Book Review

Techniques in Nuclear Structure Physics. By J. B. A. England. 2 vols. Halsted Press, Inc. (1975). $39.90.

One's initial impression on examining Dr. England's treatise is that these are surely most useful books—thorough in coverage, produced with impeccable craftsmanship, impressively researched. The author states that he prepared this work as a text for undergraduate and postgraduate students; I doubt that it will be extensively used for this purpose. In the first place, the cost seems rather high, even in an era of rampant inflation. Second, the study of nuclear structure physics is not exactly booming at the moment, a fact undoubtedly associated with the precipitous decline in government support of research in this area.

Nevertheless, many people engaged in nuclear structure research will want this book for their reference libraries. Indeed, the coverage is such that it should appeal to a broad range of disciplines, e.g., the radiochemist, the instrument engineer or the researcher doing neutron or charged-particle activation analysis. The bibliographies are truly impressive and are current through late 1972; Chap. 1 cites 430 references and the other chapters average 247 references each. The sources most heavily cited are *Nuclear Instruments and Methods*, the *I.E.E.E. Transactions in Nuclear Science*, and various conference proceedings.

The first volume (Part I) comprises three chapters, as follows:

Chap. 1. Detectors and Methods of Detection (130 pages)

Chap. 2. General Instrumentation (111 pages)

Chap. 3. Accelerators (71 pages).

The first chapter includes thorough discussions of film detectors—both photographic and dielectric-track types—gas ionization detectors, scintillation and semi-conductor detectors, spark chambers, Čerenkov detectors, and neutron detectors.

The second chapter contains sections on particle beam detection, measurement and handling, scattering chambers, electronics, and on-line computers.

Chapter 3 describes the operating principles and characteristics of Cockcroft-Walton accelerators, the dynamitron, the SAMES generator, Van de Graaff machines, insulating core transformers, linear accelerators, cyclotrons, and hybrid combinations "cyclograaffs" and "tandetrons") of the cyclotron and tandem Van de Graaff accelerators.

The second volume (Part II) consists of four chapters:

Chap. 4. Magnetic Spectrometers and Spectrographs (106 pages)

Chap. 5. Particle Identification Techniques (85 pages)

Chap. 6. Coincidence Measurements, Angular Correlations and Lifetime Measurements (63 pages)

Chap. 7. Polarized Beams and Polarized Targets (83 pages)

Sections in Chap. 4 are devoted to design considerations and focusing theory of charged particles, electron spectrometers, and heavy ion spectrometers.

In Chap. 5 are sections on time-of-flight techniques, single-detector identification methods, telescope techniques, and particle identification problems with transmission detectors.

Chapter 6 contains seven sections that cover the general theory of angular correlation, γ-γ techniques, β-γ correlations, heavy particle-γ techniques, correlations with oriented nuclei and in polarized particle reactions, particle-particle correlations, and nuclear lifetime measurements.

The final chapter includes descriptions of polarized ion sources and polarized targets and a discussion of the information about nuclear structure that can be obtained with polarized beams and targets.

Clearly the subject matter in Part I is quite broad and should be useful to many experimentalists. The second volume deals with increasingly specialized topics. One might be tempted to purchase only the first part, but, unfortunately, the index for both volumes is incorporated in the second part.

Without apologies the author states that this work is not designed for theoreticians. He does, however, outline basic principles sufficiently to indicate the applications of the various devices in performing nuclear structure analysis.

While the subject matter requires a somewhat mechanistic treatment, the literary style in places seems unduly stilted. For example, in the description of the voltage doubler in the Cockcroft-Walton machine, we read:

> The point A_0 is connected to the point A_1 by the capacitor C_1 and A_1 is connected to B_1 by the diode rectifier D_1 which conducts when the voltage of B_1 is greater than that of A_1. . . . The point B_1 attempts to follow point B_0 and, since C_0 is uncharged, it becomes negative with respect to A_0 so that D_0 conducts and point B_1 stays close to the voltage of point A_0.

The author should be thanked for his coverage of certain topics that are of great practical importance but that are seldom addressed. For example, the frustrated experimenter who has spent painful hours with ubiquitous ground loops and line transients will welcome the five pages in Chap. 2 devoted to the suppression of electrical interferences.

In summary, these two volumes should be extremely useful references that are of interest to a much wider audience than the title might indicate.

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October 6, 1975

About the Reviewer: Tom Parkinson is presently professor of nuclear engineering and director of the Nuclear Reactor Laboratory at the Virginia Polytechnic Institute and State University, following a number of years in similar positions at the University of Missouri at Columbia and the University of Florida. Dr. Parkinson did his undergraduate work at Auburn and completed his graduate studies at the University of Virginia. He has held appointments to several research institutes both here and overseas.