## Particles and Interactions

**Elementary Particle Physics.** STEPHEN GASIOROWICZ. Wiley, New York, 1966. xxii + 613 pp., illus. $14.95.

Stephen Gasiorowicz, who has previously applied his expository skills to produce a number of well-wrought review articles in the field of elementary particle physics, has written a book covering most of the topics of major importance in elementary particle theory. His purpose was to write an introductory book from which one can learn, rather than some sort of "treatise" on the subject, a fact for which we can all be thankful. It is a pleasure to be able to say that he has succeeded remarkably well.

The book covers the following general areas: (i) canonical field theory, perturbation theory and Feynman's rules, quantum electrodynamics; (ii) strong-interaction physics—including a rather detailed survey of the properties of the presently observed hadron resonances and discussions of topics such as SU(3), scattering theory and its application to "bootstrap" dynamics, Regge pole theory, properties of form factors; and (iii) weak interactions—this section being sufficiently up to date to include such topics as *CP* violation, the Cabibbo theory, *PCAC*, and the Adler-Weisberger relation. The coverage is generally at such a level as to make the material accessible to a student with a strong background in quantum mechanics.

Perhaps the point at which the book makes its greatest contribution, as compared to what was previously available in the literature, is in its exposition of strong interactions. To write such a clear exposition is not a small accomplishment, because strong-interaction "theory" at present consists of a somewhat disparate collection of ideas and techniques which have each proven partially successful for understanding a limited class of phenomena. The author has made a judicious choice of topics to be included and has provided sufficiently lucid and accurate explanations of them that a person who is not familiar with the material can gain an understanding not only of the main ideas, but also of the machinery that goes into carrying them out. Accompanying these explanations are generally fair-minded assessments of the successes and shortcomings of the approaches described.

The sections on weak and electromagnetic interactions and canonical field theory cover more standard ground and are on the whole less distinctive than that on strong interactions. Nevertheless, the elaborate machinery of field theory is clearly presented and its use illustrated by a number of instructive calculations. In particular, the principal results of quantum electrodynamics (including renormalization effects and the like) are explained by detailed treatment of a number of (nontrivial) examples, rather than by an exhaustive or systematic presentation of the subject.

The section on weak interactions is rather brief, yet it covers a lot of ground. The result is that the discussions in this section, while they appear reasonably clear to someone who has gone over the material before, may strike a student as almost epigrammatic at points, and the illuminating detailed calculations which grace other parts of the book will probably be missed.

In conclusion, the strengths of the book include the admirable way in which many complicated techniques and calculations have been made reasonably accessible to a beginning student, the good selection of material, and the welcome open-minded attitude towards various "paths to the future" that pervades the book. I do not have a long list of weaknesses to catalog, and have not, in fact, scrutinized the book with a view to finding errors in factors of 2. In the section on field theory, however, I find it a trifle eccentric, especially in an introductory book, that Feynman's rules are derived by a "functional" method rather than from some version of time-dependent perturbation theory, with which the student is likely to be more familiar. Also I think it would have been worthwhile to try to give some sort of idea of what goes wrong when one tries to deal precisely, from a mathematical point of view, with interacting fields and of what people working in "axiomatic" field theory have been up to for the past 15 years or so. I suppose, however, that the author could reply that this is inconsistent with the aims of the book, and in any case is much easier said than done.

The book is, of course, "out of date" in the narrow sense that it doesn't cover in much detail some topics that people find exciting today—for example, current algebra and various newly found refinements of Regge pole theory. I think this is not serious; if a student has learned what is in this book he will be well equipped to learn the newer things as well. He has to start somewhere, and I think that, all things considered, this book provides as good a starting place as anything now available in the literature.

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## Nuclei and Other Particles

**High Energy Physics and Nuclear Structure.** Proceedings of the 2nd international conference, Rehovoth, Israel, Feb.–March 1967. GIDEON ALEXANDER, Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1967. viii + 489 pp., illus. $23.

"In the beginning" there was only nuclear physics: the science we trace back to Rutherford began with the study of nuclei through nuclear radiation. With time we have become accustomed to the separation of the study of the radiations, or, more generally, of elementary particles, from the study of the nuclear structure. The book under review, however, collects between its covers a variety of articles that were presented as invited papers at a conference entitled "High Energy Physics and Nuclear Structure." Is this in fact one subject, or two?

Clearly many different specialties are represented. Some look more like nuclear structure, for example, the several discussions of the interactions of nuclei with particles supplied by the high-energy physicists. On the other hand, the articles on the structure of elementary particles in terms of the concepts of quarks, currents, sum rules, and extended elementary "matter" seem to be strictly high-energy physics. And nuclear astrophysics seems another subject altogether, although the processes of interest include nuclear and neutrino reactions.

Some of the articles do give the impression that the problems of elementary particles and nuclear structure are not distinct, however. For example, Van Hove and Dar compare diffraction and particle-exchange phenomena on nuclei, for which there are striking similarities at low and high energies. Glauber, Palevsky, and others discuss the application of diffraction theories to the experiments of very-high-energy scattering of nucleons from nuclei. Here it becomes apparent that the understanding of nuclear shapes and