participants. One wonders: were there no blunders in this complex undertaking? Was it *all* so astonishingly successful, or have some failures been conveniently forgotten? No matter; if there were failures, they were minor and swiftly bypassed by the tide of success. Is the drama overdrawn? In one or two places, perhaps so. For the reviewer's taste, phrases like "The Last Card", "The Terrible Swift Sword", and "Bush Strikes Again" are a trifle over the line, but these are extreme examples; let us grant the authors some license in the interest of readability; readable their story certainly is. Accuracy? In the reviewer's knowledge, only one tiny slip was noticed; J. H. Manley was not engaged in cyclotron work at the Metallurgical Laboratory, as stated on page 103, although he would have been welcome. Fairness? On the whole, good. Names are generously used, although many are perforce left out. One can sense in a small degree that some informants probably collaborated with the authors more effectively than did others, but some of this would seem to be inevitable.

In summary, Hewlett and Anderson have given us a superb job of history writing and one that will, in its various sections, appeal to physicists, chemists, engineers, moralists, lawyers, politicians, students of international affairs, and in fact to anybody alive to the strongest force that is shaping the affairs of the world today.

Atomic and Molecular Processes. D. R. Bates, ed. Vol. 13 of Pure and Applied Physics, edited by H. S. W. Massey. 904 pp. Academic Press Inc., New York, 1962. $19.50. *Reviewed by I. Amdur, Massachusetts Institute of Technology.*

NOT since the appearance in 1952 of the now classic *Electronic and Ionic Impact Phenomena* by H. S. W. Massey and E. H. S. Burhop have I seen a book which has dealt so thoroughly and authoritatively with theoretical and experimental aspects of radiative and collision processes in ionic, atomic, and molecular systems. Professor Bates has shown excellent judgment in enlisting as contributors twenty-one investigators, each of whom is active in at least one of the areas covered in the volume. The special expertness that comes from actually working in a field characterizes each of the twenty-one sections and makes it obvious that the discussions and conclusions are as authoritative as one is likely to find in a subject in which there is so much current and diverse activity. There is so very little of the unevenness in scientific and literary quality usually found in books of this type that one's faith in the possibility of good cooperative compilations is restored.

The following topics are surveyed, with special emphasis on contemporary development in both theory and experiment: forbidden and allowed transitions; photoionization and photodetachment; recombination, electronic and ionic; attachment and ionization coefficients; elastic and inelastic scattering of electrons; energy loss by slow electronics; collision broadening of spectral lines; collisions in atomic systems with specific treatment of range, energy loss, excitation, ionization detachment, charge transfer, elastic scattering, mobility, diffusion, and relaxation in gases; high temperature shock waves; and chemical processes.

There are very extensive and complete bibliographies at the end of each section and a subject index listing all the species of atom or molecule referred to in the text. This particular index should prove more useful than the usual general subject index, which is also included, since general indices seem to have an uncanny ability to list topics under designations other than those which occur to the reader.

There is one section, Chemical Processes, which differs in character from the others. Each of the other sections treats in depth a relatively narrow aspect of atomic and molecular processes. The discussion of chemical processes is more encyclopedic and tends to cover broad areas of chemical kinetics. As a result, it does not carry the air of authority of the more specialized treatments. Since treatises the size of the present volume have in fact been devoted exclusively to chemical processes, the criticism is not one of the author but rather of the inclusion of so broad a topic in a compilation where the average length per section is of necessity under fifty pages.

It is a rare pleasure to agree wholeheartedly with the publisher's prediction on the jacket of the book: "The volume will for many years to come be an indispensable reference to anyone engaged in research on atomic physics, molecular physics, plasma physics, astrophysics or space science."

Elementary Quantum Field Theory. By Ernest M. Henley and Walter Thirring. 277 pp. McGraw-Hill Book Co., Inc., New York, 1962. $8.95. *Reviewed by J. C. Polkinghorne, University of Cambridge.*

IN recent years, there has been no lack of books about quantum field theory; the two authors of this volume have achieved a particular distinction in writing one of a new kind. It is elementary in scope, not aspiring to Feynman graphs, let alone dispersion theory, but its aim is to convey a thorough understanding of the conceptual framework of quantum field theory. To do so, free from irrelevant mathematical complication, a series of simple models is discussed.

The first is that of a free Bose field. The central importance of the harmonic oscillator with its zero-point fluctuations is clearly established. Then the solutions of neutral scalar theory, pair theory, and the Lee model are described and the insights they afford into more realistic theories discussed. In the final section, a thorough account of Chew-Low static theory is given. This enables the authors to make a satisfying final contact with the aim of all physics, the interpretation of experimental data.

It is an excellent pedagogical plan, admirably executed. The authors are particularly good at summarizing the intuitive understanding behind a piece of formal manipulation. The depth of understanding aimed at means that it is not a particularly easy book for graduate students, but the concreteness of the examples provided should considerably aid the mastering of such elusive ideas as vacuum fluctuations, renormalization, real and bare particle states, and other such notions that quantum field theory has made the stock-in-trade of physics.

This is the first textbook that the reviewer recalls encountering which has been priced on the department store principle of making nine look like eight. It should not need that aid to sales.

Atomic Spectra. By H. G. Kuhn. 436 pp. Academic Press Inc., New York, 1962. $13.00. *Reviewed by William F. Meggers, National Bureau of Standards.*

FOLLOWING the discovery of "multiplets" by M. A. Catalán in 1921, there was a flood of scientific papers and books on atomic spectra for some twenty years. Among books, we may mention those by Sommerfeld, by Hund, by Back and Landé, by Pauling and Goudsmit, by Ruark and Urey, by Candler, by White, by Herzberg, and by Condon and Shortley.

In April 1961, H. G. Kuhn of Oxford wrote: "There appears to be a need for an up-to-date book on Atomic Spectra treating the subject in an introductory manner, yet more thoroughly than general text books on modern physics are able to." Kuhn's book has seven chapters: Introduction, Theoretical Methods, The Simple Spectra, Periodic Table and X-ray Spectra, Complex Spectra, Hyperfine Structure and Isotope Shift, Width and Shape of Spectral Lines. A ten-page appendix containing intensity ratios in multiplets, the Periodic Table, ground states and ionization potentials, nuclear moments of natural isotopes, symbols, definitions, and constants, is followed by a 567-item bibliography, and by author and subject indexes.

The author states that "the approach is that of the Physicist, not the Mathematician, starting from observed facts and classical concepts, and intentionally stressing the correspondence between classical and quantum physics." However, the absence of historical development, and the total lack of information about spectroscopic apparatus (light sources, dispersing devices, detectors) and experiments, give the impression that theory is preferred over practice. For example, on page 2 a "discrete" spectrum is said to result from a Fourier analysis performed by the spectroscope!

On page 8, we read "A commission on wavelength standards and spectrum tables set up by the International Astronomical Union has recommended that a line of the isotope 86 of krypton be adopted as a new primary standard". That recommendation originated in an Advisory Committee on Redefining the Meter, appointed in 1953 by the General Conference on Weights and Measures.

On pages 85 and 86, the Lyman, Balmer, Paschen, Brackett, and Pfund series in the spectrum of hydrogen are mentioned but the Humphreys series is ignored. On pages 174 and 186, we are told that intersystem combinations in the first spectrum of beryllium are so weak that they have not been observed with certainty. Such sins of omission and commission are difficult to explain since Prof. Kuhn quotes copiously from three volumes of C. E. Moore's *Atomic Energy Levels* (see Volume 3, pp. 238 and 239 for up-to-date (1958) information on the above topics).

In *Atomic Spectra*, equations, figures, tables, and literature references are numbered serially in each chapter and the latter are collected in a bibliography near the end. Among hundreds of cross references, only a few give the page number; the great majority are indicated by chapter number only. The reader is soon irritated, if not discouraged, in seeking interchapter connections for which no page numbers are given.

This book is illustrated by eighteen halftone plates of well-chosen examples of absorption and emission spectra but, in every case (except one), the reproductions, without warning, are of negatives.

The electron configurations and ground terms of 22 rare-earth elements (57 La to 70 Yb and 89 Ac to 96 Cm) are tabulated (pp. 320 and 321). Ten of these are in parentheses (called brackets) to show that they are theoretical and uncertain; all of them have been experimentally confirmed or corrected.

Despite the above-mentioned, and other minor, defects in the first printing of *Atomic Spectra,* we believe this book will appeal to teachers and advanced students because it is the most modern general discussion of this subject and "It is likely that semi-empirical methods, combining spectroscopic data with theoretical concepts, will continue to play a great part in the study of atoms" (p. 3).

Fundamental Problems in Statistical Mechanics. Proc. NUFFIC Internat'l Summer Course (Netherlands, Aug. 1961). Compiled by E. G. D. Cohen. 249 pp. (North-Holland, Amsterdam) Interscience Division, John Wiley & Sons, Inc., New York, 1962. $7.50. *Reviewed by Nandor L. Balazs, State University of New York at Stony Brook.*

IN the United States, statistical mechanics is not a fashionable subject to be pursued in physics departments, and much of the work is being done either in chemistry departments or in the research laboratories of different organizations. Not so in Holland, where the physics departments at the Universities of Leyden, Utrecht, Amsterdam, and Groningen are all active in this field. For this reason it seems natural that the first summer school in theoretical physics held in Holland (1961) should deal with problems in statistical mechanics. All the lectures that were given are published in this volume, except those by G. E. Uhlenbeck on condensation. The first striking feature is the speed of publication: less than one year elapsed between the summer school and the book's publication; both the editor and the North-Holland Publishing Company should be congratulated for this accomplishment.