NUCLEAR PHYSICS

Elements of Nuclear Physics. By F. RASETTI. New York: Prentice-Hall, Inc. $4.50.

WITH the publication of this and other books of the past year, the term "nuclear physics" may be regarded as having been officially admitted to the language. "Nuclear chemistry" seemed likely, for a time, to take the lead. Perhaps it would have been more appropriate on the whole, since a large part of the subject consists in reactions of transmutation for which the symbolism of chemistry is admirably fitted, and another part consists in measurement of the masses of atoms; but after all, almost the whole of the subject is a gift of the methods of physics to the sum of knowledge, and it would certainly ill beseem a physicist to complain.

Professor Rasetti, now of the University of Rome, was known as a notable experimental physicist even years before he belonged to the group at Rome which, with Fermi at their head, investigated transmutation by neutrons on a grand scale and discovered the enhanced transmuting power of slow neutrons, as well as much else. He is a familiar figure in this country, both in East and West. His English as exhibited in this book is flawless, though the style is dry and austere, largely because of the extreme condensation; for the book is packed with information, and scarcely a word is dispensable.

First (after a brief introduction) we find an account of the apparatus used for detection of fast-moving charged particles. Then come two chapters on what was formerly called "radioactivity" *tout court,* but must now be called "natural radioactivity"; taken together, they give a better share of the book to natural radioactivity than is frequently given nowadays, when so many writers are in haste to get to phenomena of newer interest. The latter of the chapters contains an account of alpha, beta and gamma ray spectra and of the Gurney-Condon-Gamow theory of the alpha-particle emission. Between them is inserted a long section concerning the interactions of alpha, beta and gamma rays with the atoms which they traverse or the electrons near which they pass, and including the creation and "annihilation" of electron-pairs (why must people speak of electrons being "annihilated" when their mass and energy go over into equal mass and energy of light?) Future classifiers of physics may take these topics out of nuclear physics altogether; for the present, it is relevant to insert them. Next come the tabulations of the masses and spins of the nuclei, with an exceedingly brief outline of the ways of measuring them. Next come two chapters on transmutation—an unexpectedly small share of the book! A considerable number of reactions are quoted, and there is a table of artificial radioactive substances. The book ends with a very concise account of cosmic rays.

The book is definitely an advanced text; students of the experimental side may find that all they require is the power of concentrated attention, but for the theoretical parts a grounding in quantum mechanics is needed. Readers already having some knowledge of the earlier stages of quantum theory will be glad to find the theories of scattering (after Born) and of penetration of potential barriers expounded without these usual preliminaries; and there is a good outline of the Heisenberg and Majorana theories of intra-nuclear interactions, and of the present state of the theory of the energy-loss suffered by fast electrons as they progress through matter. The author withstood too well the usual temptation of authors to lay undue stress on their own researches; one would like a fuller account of the work of the Roman school. The part about the Compton effect must have been written just too early to include the recent tests of the simultaneity of the recoils of electron and photon. The list of the naturally radioactive elements excludes all of atomic number less than 81, but for potassium, rubidium and samarium; it is not clear whether this represents a definitely adverse judgment of the author as to claims recently made for other elements.

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SPECIAL ARTICLES

STUDIES ON THE PRODUCTION OF ANTIBODIES IN VITRO

IN 1912, Carrel and Ingebrigtsen[1] cultivated the bone marrow and lymph glands of guinea pigs in homologous blood plasma to which were added small amounts of red cells from the goat. On the fifth day, the culture fluid hemolyzed red cells from the goat without the addition of complement. After being heated at 56° C., the culture fluid lost its hemolytic power. Then, by addition of complement, this lost power was regained. On the basis of these and other tests, it was concluded that immune hemolysins had been formed. Since that time, numerous investigators have employed this direct method of adding the antigen to the tissue at the time of explantation. Some have reported positive results, others negative. A quite recent paper by Salle and McOmie[2] records negative findings in experiments in which chick embryonic tissue and rabbit or guinea pig spleen and lung were

1 A. Carrel and R. Ingebrigtsen, *Jour. Exp. Med.,* 15: 287, 1912.

2 A. J. Salle and W. A. McOmie, *Jour. Immunol.,* 32: 157, 1937. (Extensive bibliography.)