable the reader to dig deeper, if he so chooses. Editor Haydon has done a most commendable job of unifying notation and maintaining a consistent set of units (mks). There is good cross-referencing between chapters, which gives continuity to the book, and an adequate subject index is provided.

Taken as a whole, these lectures provide an excellent survey of the broad and complex field of discharge physics, and I would recommend them highly to anyone wishing to begin study in this area.

Nuclear Energy in Space. By Erik S. Pedersen. 516 pp. Prentice-Hall, Englewood Cliffs, N. J., 1964. $19.95.
Reviewed by Herbert Malamud, Sperry Gyroscope Company, Division of Sperry Rand Corporation.

During the 1930's, science fiction stories were common which dealt with the "attic genius" type of scientist, who built an atomic-powered space ship in his back yard and flew off to battle. Such a scientist would have found this book invaluable: it covers, in sufficient detail to be a good introduction, just about every part of the subject to which the title lays claim, and a few related fields outside this direct claim area.

Today's "space ship" builders are, however, teams of specialists, and clearly the men who design nuclear power sources will not also have responsibility for fluid-flow analysis in