

Books

Theoretical Nuclear Physics. By John M. Blatt and Victor F. Weisskopf. 864 pp. John Wiley and Sons, Inc., New York, 1952. \$12.50.

It is not necessary to say much in praise of this book. It is the only adequate account of theoretical nuclear physics which has appeared since the Bethe-Bacher-Livingston articles in the *Reviews of Modern Physics* of 1936-37. In addition to being the only book in its field, it is also by any standards a good book. This reviewer had the advantage of being able to use parts of it before publication as the text for a regular graduate course in Theory of Nuclei. This experience showed that the book succeeds astonishingly well in achieving its double purpose. It is not only a mature and up-to-date survey of the whole field of nuclear theory, but it is also written clearly and simply enough to be used as a text-book by experimental physicists or theoretical students who are learning the subject from the beginning. There are few books in any branch of physics of which one can say the same.

The success of the book rests primarily on the authors' intelligent choice of the subject-matter. It happens that there exists at the present time a wide gap between the practical and the fundamental understanding of nuclear phenomena. What we may call "fundamental nuclear theory" consists in attempts to deduce nuclear properties from an exact mathematical description of individual particles. These attempts have repeatedly failed in the past, and are now only just beginning to succeed as a result of our recently gained and still very partial knowledge of the experimental properties of the meson. On the other hand, "practical nuclear theory" consists of an analysis of the properties of nuclei and nuclear reactions, based on a rough empirical knowledge of the properties of individual particles, combined with a quantitative application of the elementary principles of quantum mechanics to the system as a whole. This practical nuclear theory is the theory which is actually used by the nuclear physicists of today. It includes almost everything which is known about nuclear phenomena in the energy range below 50 Mev, the range which is now given the name of "classical nuclear physics". It also can be understood and used by anyone who understands elementary quantum mechanics. The authors' decision to limit their subject matter to the practical theory has made it possible for them to cover the whole of nuclear theory in one volume without anywhere becoming condensed or obscure.

The situation of the practical nuclear theory at the

present time is in many ways analogous to the situation of classical thermodynamics before the elucidation of atomic physics by quantum theory. Around 1900 it was possible to write a comprehensive treatise on thermodynamics, based only on a rough qualitative picture of the nature of molecules and on an exact treatment of the two classical laws. The usefulness of such a treatise would not have been increased by including an account of the latest speculations concerning the nature of atoms. In the same way, this book is none the worse for having little to say about mesons.

The plan of the book is as follows. First an introductory chapter describing the empirical properties of nuclei. Then four chapters discussing the exact knowledge which we have about nuclear forces, mainly derived from the detailed study of the two-body problem. Then two chapters on nuclear spectroscopy, the distribution of excited states of nuclei, and the various nuclear models that have been proposed in order to explain the empirical data. Next three long chapters on the general theory of nuclear reactions, starting with a very simple derivation of the general properties of reaction and scattering cross sections, and gradually leading up to the formal theory of Wigner. This part of the book is the most important, and nothing like it exists elsewhere in the published literature. Next come three chapters on alpha, gamma and beta decay processes, and on the methods of using the observed properties of emitted radiation to identify and classify excited states of nuclei. Finally there is a short chapter on the nuclear shell model, and two mathematical appendices concerned with spherical harmonics and the definition of multipole radiations.

An unusual feature of the book is a list of symbols, which appears at the end of every chapter, listing and briefly identifying every symbol which occurs in that chapter. These lists are very useful when one is using the book as a reference book and wishes to pick out a particular equation without reading through the preceding text to find out what the symbols mean.

The quantity of new ideas incorporated into the book is very considerable, and always the new ideas result in a simplification and clarification of earlier discussions. The whole book is distinguished by a simple and readable style; the typography and layout of formulae are also excellent. Everyone whose business it is to understand nuclear physics will find this book sooner or later indispensable. It is already the standard work in its field, and it will not soon become out of date.

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High-Energy Particles. By Bruno Rossi. 569 pp. Prentice-Hall, Inc., New York, 1952. \$12.50.

Professor Rossi's book is the finest general reference work on the subject of high-energy particles yet published. It will be an invaluable book for all who work in this field, especially so for those who are using the energetic particles found in cosmic rays as tools for probing the nucleus. As a text for graduate courses in