
Books

Nuclear Moments (English version prepared from 2nd German edition by E. E. Schneider). Vol. 2 of Pure & Applied Physics. By Hans Kopfermann. 505 pp. Academic Press Inc., New York, 1958. \$13.00. Reviewed by William F. Meggers, National Bureau of Standards.

The second German edition of Kopfermann's *Kernmomente* was published in 1956 by Akademische Verlagsgesellschaft, Frankfurt, and reviewed by F. Bloch.¹ That book was a vast improvement over the first edition which appeared 15 years earlier when the study of nuclear moments was practically a specialized branch of optical spectroscopy limited to interferometric resolution of hyperfine structures and isotope shifts.

Optical interference spectroscopy is still the most versatile method for the study of nuclear moments, and isotope shifts in atomic spectra remain its exclusive domain, as stated in the second edition of Kopfermann's *Kernmomente*. But the recent development of radio-frequency methods has greatly increased the precision of magnetic and electric moments, and stimulated searches for a successful nuclear model. Consequently the second German edition had four large chapters dealing with the nuclear moments in free atoms, in free molecules, in liquids and crystals, and nuclear models. Radio-frequency spectroscopy of atomic and molecular beams was introduced in the first chapter, magnetic and electric molecular beam radio-frequency spectroscopy in the second, the third dealt with nuclear magnetic resonance, nuclear quadrupole resonance, and paramagnetic resonance, and the fourth dealt mainly with a comparison of the nuclear shell model with experimental results. In preparing the present English edition of Kopfermann's *Kernmomente* the translator has closely followed the experiments, physical arguments, and mathematical derivations of the German edition, but has occasionally deviated from a literal interpretation to make the text more acceptable to English and American readers. Substantial amendments and additions have added about 40 pages, partly to include new experimental data from May 1955 to May 1957, and partly to provide extra conveniences, including a 6-page explanation of symbols, a 2-page element index, a 10-page author index, a greatly extended subject index, and 15 pages of literature references as compared with 9. These important improvements will appeal to all spectroscopists and nuclear physicists, even those who read German as easily as English. Incidentally this English edition is printed on matte paper which seems easier

to read than the German edition printed on glaring glossy paper. Without doubt, this timely and useful book on *Nuclear Moments* will achieve popularity both on account of its interesting content and its excellent typography.

The Neutrino. No. 5 of Investigations in Physics. By James S. Allen. 168 pp. Princeton U. Press, Princeton, N.J., 1958. \$4.50. Reviewed by Arthur H. Snell, Oak Ridge National Laboratory.

All physicists recognize as one of the absorbing aspects of their science the crossing and interlocking of its many threads, the appearance of basic principles in various forms when varying subjects are under scrutiny, and the diverse viewpoints from which sets of phenomena can be assessed. Take the subject of beta decay. The classical expository approach has been based upon the Fermi theory, with emphasis on the shape of the continuous spectrum, the allowed and forbidden transitions, the ft values, and so on, and indeed the remarkable developments of the last two or three years can be incorporated as capstones upon a structure of this kind. In Dr. Allen's book he has shown that the story can also be developed with emphasis upon the neutrino, and that such a development can be given sweep and vigor. A sense of drama accompanies this approach; suspense and triumph have lived with our growth of knowledge of this gentle particle since its invention in 1933. Since then, it has developed from a seemingly artificial concept demanded for the salvation of the conservation laws to a familiar body that has been detected in the free state, and with which we are sufficiently acquainted even to know that a neutrino twists to the left in flight, while an antineutrino twists to the right. There is indeed a story in physics to be told here, sharpened by the philosophic interest that many feel in something that is so very close to nothing. Yet Dr. Allen's treatment retains the physics of the many aspects of beta decay; the shape of the continuous spectrum (especially near its end point), angular correlations in the three-body breakup, double beta decay, decay of polarized nuclei, meson decay, helicity experiments, the nature of the basic interactions, and the universal Fermi interaction all receive discussion. Late developments have been incorporated as notes added in proof, and although this device has unavoidable awkwardnesses, nevertheless we can be thankful in this case that it was possible. Publication a few months earlier would have meant the total omission of a climax as important as the helicity experiment of Goldhaber, Grodzins, and Sunyar!

Despite the impact of the subject matter as a chapter in physics, the language of the book is sober and factual. There is sufficient theory to give unity and a feeling for the objectives sought by all of the investigations, but the text is at its best when it deals with the experiments. As one reads successively about the various measurements that have informed us about the neutrino, one cannot avoid being struck by the ingenuity

¹ Bloch, F., *Science* 124, 1152 (1956).