

Books

Mesons and Fields. Volume II: Mesons. By Hans A. Bethe and Frederic de Hoffmann. 434 pp. Row, Peterson and Co., Evanston, Ill., 1955. \$8.00. *Reviewed by Freeman J. Dyson, Institute for Advanced Study.*

In two volumes the authors are giving us an exposition of the meson field theory and of the attempts which have been made with this theory to understand meson experiments. Volume 2 comes out first and describes the experimental results with theoretical analysis and commentary. Volume 1 will follow in a month or two and will contain the mathematical development of the theory from its abstract foundations. The division is made in such a way that Volume 2 is self-contained and can be used by experimental physicists, while Volume 1 is for theoretical people only. Both volumes are designed as text-books for graduate students, and they grew out of courses in high-energy physics which Bethe gave to the third-year graduate students at Cornell. Volume 2 represents what every Ph.D. in high-energy physics at Cornell, either experimental or theoretical, is expected to know. Volume 1 is what the theoretical students are expected to know in addition.

Before discussing the book in detail, some general remarks are in order. Volume 2 is an important historical phenomenon. It represents in a nutshell the American philosophy in the training of physicists, the idea that there should be a wide range of common ground with which experimental and theoretical people should both be thoroughly familiar. This philosophy, much more than the availability of money and equipment, is the reason why so much good physics is done nowadays in America. The lack of this philosophy was the prime cause of the decline of the Cavendish Laboratory after Rutherford's death. When I was a student in Cambridge, an experimental physicist was considered good if he knew how to build good equipment, a theorist was considered good if he knew how to handle his mathematics. It was not generally understood that a creative experimenter is one who thinks about what he will discover with his equipment, and a creative theorist is one who thinks about what he will do with his mathematics. Things have improved in Cambridge since those days, and they will improve a lot more when Bethe goes there next fall.

So the substance of this Volume 2 is the meaning of the results of the precise experiments which have been done with mesons. Nothing is said about experimental

equipment and techniques, which the experimental student is expected to know anyway. Nothing is done with high-powered mathematics, which the theoretical student will find in Volume 1 when he needs it. Specifically, the main part of the book is concerned with the scattering of pi-mesons by protons and with the photo-production of mesons by photons colliding with protons. These are the processes for which rather complete experimental data now exist, and for which detailed comparisons with various theoretical models are meaningful.

The book has one major fault, which is hardly to be avoided in any book written about a rapidly growing subject. It tries too hard to be up-to-date. The reviewer wishes in this connection to enunciate a theorem: if a book is to be published at a time T , and if it is supposed to be up-to-date to a time $T - t$, then it will inevitably be out-of-date at the time $T + t$. This principle will be recognized by experts as having some analogy to the "spin-echo" phenomenon in nuclear induction. The principle is based on the observation that a physical theory which has survived for a time t has, statistically speaking, a further expectation of life equal to t . An equivalent statement is the inverse-cube law of survival of ideas: the *a priori* probability that an idea shall be disproved or abandoned at a time t after it is proposed is proportional to t^{-3} . The proof of equivalence is left as an exercise to the reader.

The question many people will ask is, why try to write a book about meson theories now, when the problem of obsolescence of ideas is so particularly acute? To this Bethe would probably reply, the purpose of such a book is to be useful, not to be immortal. And I believe he is right. The book is particularly badly needed now, just because the situation is confused. Students and researchers are bombarded with a weekly barrage of papers and reports, each claiming to interpret this or that item of experimental information with this or that theoretical model. There is no time for most people to read all this literature, let alone to understand it, and people had until now no text-book in which the important parts of it were extracted and arranged in orderly fashion.

That is what this volume does, and does very well.

High-Energy Accelerators. By M. Stanley Livingston. 157 pp. Interscience Publishers, Inc., New York, 1954. \$3.25. *Reviewed by A. H. Snell, Oak Ridge National Laboratory.*

Do you know the difference between a betatron oscillation and a synchrotron oscillation? Can you distinguish between a synchrotron and a synchro-cyclotron in the dusk with a light behind them? Can you tell a λ -particle from a necktie diagram? If not, draw an easy chair up to the fire and open this little book. It takes you clearly and logically from the introductory chapter on the whys of the large, high-energy accelerators (those bothersome new particles, you know!) through a chapter on the stability of orbits, to descriptions of electron synchrotrons, synchro-cyclotrons, linear accelerators and proton synchrotrons, and it ends with the de-