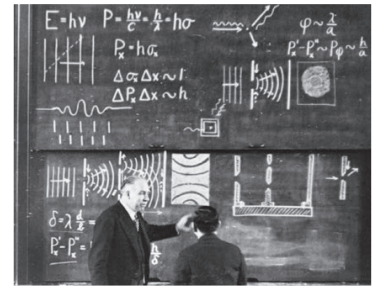


Into the tumult of the beginnings of quantum mechanics

In October 1921, a young and undistinguished scientist in his first year at RIKEN traveled to the Cavendish Laboratory at Cambridge University, in pursuit of new fields of physics. In Cambridge he studied under Ernest Rutherford, who was then 50 years old. The young scientist's name was Yoshio Nishina. At this time Europe and America were in the calm before the storm caused by Werner Heisenberg's theory of quantum mechanics in 1925.

In March 1922 in Cambridge, Nishina, aged 31, met Niels Bohr, aged 36, who had also studied under Rutherford and was then an up-and-coming physicist at Copenhagen University. For Nishina, the young genius Bohr was a huge inspiration. This chance meeting between the two determined the course of Nishina's own career and had an enormous effect on Japanese science.



Bohr and Nishina in Japan

By November, there was less than six months left of Nishina's planned sojourn in Europe. He had started studying German at Göttingen University. With a mixture of optimism and anxiety, Nishina pinned his hopes on a single letter, and followed his dreams to Copenhagen.

Episode

A short letter

The appeal Nishina sent to Bohr from Göttingen



The Niels Bohr Institute

In November 1998, the author traveled to the Niels Bohr Institute (NBI) in Copenhagen and met with its director, M. Olesen. In the 1920s,

Yoshio Nishina had worked under Bohr with top young physicists from countries around the world, and participated in the creation of quantum mechanics. Eighty years later, T. D. Lee had proposed the setting up of the RIKEN BNL (Brookhaven National Laboratory) Research Center, in New York State, to be an international center of excellence like NBI. This was the background to my visit.

The manager of the Niels Bohr Archive, Finn Aaserud, showed me a letter, about ten lines long, and told me that this was the first letter that Nishina had written to Bohr. It read, "You may remember that I was working in the Cavendish Laboratory when you came to Cambridge about a year ago ... I left Cambridge last September and came here for the purpose of learning the German language ... As my Institute in Tokio does

not allow me to stay in Europe longer than two more terms, I do not know whether it is wise to set up new work. My chief wish is to study your theory of spectra and atomic constitution in details. But if any one wants assistance in the experiment or the calculation, I should do it with pleasure."

When he received this letter, Bohr made every effort to secure funding for Nishina's stay in Europe. Fortunately he was able to acquire a scholarship from the Rask-Ørsted Foundation. So Nishina was able to go to Copenhagen and study quantum physics under Bohr for the next five years. He absorbed the *Kopenhagen Geist*, which later had a huge effect on the RIKEN Spirit. We have become especially aware of this while editing *Eighty-eight years of the RIKEN Spirit*. As the curtain rises on RIKEN's new accelerator science, we feel anew the significance of this short letter.



The letter from Nishina to Bohr



Bohr in Kamakura

- Niels Bohr* gathered top young physicists from all over the world to work with him in Copenhagen, including Heisenberg*, de Hevesy*, Kramers, Pauli*, Jordan, Dirac*, Klein, Rabi*, and Gamow. Bohr's labs did not just debate theoretical physics; they also did physical and chemical experiments. Most of these physicists were then in their 20s. *Nobel laureates.
- In April 1937 Nishina's long-cherished wish was fulfilled when Bohr visited Japan with his wife and son. With Nishina as interpreter, Bohr gave ten lectures around the country, and attended numerous debates and dinners. The Bohrs were taken to see the sights of Japan, from Matsushima in the north to Mount Unzen in the south. On May 19 they left Nagasaki for Shanghai, and their return journey traversed Russia. A month and a half later, the Marco Polo Bridge Incident heralded the start of the Sino-Japanese War.
- The *Kopenhagen Geist* was said to be a spirit of cooperation, free debate without ceremony, and commitment with humor.
- The author was impressed by the words of an elderly taxi driver in Copenhagen in 1998: "You are from Japan? After he went to America, Bohr worked on the Manhattan Project. But he regretted the bombings of Hiroshima and Nagasaki for the rest of his life."

• T. D. Lee shared the 1957 Nobel physics prize with C.N. Yang. The RIKEN BNL Research Center continues to flourish as the Mecca of spin physics.