BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

AN EMINENT SOVIET SCIENTIST

Title Peter Kapitsa On Life And Science—Addresses and Essays

Translator Albert Parry

Publisher The Macmillan Company, New York, 1968

Pages 271

Price $7.50

Reviewer Mark Oliphant

Shortly after the First World War, a young engineer, Peter Kapitza, was sent to England by the Russian government as a member of a technical mission. While there he became imbued with the desire to do research under Rutherford, whose genius had won his deep admiration. Fearfully, he approached the great man, asking to be allowed to work in the Cavendish Laboratory which Maxwell, Rayleigh, and J. J. Thomson had made the greatest center of physics in the world. Rutherford was at the height of his powers. He had just come to the conclusion that the structure of the nucleus, which he had discovered, and the nature of the transformations produced in light nuclei by bombardment with alpha particles, could be more easily understood if there existed, in addition to the proton and electron as elementary building particles, a particle with the mass of a proton but without electric charge. A search for this hypothetical particle was in progress, and though it was not to bear fruit till 1932 when Chadwick discovered the neutron, it created in the laboratory an atmosphere of excitement which Kapitza sensed.

Rutherford recognized the scientific qualities of the young Russian, but, even more, he was attracted by one whose personality was singularly like his own. Fired with enthusiasm and self-confidence, Kapitza convinced Rutherford that if given the opportunity he would achieve much, and he was accepted as a research student. The letters to his mother which are reproduced in translation in this book, reveal that beneath the veneer of confidence the young Kapitza had many doubts whether he would be able to justify Rutherford's confidence in him. He found it difficult to believe that so great a man could be so kind to an inexperienced youngster, and it was some time before his continental awe of the professor gave way to that personal affection which Rutherford inspired in all who were closely associated with him. The ebullient, tough, determined, and gifted Kapitza proved himself rapidly, and Rutherford backed him wholeheartedly. Kapitza never worked with Rutherford, but went his own way, developing his own ideas, with Rutherford's help and inspiration.

When I joined the Cavendish Laboratory in 1927, Kapitza was already entrenched there. He had established himself by his success in producing very strong magnetic fields, for which he had turned from batteries to a short-circuit type alternator as the source of energy, and he had commenced his work in cryogenics. He had recently married, and his wife Anna rapidly endeared herself to us all. They both became close friends of my wife and me, and this friendship has outlasted the turmoil of years which were to follow Kapitza's return to Russia and the outbreak of war. Hence, I can speak with some knowledge of many aspects of Albert Parry's book.

It is to be regretted that much of the "mystery" surrounding Kapitza is reflected in Parry's introduction, for he could easily have cleared up much of the speculation by consulting with those who knew Kapitza well, among them the late Sir John Cockcroft, Dr. W. Webster, Dr. D. Shoenberg, and others. Alternatively, he could have talked with Kapitza himself, for nowadays there are no barriers to such contacts. Peter Kapitza is an upright, honest man, who hates humbug and double-talk as much as did his teacher, Rutherford. There is no mystery about him. When he was detained in Russia, where he had gone to visit his old mother and his many friends, his family remained in Cambridge until it was clear that he would not be permitted to return. It was six months later that his wife and two children rejoined him in Moscow. It is strange also that the author did not consult with a scientist about the correct translation of many technical terms in Kapitza's writings. For instance, one speaks of the range of an alpha particle rather than its run, and of the scattering rather than the diffusion of such particles. However, despite these deficiencies, Albert Parry has done a real service to international scientific understanding by his translation of Kapitza's more general writings.

There emerges from these pages a very human man of science, deeply concerned for the healthy development of science in Russia, disturbed by the impediments to free exchange of information and personal contacts

with scientists outside Russia, and with the courage to express his thoughts freely. Throughout, Kapitza reveals his love for Rutherford and the enormous benefits he derived from his thirteen years in England. Honesty and generosity are seen to be his outstanding characteristics. A loyal citizen of the U.S.S.R., he sees both her strengths and her weaknesses. Problems of the organization of science in the technological age, and of its use for the welfare of mankind, are of great importance to Kapitza. Readers will learn from Albert Parry's book that an eminent Soviet scientist is very like an eminent American or European scientist, and such understanding is of immense value today.

Mark Oliphant worked with Rutherford in the Cavendish Laboratory from 1927 to 1937, during which time he became a close personal friend of Peter Kapitza. Since the war he has visited the U.S.S.R. several times, and, apart from these opportunities to see the Kapitzas, he and his wife have kept in contact by correspondence. During the war he worked at Oak Ridge and Berkeley as a British member of the Manhattan Project. In 1950, he left England to return to his native country, Australia, with responsibility for the physical sciences in the newly established Australian National University.

DOSIMETRY DETAILED

Title Mathematical Theory of Radiation Dosimetry

Authors J. J. Fitzgerald, G. L. Brownell, and F. J. Mahoney

Publisher Gordon and Breach Science Publishers, Inc., 1967

Pages ix + 747

Price hardback $30.25; paperback $11.50

Reviewer Arthur B. Chilton

The authors of this book are workers and consultants within the nuclear research complex in the Boston-Cambridge area. The first is also associated with the faculty at Harvard University. The second, who is on the faculties of both Harvard and the Massachusetts Institute of Technology, is a co-editor of Hine and Brownell's *Radiation Dosimetry*, considered for a decade the definitive compendium on that subject.

The preface states that the book is an educational text for health physicists, radiological engineers, and radiological health specialists, written to help them develop the understanding needed to properly analyze potential hazards from radioactive materials and other radiadiation sources. The level of presentation is for first- and second-year graduate students. The authors express hope that in addition the book will be useful to students and practitioners in the fields of nuclear physics, nuclear engineering, reactor shielding, and medical physics.

The title may be misleading to some. I expected the book at first sight and heft to be a rather thorough exposition of the theoretical fundamentals underlying the measurement of absorbed dose and related quantities, with special emphasis upon the mathematical exposition of the theory—something of an expansion and updating of the material found in Whyte's *Principles of Radiation Dosimetry*.

However, it is not this at all. The authors in their introductory chapter distinguish between "theoretical radiation dosimetry," which they define as involving the *estimation* of dose, and "applied radiation dosimetry," defined as the *measurement* of dose. The fact that there are also important theoretical and mathematical problems associated with dose *measurement*, e.g., examination of the Bragg-Gray cavity principle and its elaborations, does not dissuade the authors from their terminology; thus one finds this book on "theory" devoted exclusively to *estimation* of dose. (In this review I will use the term "dose" in a generic sense.) Having overcome this semantic difficulty, one is then in a position to judge how well the authors carry out their intentions.

The information is quite well organized. After an introductory chapter, two chapters on fundamentals, one covering nuclear and radiation physics and the other radiation biology, are presented, not as definitive works on their respective subjects but as broad surveys to serve as background material. The main portion of the book is divided between six chapters on dose prediction for external sources and two on internal source dosimetry. The external source chapters cover interactions between matter and gamma rays, neutrons, beta-rays, heavy charged particles, and high energy particles and dose prediction for each of these forms of radiation. The final two chapters include one on biomathematical models for internal source distribution and one on the dose prediction for internal emitters.

In my opinion, the chapter on the background physics, which contains 108 pp., is much longer than necessary. Some material is only remotely related to dosimetry, and much of the related material is repeated in even greater detail later. However, the chapter on radiobiology appears much more praiseworthy. It is shorter, with little repetition in other chapters; the text serves excellently as a survey for students in engineering and physics who might not otherwise be exposed to a separate course in radiobiology. The parts dealing with the interactions of various types of radiation with matter cover their subject well, concentrating on items of direct concern to dosimetry, while gliding over points of less immediate interest. The depth and sophistication appear proper for the type and level of student for whom it is written.

The chapter on gamma-ray dosimetry is almost the heart of the book. It contains 138 pp. of theory on dose calculation, gamma-ray transport, and attenuation. Included are a large compilation of formulas and graphs, for calculating gamma-ray energy fluxes, and dose rates from a variety of simple standard source configurations, that penetrate a number of idealized standard shielding configurations. Most formulas are based on an elementary exponential attenuation process; however, the concept of the buildup factor as a corrective measure for such oversimplification is explained in some detail.

The chapters on neutrons suffer by comparison with those on gamma rays. The authors appear most interested in radioisotopic sources, and one cannot escape the impression that neutron interactions and