

# The Development of Nagaoka's Saturnian Atomic Model II (1904-05)

—Nagaoka's Theory of the Structure of Matter—

Eri YAGI\*

## 1. Introduction

A research group, whose members are Dr. Kiyonobu Itakura, Mr. Tōsaku Kimura and myself, has worked on the biography of Hantaro Nagaoka since 1963. My participation in the biography is mainly connected with Nagaoka's activities in the period from 1903 to 1926, namely from his proposal of the Saturnian atomic model to his retirement from the University of Tokyo. I have published several papers on these activities.<sup>1</sup>

Nagaoka proposed his Saturnian atomic model on December 5th 1903, at the monthly meeting of the Tokyo Physico-Mathematical Society and a year later his theory was published both in the *Proceedings of the Tokyo Physico-Mathematical Society*<sup>2</sup> and in the *Phil. Mag.*<sup>3</sup> Nagaoka's model consisted of a number of negative electrons of equal mass, arranged uniformly in a circular ring, and a positively charged sphere of large mass, located at the center of the ring. In his paper Nagaoka tried to prove that if these mutually repelling electrons revolve with nearly the same velocity around the center, whose attracting force is sufficient, the whole system remains stable against minor disturbances.

The origin of Nagaoka's model has been discussed in my paper on Nagaoka's Saturnian Atomic Model (1903).<sup>4</sup> The reason why he proposed this atomic model, rather than one similar to J. J. Thomson's has been also discussed by the use of Nagaoka's notes, correspondence, diaries, and review papers in Japanese. These materials had not been used before. It should be noticed that the uniqueness of

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\* Institute of Physics, Faculty of Engineering, Tōyō University Kawagoe-shi, Saitama-ken.

<sup>1</sup> Eri Yagi, "On Nagaoka's Saturnian Atomic Model (1903)", *Jap. Stud. Hist. Sci.*, No. 3, 29-47, 1964; "The Development of Nagaoka's Saturnian Atomic Model I —Dispersion of Light—", *ibid.*, No. 6, 19-25, 1967; Errata, *ibid.*, No. 8, 177, 1969; "The Development of Nagaoka's Saturnian Atomic Model", *Actes XII<sup>e</sup> Congrès International D'Histoire Des Sciences Paris 1968*, 5, 117-119, 1971; For the contents of our book on Nagaoka's biography, which will be published soon in Japanese by the Asahi Newspaper Publisher, see "Research Group of the Committee for the Publication of Hantaro Nagaoka's Biography", *Jap. Stud. Hist. Sci.*, No. 10, 23-24, 1971.

<sup>2</sup> Hantaro Nagaoka, see Appendix I 1.

<sup>3</sup> H. Nagaoka, see Appendix I 4.

<sup>4</sup> E. Yagi, *Ref.* 1).