

# The Genesis of the Bohr Atom Model and Planck's Theory of Radiation

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## 1. Introduction

In 1964-65 we considered the origin of Bohr's quantum theory of atomic constitution and concluded as follows:<sup>1</sup>

1. In the first decade of the twentieth century, rather the chemical consideration afforded the useful foundation for constructing an atomic model than the spectrum. J. J. Thomson's positive sphere model, which was the most successful theory of atomic structure of the time, aimed at explaining the chemical properties of elements. It may also be stressed that Thomson's model was the first theory that formulated the two historically important notions in the development of atomic model, that is, the notions that the chemical properties of an atom were determined by the configuration of electrons in the atom, and that the intra-atomic electrons distributed themselves in several rings.
2. Bohr's consideration of atomic constitution was begun with the intention to give an explanation of the chemical properties of atoms and molecules. In this attempt Bohr inherited the aim as well as the two fundamental notions above of Thomson's theory.
3. The common understanding<sup>2</sup> that Bohr formulated his theory by borrowing the idea of quantizing the angular momenta of orbital electrons from J. W. Nicholson is quite contrary to the fact. Nicholson cannot be said to have put forth such a clear idea that the electron orbit would be determined by the condition of quantized angular momentum. Furthermore Bohr's condition for fixing the electron orbit was not stated in terms of the angular momentum.
4. Bohr's actual quantum condition  $W = (\tau h/2)\omega$ , where  $W$  is the amount of energy emitted during the binding of an electron by the nucleus,  $\omega$  the number of rotation of the electron on its final orbit, and  $\tau$  an integral

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<sup>1</sup> T. Hirose and S. Nisio, "Formation of Bohr's Theory of Atomic Constitution", *Jap. Stud. Hist. Sci.*, No. 3, 6-28 (1964). T. Hirose, "On the Background of Bohr's Theory of Atomic Constitution", *Actes du XI<sup>e</sup> Congrès international d'Histoire des Sciences, III*, 430-434 (1965).

<sup>2</sup> For example, E. T. Whittaker, *A History of the Theories of Aether and Electricity, II. The Modern Theories*, Thomas Nelson, London, 1953, pp. 107-109.