

Striving for self-reliance

It was in 1946, during the turmoil that followed the end of the war, that Yoshio Nishina, the fourth Director of RIKEN, undertook the task of making RIKEN fully self-reliant. Nishina knew that the United States had begun cheap steel production using large amounts of oxygen during the war, and he judged that this technology would be useful given the dire state of Japan's energy supplies.

One of Nishina's subordinates, Hidehiko Tamaki, learned about Pyotr Kapitsa's liquid oxygen production method from a paper that had been published in the Russian *Journal of Physics* in 1939. Nishina decided that this should be RIKEN's next big project, to go alongside its research on penicillin production. Tamaki was competent in Russian, so he got the detailed technical documents from the Allied occupation forces and made a report to Nishina.



Yoshitoshi Oyama

In 1947, Yoshitoshi Oyama's lab, together with the Nishina, Tsuji, Ebihara, and Kuroda labs, began their collaborative research, using funds obtained from RIKEN and a grant from the ministry of trade and industry. In June 1949 they succeeded in liquefying air, which was an important step towards producing liquid oxygen. Three more labs joined the project, and a mid-term experimental division was established. They then moved on to the development of industrial production facilities, and commercialization.

Half a century later, an unexpected opportunity arose for RIKEN to repay the favor it had received from the great Kapitsa in its hour of need.

Episode

Kapitsa, Nishina, Fushimi, Arima, and Kobayashi

Repaying Russia for the low-pressure oxygen production apparatus that saved KAKEN



Pyotr Kapitsa

At the end of March 2003, RIKEN extended an invitation to Sergei Kapitsa, and he came to visit Japan for one week. Kapitsa was then director of the Institute for Physical Problems in Moscow. His father was Pyotr Kapitsa, the world-famous physicist who had won the Nobel prize in

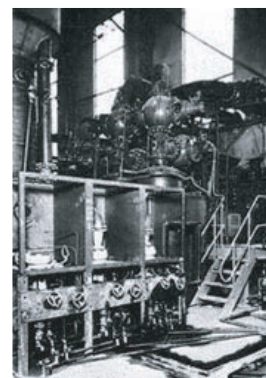
1978 for his work on low-temperature physics. What were the reasons behind RIKEN's invitation to Sergei?

After the war, RIKEN was reorganized as a company called KAKEN, and Yoshio Nishina was its president. In 1946, Nishina decided on research on the manufacture of penicillin and the production of liquid oxygen by Pyotr Kapitsa's method, as secret strategies to get the institute's finances back on a stable footing. After two and a half years of hard work, Yoshitoshi Oyama's group succeeded in building its own apparatus for the low-pressure production of oxygen. The cheap supply of large amounts of oxygen played a major role in the postwar revival and growth of Japanese industry, especially steel production.

In 1998, Akito Arima, then President of RIKEN, received a letter from Koji Fushimi, who was chairman of the Japan-Russia Exchange Society. Fushimi wrote, "The Soviet Union gave great support to RIKEN in the KAKEN years. But as far as I know RIKEN never paid any patent fees. The terrible state of science in Russia today is just the same as RIKEN after the war. Please think of some way of returning the favor."

Soon after this, Arima resigned as President to enter politics. The letter from Fushimi was passed on as Arima's "will" to the next President, Shun-ichi Kobayashi, and after half a century, RIKEN's obligation was repaid with the invitation to Sergei Kapitsa.

Sergei Kapitsa came to Japan under the memory of his illustrious father, but he is also an outstanding physicist in his own right. He traveled around the country visiting accelerator facilities such as SPring-8 in Harima and KEK in Tsukuba.



KAKEN's low-pressure oxygen production apparatus

- On June 6, 1949, an extinguished match was held in front of an open expansion valve, and it burst back into flame. That evening, Nishina raised a toast to congratulate the researchers on their success, and the No. 9 Building (the site of the project) erupted with excitement. RIKEN had only just started on the road to self-reliance, but this was a major milestone along the way.
- Soon the world was to enter the age of oxygen steel-making. In Japan and overseas, large plants sprung up that produced oxygen cheaply and in large quantities using the "tonnage oxygen" technology that Nishina had been aiming for. For KAKEN and its successor, the public corporation RIKEN, the royalties received from Hitachi for this technology were one of the main three sources of income from patents. In 2003 the license was transferred from Hitachi to Nippon Sanso.
- Pyotr Kapitsa was at the Cavendish Laboratory in Cambridge for 14 years from 1921. Coincidentally Nishina was also there for eight months, but there is no record of their having met.