

## Aspects of the role of microscopes in the history of petrology in Japan

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The study of geology in Japan started with the help of Western geologists employed by the Japanese Government during the Meiji Era in the late nineteenth century. After learning from the German teacher, Edmund Naumann (1854-1927), Japanese students went to various European countries to take more advanced studies in geology. One of them, Bunjiro KOTO (1856-1935) went to Leipzig University and studied microscopic petrography under Ferdinand Zirkel (1838-1912). He returned to Japan and initiated microscopic petrography, using imported German microscopes. The Japanese geologists claimed that they could become better than Naumann because of their use of microscopes. Until the late of 1890s the Japanese Government was trying to change the one-sided and unequal commercial treaty with Western countries that had been concluded prior to Meiji Era, and one of the points that raised was the claim that Japanese geologists had a superior knowledge of Japanese geology, as compared with some Western scientists working in Japan.

Microscopic petrography in Japan developed gradually and made some significant contributions. For example, Koto's student, Seitaro Tsuboi (1893-1986) devised a dispersion method of determining plagioclases in cleavage-flakes in 1923. This technique came to be known as the 'Tsuboi method' and was used all over the world.

Before and during World War II, Japanese geologists prospected for uranium based on the chemical analysis of various rocks. Hisashi KUNO (1910-1969), Tsuboi's student and associate professor of the University of Tokyo, went as a soldier to the front of Northeast China, where there were no good geological instruments other than microscopes. He found small differences in the refractive indices of the quartz in different granites.

After the War, one of Kuno's students, Akiho MIYASHIRO (1920-2008), advanced a physico-chemical theory of the metamorphic rocks of Japan on the basis of microscopic petrography and discussed the origin of the Japanese island arc.

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