

The Revolution in Physics

In his historical essays Niels Bohr repeatedly stressed the complex nature of the development of quantum physics, describing it as having taken "the combined effort of a whole generation of physicists" and having led eventually to nothing less than "a new outlook regarding the comprehension of physical experience." Max Jammer's **The Conceptual Development of Quantum Mechanics** (McGraw-Hill, New York, 1966. 413 pp., illus. \$10.50) is the first serious attempt to deal with the history of this revolutionary change in physical thought. Jammer has written directly from the primary sources, and must have worked his way through a quarter of a century of extensive and difficult periodical literature. He has supplemented this with a study of the recorded interviews with some of the survivors from the heroic age (interviews we owe to the project "Sources for History of Quantum Physics") and with an examination of the scientific correspondence of a number of the leading physicists of the period. The result is a book that treats the period from Max Planck's introduction of energy quanta in 1900 through the formulation of the Copenhagen interpretation in 1927, and treats it thoroughly and with assurance. Jammer is at home in the language of theoretical physics, and he has carefully discussed and analyzed a good many of the major and minor papers to show how the arguments he selects were originally presented. His previous work on the history of some of the key concepts in physics is also reflected here as he suggests the philosophical background of Bohr's work [in Kierkegaard, Høffding, and William James (!)], traces the prior history of some of the mathematical techniques used in quantum mechanics, and follows the shifting arguments on several conceptual issues that have not been fully resolved. All future students of the history of quantum physics will gratefully begin their work with the aid of Jammer's book.

But having said this I must also say that Jammer has not written a completely satisfactory history. Even dealing with the history of a particular branch of science in the recent past, it would be wise to observe A. O. Lovejoy's remark that the historian "may not assume a priori that the major problems of the present were those of the past" and his suggestion that "the intellectual historian's selection . . . should be determined, not by what

seems important to him, but by what seemed important to other men." Jammer has not always proceeded in this way. He actually begins his book by remarking that it was "unfortunate" that quantum theory arose from such a complex issue as the problem of black-body radiation! His readers will not learn, for example, that Planck's fundamental aim in the late 1890's was to provide an electromagnetic, nonstatistical derivation of the second law of thermodynamics, or that Planck's full confidence in the correctness of his energy quanta was based on his determination of the basic units of mass and electricity with the help of his radiation formula. The concerns that loomed large 50 or 60 years ago do not always control Jammer's account of the events of that time. Thus, by choosing to emphasize only Bohr's derivation of the hydrogen spectrum, which has "survived," Jammer gives a misleading picture of the purpose of Bohr's 1913 papers, which was the construction of a theory of atomic and molecular structure, with emphasis on the "permanent" states of such systems, in order to explain the chemical and physical properties of matter. This sort of failure of the historical sense is the major flaw in Jammer's book.

Robert Oppenheimer once commented that writing the history of quantum physics "would call for an art as high as the story of Oedipus or the story of Cromwell." Jammer's book lacks the "bravura adequate for this great hymn." He deserves all credit for having written the first word on his subject, but it is hardly the last.

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Marine Biology

Matter suspended in the water provides food for a very large number of marine organisms. In C. Barker Jørgensen's **Biology of Suspension Feeding** (Pergamon, New York, 1966. 373 pp., illus. \$12.50), an outgrowth of a general survey of the topic that appeared in *Biological Reviews* some years ago, the various types of feeding structures that have developed to capture suspended material are described, and the organisms that subsist by such means are reviewed. Jørgensen then goes on to discuss the sources of suspended material,

including phytoplankton and various "dissolved" and breakdown substances. The book is an excellent contribution to one of the most basic problems of marine biology in terms both of morphological and zoological summary and of the ecological aspects of the process. There are 144 pages of references and numerous illustrations of feeding or collecting structures. The illustrations have been copied from the literature and represent diverse drawing techniques. In some instances lines should have been strengthened or illustrations redrawn, but this is a comparatively minor defect in what is one of the best and most useful volumes of Pergamon's series of monographs in pure and applied biology.

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Laser Therapy

Leon Goldman, a dermatologist with extensive clinical experience, has been intensely interested and closely involved in the development of the laser as it relates to medical applications. He has written a short monograph, **Laser Cancer Research** (Springer-Verlag, New York, 1966. 73 pp., illus. \$4), which in part justifies the enthusiasm with which his laser studies have been carried out. A carefully written introductory chapter on laser instrumentation details to the novice innumerable innovations that the engineers have offered the investigator interested in determining the role that the laser may play in the treatment of the cancer patient. The poorly understood safety hazards, which must be considered in every laser laboratory, are summarized in the second chapter, emphasis being placed on the all-important protection of the eye. The author's philosophy, that true advances in the biomedical laser art will be made in the human and not necessarily in the experimental laboratory, are reflected in four abbreviated chapters on laser reaction in normal and tumor tissue in animals and tissue cultures and the role of pigmentation in laser sensitivity. The concluding chapters outline the active role that the laser currently plays in the author's clinic. In the discussion of the laser treatment of melanoma, epithelioma, lymphoma, and other malignancies, encouragement is offered the therapist who is