

BOOK REVIEWS

Nuclear Theory. Pairing Correlations and Collective Motion. By A. M. Lane. 250 pp. Benjamin, New York, 1964. Cloth \$8.00, paper \$4.95.

Reviewed by Evans Hayward, National Bureau of Standards.

This volume is another in the new Frontiers in Physics series devoted to the timely publication of lecture notes or collections of related reprints. It comes in both cloth binding for libraries and paperback for private citizens, a very excellent arrangement for a book that is destined to be both read and used.

The text is based on two series of lectures given at Harwell in the spring and fall of 1962. They are devoted respectively to the two topics "Pairing Force Correlations" and "Collective Motion". Both topics represent areas in which much of the basic material is either unpublished or available in papers that the main contributors wrote for each other. They are barely comprehensible to the uninitiated or those who try to take up the subject from a related or alien point of view. It is, therefore, refreshing to have the whole subject reviewed by an interested and competent nonparticipant. Nuclear physicists, in general, should be grateful for this systematic exposition.

The book opens with a development of the pairing force as an explanation of the energy gap, a prominent feature in the spectra of spherical nuclei. The concept of quasiparticles and second quantization are then introduced, developed, and utilized throughout the remainder of the book. The first part leads up to the prediction of the properties of non-collective levels such as their reduced widths and electromagnetic transition rates.

In the lectures on collective motions, the particle-hole calculations, labeled Tamm-Dancoff method, are described and the random phase approximation is shown to be the way to take into account the correlations in the nuclear ground-state. Both the

energy-weighted and non-energy-weighted sum rules are discussed in this context, and the results of the different calculations already performed are summarized and compared with experiment.

The last pages of this volume contain a selection of reprints of some of the basic papers on the subject.

The reviewer highly recommends this text to nuclear physicists, both theoretical and experimental, for it offers an opportunity to follow the systematic development of these two important topics.

The Discovery of the Electron. The Development of the Atomic Concept of Electricity. By David L. Anderson. 138 pp. Van Nostrand, Princeton, N. J., 1964. Paper \$1.50.

Reviewed by L. Marton, National Bureau of Standards.

The Commission on College Physics, under the general editorship of Edward U. Condon, has started a very praiseworthy undertaking. The present book forms part of a series endeavouring to give to students, or whoever wishes to read this book, a "case history". In about 130 pages, the author reviews the circumstances surrounding the discovery of the electron and the development of our modern concepts. A brief listing of the individual chapters may serve best to give some idea about the organization of the book: (1) The Discovery of the Electron, (2) The Cathode Ray, (3) X-Rays and Radioactivity, (4) The Atomicity of Electric Charge, (5) Later Developments in the Physics of the Electron, (6) The Discovery of the Electron as a Case History in the Methods of Science. At the end of each chapter there is a reference list and the last chapter ends with a short bibliography listing some more general books.

The treatment on the whole is quite readable and well organized. I like particularly the introduction giving the background for the discovery

in which the author contrasts the experimental observations with various theories and models. A reviewer's duty is, however, to look both for the good and the less good side of the book and I would like to mention some of the less good aspects.

First of all, I have serious objections against some parts of the style. I think in a book written for college students and essentially for educational purposes the author should be very finicky about the style which is used. I have waged a losing battle against the current usage of "data is". Although I am still convinced that people should know that "data" is a plural, I know when I am beaten and I have given up the fight on that particular word. In this book, however, I see at one place that the author knows that the singular of the word "phenomena" is "phenomenon", yet he uses on page 4, "phenomena" as singular, and on page 1, "phenomenon". I don't believe there is any excuse for giving to the student the wrong usage and encouraging him in perpetrating this kind of error.

In the same category belong words like "conceptualization" which he uses on page 2. I think this usage mars an otherwise reasonably good book. There is quite a bit more "slang" and a number of mixed metaphors.

In the historical introduction, I miss Benjamin Franklin's name. In his classical book, Millikan devoted perhaps a little too much space to Benjamin Franklin, but here I feel that a little more should be given.

On page 104 there is a caption entitled, "The Pursuit of Precision". I am worried that the author here confuses precision with accuracy, and propagates his confusion of the subject to the student.

Last but not least, I would like to take exception to the statement on page 120 concerning the discovery of the electron microscope. The author is utterly unaware of the extensive controversy about the subject of the

invention of this instrument. His presentation is apt to mislead the student.

The defects, listed above, should not prevent the discerning student from perusing this volume. It is recommended, however, that the student be advised to use his critical sense when reading it and that if there is a second edition, a very serious effort should be made to remove as many of the defects as possible.

The Feynman Lectures on Physics. By Richard P. Feynman, Robert B. Leighton, and Matthew Sands. Vol. 1, 52 chapters; vol. 2, 41 chapters. Addison-Wesley, Reading, Mass., 1964. \$8.75 per volume. Reviewed by S. B. Treiman, Princeton University.

These two volumes stem from a program undertaken at Caltech for the reform of its introductory physics course. Similar movements are afoot on many other campuses too. But only Caltech can draw on that unique resource of the physics profession—Richard Feynman. Over the two-year period 1961-63, he expounded his version of physics in a course of lectures for underclassmen, and what a version it is! The talks were tape recorded and edited, and they are now set out before us in the volumes under review.

Each book contains about fifty chapters, approximately ten pages to a chapter. The layout and typography are unusually attractive. The margins are wide; the equations set off just right; the drawings clear, relevant, and free of those needless shadings and flourishes that sometimes pass for

high pedagogy. But the flavor of an exuberant and informal set of lectures comes through even more handsomely. The reader is addressed directly, admonished, reasoned with, led to and from the brink of logical error, and in other delightful ways engaged in discussion. That Feynman really gave the lectures live can hardly be doubted. One chapter contains an "almost verbatim" transcription of a session on the principle of least action. It features a photograph of Feynman in action as a lecturer, one hand flung out expressively, standing in front of a blackboard covered with formulas.

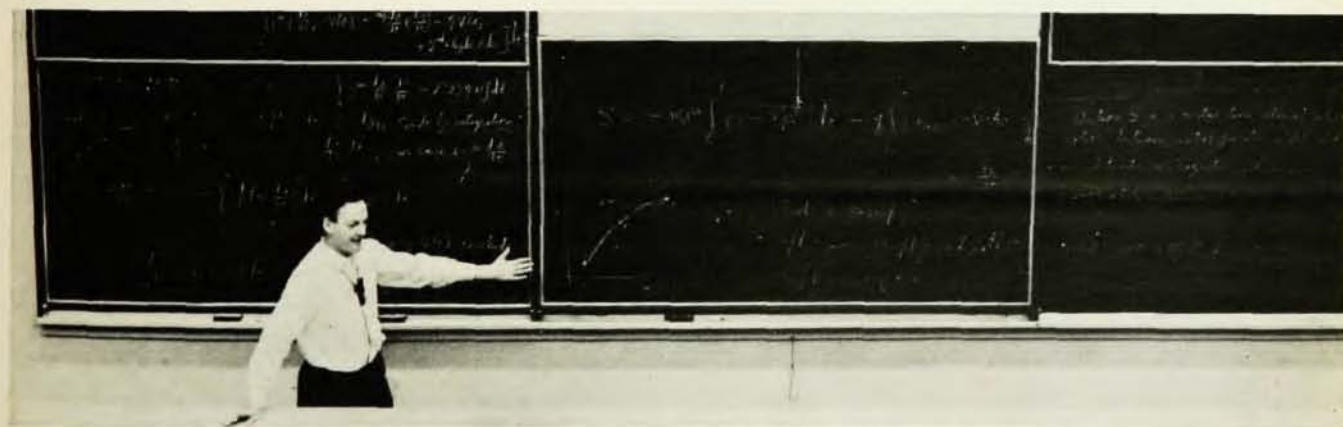
For all of their informality and high spirits, the lectures represent a very serious and thoughtful undertaking. As he tells us in the Preface, Feynman made every effort to insure the accuracy of the contents. I took this as a personal challenge, but must report here that the margins are quite wide enough to record such errors as I could find.

The scope of the lectures is monumental. The standard topics of an introductory course, and a lot more, are covered. Of course, it's not alone the table of contents that determines the quality of a book. Textbook writers inevitably issue ringing manifestos, but somehow they often end up with a few new (usually "modern") twists superimposed on the standard fare—thus, some late results from high-energy physics will appear in the last (or first) chapter of a text which treats optics, say, in the time-honored fashion. Feynman too is modern, but in *all* chapters, classical and "mod-

ern". He is simply concerned with good physics at every stage; lots and lots of physics! The treatment ranges from the discursive to the technical and mathematical, but it is never merely manipulative. Feynman has evidently personally thought through, from half a dozen angles, every topic covered. Where the old demonstrations are after all the best, he betrays a mild disappointment. For the most part, however, he finds new and sometimes breathtaking insights into even the most venerable parts of physics. He is forever in search of a qualitative understanding of the formalisms that we manipulate.

The Feynman lectures must inevitably transform the quality of undergraduate physics teaching: through direct impact on student readers, in part; but more importantly, through impact on their teachers and on the writers of textbooks yet unwritten. Here is a new sourcebook, for physics and physics teaching, to be consulted openly by some and clandestinely by others.

But never mind the undergraduates! These lectures are for the professionals too. Where else can a harried professor learn so clearly: how a ratchet works (Chapter 46, Vol. I)? or what algebra is *really* all about (22-I)? or the latest authoritative ideas on the neurology of vision (36-I)? or about the flow of "wet water" (41-II)? or about thunderstorms (9-II)? or how chalk breaks when you twist it, and why (39-II)? And who else since Rutherford has managed to make atoms come so much alive? This is fine leisure read-



Professor Feynman discussing the principle of least action (from *The Feynman Lectures*)