

Books

Atomic Physics: An Atomic Description of Physical Phenomena. By G. P. Harnwell and W. E. Stephens. 401 pp. McGraw-Hill Book Co., Inc., New York, 1955. \$8.00. *Reviewed by B. T. Feld, Massachusetts Institute of Technology.*

Time was (and not so long ago) when a course in atomic physics was the apex of a good undergraduate physics program. These days, with the tendency in many physics departments to incorporate the concepts and techniques of modern physics (i.e., quantum mechanics) early in the undergraduate curriculum, the undergraduate course in atomic physics is generally regarded as providing a breathing spell, during which the student is introduced to the quantum concepts and given a little time for them to become incorporated into his thought patterns, before being plunged into those courses on the various aspects of modern physics which are the sine qua non of the present day physicist. At the same time, the atomic physics course is used to instill in the student that minimum of historical perspective (and reverence for bygone genius) which is still thought to be an integral part of his professional education.

However, one of the major problems faced by our physics graduate schools is the wide disparity in the backgrounds of the entering students; a large fraction comes from small, liberal-arts colleges, in which the physics curricula follow the old pattern. As a result, many of the first-year graduate courses must have the main purpose of establishing a common level of background from which the more advanced courses can freely draw. The text on *Atomic Physics* by Professors Harnwell and Stephens of the University of Pennsylvania is eminently suited to this end.

At the same time, this book serves another and perhaps more important purpose. It attempts to develop a concept of the unity of modern physics which is so easily lost in the usual sequence of specialized graduate courses followed by the normal graduate student.

The first three chapters (Classical Foundations of Atomic Theory; Atomic Nature of Matter and Radiation; Atomic Structure) are intended to achieve the leveling process. They suffer somewhat from the usual fault of such attempts: they are too brief for the uninitiated and too detailed for the sophisticated student. However, assuming a prior or, at least, a concurrent course in quantum mechanics, these chapters contain a great deal of useful background material, usefully

coordinated (e.g., the very condensed but very complete summary of the quantum theory of radiation and its applications).

The remainder of the book (Electron Spin and Polyelectronic Atoms; Molecular Structure; Statistics and Atomic Processes; Elementary Properties of Matter) constitutes the meat, of which there is a great deal. The main features of these chapters are the attention paid to detail and the great care which has been lavished on attempts to transform formal derivations into physically understandable and mathematically simple treatments. These, as well as the previous chapters, reflect much hard work and teaching experience on the part of the authors. Their effectiveness is reduced somewhat by a number of attempts to include last-minute developments. These attempts are generally not as successful as the older portions and tend to detract from the continuity of their discussion. However, the authors' decision to forego completely the historical approach is regrettable in that (aside from the loss to the students' education) it results in a certain lack of motivation in the development which, while it can possibly be overcome in the teaching process, makes it considerably more difficult for the reader to appreciate the significance of subject matter so carefully selected by the authors.

The Science Book of Space Travel. By Harold Leland Goodwin. 213 pp. Pocket Books, Inc., New York, 1956. Paperbound \$35. *Reviewed by J. R. Pierce, Bell Telephone Laboratories.*

With one reservation, this is a rave review. This thirty-five cent reprint (I missed the hard-cover original) summarizes about all there is to be said about satellites and space travel, although it does miss ion rockets. The author has read widely and he hasn't been stuffy about his sources. Thus, the organization of the satellite program, Newton's laws, stepped rockets, and something of relativity are reviewed, but we also have reflections on baths in free fall, space scooters and other aspects of space flight which show a wide acquaintance with science fiction. In general, interesting ideas are set forth correctly and clearly, and without overcommitment on the part of the author. This sometimes leads to amusing summaries as: "... Dr. Milton Rosen ... says that a practical unmanned satellite is the first need—not an enormous space station fully equipped with spacemen and Civil Service job descriptions." "... the more optimistic have hopes that *homo sapiens* can adjust to the uncertainties of space as easily as he has adjusted to the man-made horrors of television and Sunday traffic."

In reading this book I was at first annoyed by a few statements which I felt to be either wrong or misleading; I believe they show that the author's knowledge of science is broader than it is deep. But in all I noted only 9 examples. I suppose a chemist or a biologist would pick up others. Most are not clearly wrong, and



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I am more bothered by the chapter on flying saucers. That the material referred to has anything to do with space travel is merely assumption or conjecture. When people were concerned with the transcendent importance of great men and events, with survival after death, and with the powers of darkness, those who felt called upon to interpret the unexplained part of their experience did so in terms of portents, ghosts, and witchcraft. Nowadays those who can't rest until all reports and experiences are ticketed give us space craft.

Still, if the reader can take the author's concern with Charles Fort and unidentified flying objects as lightly as the author takes space flight in general, he can't help being entertained as well as instructed by everything in this excellent book.

Modern Physics. By John C. Slater. 322 pp. McGraw-Hill Book Co., Inc., New York, 1955. \$5.50. *Reviewed by E. Richard Cohen, North American Aviation, Inc.*

In comparison with the rate at which knowledge and understanding of the physical universe has developed from the beginnings of history up to the end of the nineteenth century, the rate in the last sixty years has been explosive. The combined impact of relativity and quantum mechanics (ushered in by Einstein and Planck) has so altered our concepts of nature that modern theories are often presented as an almost magical recipe which will miraculously give the right answer. Professor Slater's book is intended to serve as a nonmagical introduction to the so-called "mysteries" of modern physics.

Beginning with the thermodynamic paradox of black body radiation and the Maxwell-Boltzmann distribution law, Slater presents quantum mechanics as a logical and inevitable consequence of experimental facts. With a minimum of mathematics, and with the emphasis instead on the logical development of ideas, the book follows the step by step evolution of the present day theory of the structure of the atom. It is intended for an introductory course in modern physics or for a survey course for engineers, chemists, and physicists who will not continue into the study of the mathematical details.

The title, "Modern Physics", implies a wider range, however, than it is the purpose of the book to cover; relativity is treated only as it is needed to explain atomic structure while the entire field of nuclear physics, mesons, and cosmic rays is covered in a single chapter. A more descriptive title for the book would be "Atomic Structure", since it restricts itself for the most part to what may be defined as "classical quantum mechanics"—those problems which are completely specified by Schrödinger's equation with a well defined potential function and which are best exemplified by the electronic energy states in atoms and perfect crystals.

Within the limits which Professor Slater has set for

the book, it provides a good survey of the field. There are indications, however, that parts of the book were hastily written, and the omission of any mention of the center of mass correction in the Balmer formula was disturbing. On the other hand, an excellent selection of problems at the end of each chapter supplements the text and should provide the student with additional insight.

Carl Friedrich Gauss: Titan of Science. By G. Waldo Dunnington. 479 pp. Exposition Press, New York, 1955. \$6.00. *Reviewed by T. Teichmann, Lockheed Aircraft Corporation.*

Gauss' scientific work encompasses many of the most significant contributions to both pure mathematics and physics, and an account of these accomplishments would presumably be fraught with interest to any scientifically oriented reader. On the other hand, Gauss' personal life was singularly devoid of unusual incident or the romance of many other great figures of mathematics. One might, therefore, expect that any interesting biography would accent Gauss the scientist, and that Gauss the man would simply provide the continuity and background for his scientific work.

It is clear that Professor Dunnington has done a tremendous amount of meticulous research on the minutiae of Gauss' life, but it is unfortunate, at least in this reviewer's opinion, that he has not cared to put less emphasis on the less significant incidents. As a result, Gauss' achievements are often buried amid the day to day trivia with which Professor Dunnington regales his readers. It is perhaps unfair to suggest that Gauss' daily life was completely uninteresting; Gauss maintained close relationships with famous scientific figures such as Weber and Bolayi, and it is certainly not without interest that Bolayi, for example, did not regard Gauss as a genius. It is, however, a pity that this fact and others of similar nature are submerged in a welter of insignificance.

In view of the fact that Professor Dunnington has done such a painstaking and dedicated job, this reviewer hopes that he will also write a book which is more palatable to the scientifically interested layman, if not so impressive to the historical scholar.

Classical Electricity and Magnetism. By W. K. H. Panofsky and Melba Phillips. 400 pp. Addison-Wesley Publishing Co., Inc., Cambridge, Mass., 1955. \$8.50. *Reviewed by P. M. Morse, Massachusetts Institute of Technology.*

It is perhaps instructive to observe the changes in fashion in texts on various fields of physical theory. In the case of electromagnetic theory, Starling's *Electricity and Magnetism*, a popular college text in the twenties, might represent the first phase. A concentration on techniques of measurement, on the peculiarities of measuring equipment, and finally an apologetic statement of the general Maxwell equations with a few