

Books

High Energy Nuclear Physics: Proceedings of the 6th Annual Rochester Conf. (April 1956). Compiled and edited by J. Ballam, V. L. Fitch, T. Fulton, K. Huang, R. R. Rau, S. B. Treiman. 9 sessions. Interscience Publishers, Inc., New York, 1956. Paperbound \$3.75. *Reviewed by J. C. Polkinghorne, University of Edinburgh.*

Each annual Rochester Conference provides a welcome opportunity of taking stock of the advances that have been made in high-energy physics during the preceding year. During the year 1955-56 the experimental discovery that attracted the greatest attention was the long-awaited production of the anti-proton and this particle had the honor of occupying the attention of the conference for a whole session. Its properties are generally what they were expected to be except that the cross section for annihilation is twice geometrical. The theoretical explanation of this remains a matter for debate. Other experimental results reported included polarization experiments on p - p and n - p scattering that show the existence of strong noncentral forces and the results of π - p and p - p scattering experiments above 1 Bev. The work on high-energy electron scattering provides information that may be interpreted either as relating to nucleon structure or to the breakdown of quantum electrodynamics at short distances.

The year has seen the steady accumulation of evidence of the properties of the strange particles. In particular, as the experimental errors diminish, the masses and lifetimes of the various K -meson decay modes seem to persist in converging to the same values. At the same time the evidence that the $K_{\pi 2}$ and $K_{\pi 3}$ modes either have opposite parities or relate to a common particle of uncomfortably high spin becomes stronger. Several theoretical resolutions of this puzzle have been propounded but it is clear that the last word has not yet been written.

The chief interest is on the theoretical side related to the exploitation of the causality condition and its resultant dispersion relations. In practical terms this leads to the selection of the Bethe phase shifts in low-energy π - p scattering. Some of the wider implications of this approach include the possibility of making further progress with Heisenberg's program of formulating a theory in terms of physically measurable quantities only. This seems to be possible provided an analytic continuation process can be found into certain unphysical energy regions. Another theoretical problem discussed was the existence of "ghost" states in quantum

electrodynamics. This appears to remain an open question.

The editors are to be congratulated on the speed and efficiency with which they have compiled this report.

Radiation Dosimetry. 22 Contributors. Edited by Gerald J. Hine and Gordon L. Brownell. 932 pp. Academic Press Inc., New York, 1956. \$22.00. *Reviewed by Joseph G. Hoffman, Roswell Park Memorial Institute.*

The broad and all-inclusive title may be misleading. In the preface the editors mention that no attempt has been made to treat non-ionizing radiations such as ultraviolet, infrared, or optical. This is a practical treatise on the dosimetry of radiations found in particle physics, x-ray and isotope therapy, and in nuclear energy work.

For example, physicists are called upon to estimate alpha particle dosage delivered to skin by a topical application of ointment saturated with polonium, or the internal organ dosage from compounds having P-32 injected intravenously, or whole body exposure in workers due to spilled gamma emitter in a laboratory. The physical conditions of radiation source and absorbing tissues vary widely. This book pulls together into a timely and welcome text those formulas and methods that have in the past 30 years become essential to the estimation of diverse dosages.

The practical aspect is seen in the tabular listing on pages x and xi of sixteen figures and eighteen tables directly applicable to dose determinations. While these are useful data they do not suffice to meet all the requirements of the radiological physicist. There remains a need for a handbook of the physical data still scattered among various places like Lea's book, *Supplements to the British Journal of Radiology*, the technical journals, and the diverse reports of private and governmental laboratories. In this connection, on page xiv there is a useful table of abbreviations of names of reports from thirty laboratories in the United States.

The eighteen chapters are grouped into three main sections. The first section describes physical fundamentals. This includes a brief outline of twenty-three pages about biologic effects. The general subjects of radiation detectors and their calibration comprise the second section which ranges from precision calorimetry to a listing of the diverse survey instruments like Cutie Pie, Rudolph, Pee Wee, and Thyac. The third section deals with the dosimetry of radiation fields and covers heavy, charged particle beams, electron beams, neutrons, x-rays, and various isotope applications.

A noteworthy aspect of dosimetry is pointed up by the inclusion twice of Bush's famous graph for the relative distribution of integral dose along the geometrical axis of the human body. The graph and its associated table are on pages 780 and 781, and again on pages 856 and 858. It seems to have become classic: it was included in Mayneord's 1950 monograph, and again in Mayneord and Sinclair's 1953 review article on isotope

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tions, alloys, semiconductors, photoconductivity, luminescence, imperfection in solids. A publication in the *Wiley Series on the Science and Technology of Materials*, J. H. Hollomon, Advisory Editor. 1956. 617 pages. \$10.00.

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JANUARY 1957

Physicists, Ph.D.

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dosimetry. Bush calculated the distribution by an elegant application of the reciprocity theorem for radiation source and absorber. This fruitful result of theory raises the question as to why there was not included in this book a chapter on the general theory of radiation fields. In Chapter 3 the editors extended their subject toward the biological side, and, in general, they have covered all physical techniques pertinent to dosimetry. Why should there not be included physical theory to balance an otherwise intensely practical text? Perhaps the answer is, in part, that relatively little work is being done on the theory.

There are a number of errors, some of which should be listed. On page 430, the word "root" is omitted, and the text says the mean square voltage of Johnson noise is $1.27 \times 10^{10} \sqrt{R}$ volts, which is too large by a factor of 10^{20} . Mitosis on page 931 is spelled "mytosis" on page 930. I couldn't check all the index entries but the very last one on page 932 called "very low energy-dosimetry, 841", should be 842. Moreover, there are a number of low-energy x-ray data in the text not referred to in the index. In spite of these minor shortcomings, the book should prove useful to the practicing radiologic physicist.

The Theory of Sound (Reprint of 2nd Edition). By Lord Rayleigh. Vol. 1, 480 pp.; Vol. 2, 504 pp. Dover Publications, Inc., New York, 1956. Paperbound \$3.90 for 2 vol. set. Reviewed by Norman H. Nachtrieb, *Institute for the Study of Metals*.

It would be gratuitous to attempt to "review" any book which was published almost eighty years ago. This is especially true of Lord Rayleigh's great monograph, here reprinted in the unabridged version of its second edition. At the same time, it is appropriate to remind ourselves that this is not merely another treatise . . . of interest for historical reasons only. On the contrary, this is a monumental work which remains the standard of excellence and retains all the vitality and usefulness it possessed in the years first following its publication in 1877.

An illustration of its current value may be found in a recent (1952) symposium volume on imperfections in crystalline solids, in which the author cites Rayleigh's "elegant method" of treating random phases of wave motion and adapts it to the random walk problem of the diffusion of atoms in crystals. "Elegant" is a good word to characterize Rayleigh's book. It has the unhurried style of a master author, anticipating the reader's difficulties and skillfully guiding him through the intricacies of a complex subject. In developing the representation of a general periodic function, for example (Vol. I, p. 24), Rayleigh has this to say about Fourier's theorem:

"Fourier's theorem is not obvious. A vague notion it not uncommon that the infinitude of arbitrary constants in the series of necessity endows it with the capacity of representing a periodic function. That this is an error will be apparent when it is observed that the