Armin Hermann: *Frühgeschichte der Quantentheorie (1899-1913)*, Physik Verlag, Mosbach in Baden, 1969, 14 × 21 cm, 181 pp.

It is a joy for the historian of the modern physics that Armin Hermann's book has been added to the literatures of the history of quantum physics. We have already possessed excellent histories of quantum theory such as the late Amano's *Theory of Heat Radiation and the Origin of Quantum Theory* and *History of Quantum Mechanics,* and Max Jammer's comprehensive *Conceptual Development of Quantum Mechanics.* Hermann's book, however, claims a unique *raison d'être* of its own.

In the period covered by this treatise, 1899 to 1913, the study of the quantum theory was not yet recognized as an active field of research in the physicists' wrold. Physicists who paid serious attention to the problem were rather few. The interest in the quantum theory was, by and large, restricted, as the author rightly states, within the boundary of German-speaking people. The author critically describes and examines the contributions of eight physicists who in this period were concerned with the quantum theory. They are: M. Planck, H. A. Lorentz, A. Einstein, J. Stark, A. E. Haas, A. Sommerfeld, W. Nernst, and N. Bohr, to each of whom a separate chapter is devoted respectively. A plenty of unpublished materials, large part of which are scientific correspondences of these physicists, have been investigated and are effectively utilized in this book by the author. The quantum theory of this period having been, as characterizes the author, a German subject-matter, he, a German historian of physics, certainly is profitably entitled to do such a work. For example, he presents interesting new findings about the career and the achievement of A. E. Haas who, in spite of being the first to apply the quantum of action to the theory of atomic structure, has been hitherto relatively neglected. This is one of the contributions of this book which a foreign historian would not be able to make without some difficulty.

Among many interesting points presented in this book, of particular interest to the reviewer are the chapters on Planck and Stark.

The author starts the history of quantum theory from the year 1899, not from the year 1900 as might be expected. This choice of date is not without reason. For as early as in May 1899, discussing the validity of Wien's radiation formula, Planck introduced two constants a and b, of which the latter was the equivalent of Planck's constant h and was calculated to be 6.885×10^{-27}. Planck noticed that they were universal constants with the aid of which a natural system of units of physical quantities could be constructed. Planck emphasized this again in his papers of 1900–01 which introduced the energy element, while, asserts the author, in 1900–01 Planck was not quite aware of the violence of the principle of continuity. In his deriving the radiation formula using $S = k \log W$, it was entirely out of question to take the limit of ε or $h \to 0$, because, according to the author, the constant h, being a universal constant, had been, since the previous year, of fundamental importance to Planck.

Thus the author asserts that what was new for Planck in his theory of radiation was not the energy element but the universal constant h. This is the reason why the author considers the beginning of the history of quantum theory to be in the year 1899. In this connection, the author also makes a remark about what Planck called "an act of desperation" in his letter to R. W. Wood. This may be liable to be interpreted as indicating the introduction of a discreteness of the energy. But the author asserts that his historical exposition, together with some writings of Planck, indicates that Planck meant by "an act of desparation" not the discreteness but that he had adopted Boltzmann's probabilistic interpretation of the entropy notwinthstanding the dislike of the atomism openly expressed by him until only a few years ago.

This conclusion is a very probable one. To the reviewer's regret, however, all the writings of Planck's, adduced by the author as the evidence, are of later date. They are quotations from Planck's Nobel lecture, the essay on the history of the discovery of quantum of action written in 1943, the scientific autobiography, and the letter to Wood dated October 7, 1931. It is virtually impossible to use writings of Planck himself at the crucial time because all his private papers were destroyed by the War. But when a later writing is presented as evidence in the historical study, adequate caution may be required. For example, Planck says in his letter to Wood that he will narrate the psychological side of his investigation. His narration is, however, a retrospective, somewhat logical reconstruction of the course of events, as is evidenced by his reference to the partition of energy between the radiation and the resonators, a problem of which Planck was not yet conscious in 1900. The reviewer does not mean that the author's conclusion is doubtful. It seems well supported by circumstantial evidences. It may however be hoped that the author would have added here some adequate consideration.

Now another point of particular interest is to be discussed. The author has uncovered many interesting efforts of Stark which have hitherto been neglected in the history of quantum theory. To take an example, the idea that the energy difference of two positions of intra-atomic electron may be emitted as a spectral line is found to be first stated by Stark in 1908. What seems to the reviewer especially suggestive is the discussion of the possible influence of Stark on Bohr's theory of atomic constitution. In 1908, Stark considered a mechanism of the emission of spectral line. He supposed that the emission was due to binding process of a remote electron by the atom. The electron captured by the atom was supposed to described an elliptic orbit of large eccentricity. At each successive perihelion and aphelion the electron loses some of its energy in the form of radiation because of its large acceleration. Thus the electron, emitting radiations of ever increasing wavelength, successively describes a series of orbits which become smaller and smaller until it settles down in a state of lowest potential energy. Stark presented this idea in a more careful form in his book *Prinzipien der Atomdynamik II* of 1911, a copy of which was in possession of Bohr around the time when the latter was finishing his theory of atomic constitution. Now, the author suggests that Stark's book should have strongly influenced on Bohr in shaping of his theory, because Stark's idea, when applied to the Rutherford atom, will automatically lead to the concept of a family of elliptic orbits characterized by the energy of electron on each of them. To the reviewer this is quite a interesting suggestion. For he, with S. Nisio, once proposed an interpretation of Bohr's first form of the quantum condition that this condition would have been derived by an averaging of the energy which an electron captured by the nucleus might emit with a certain probability during its binding through successive, ever shrinking orbits (No. 3, 1964 of this journal. See also pp. 35–47 of the present volume). The suggested influence of Stark on Bohr will probably corrobarate this interpretation. However, here again, there is lacking any direct and contemporary evidence that Bohr actually derived inspiration from Stark. It therefore cannot be said to be conclusively established, possible though it may be, that Stark directly influenced on Bohr.

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