MEMORIAL OF SHUKUSUKÉ KÔZU

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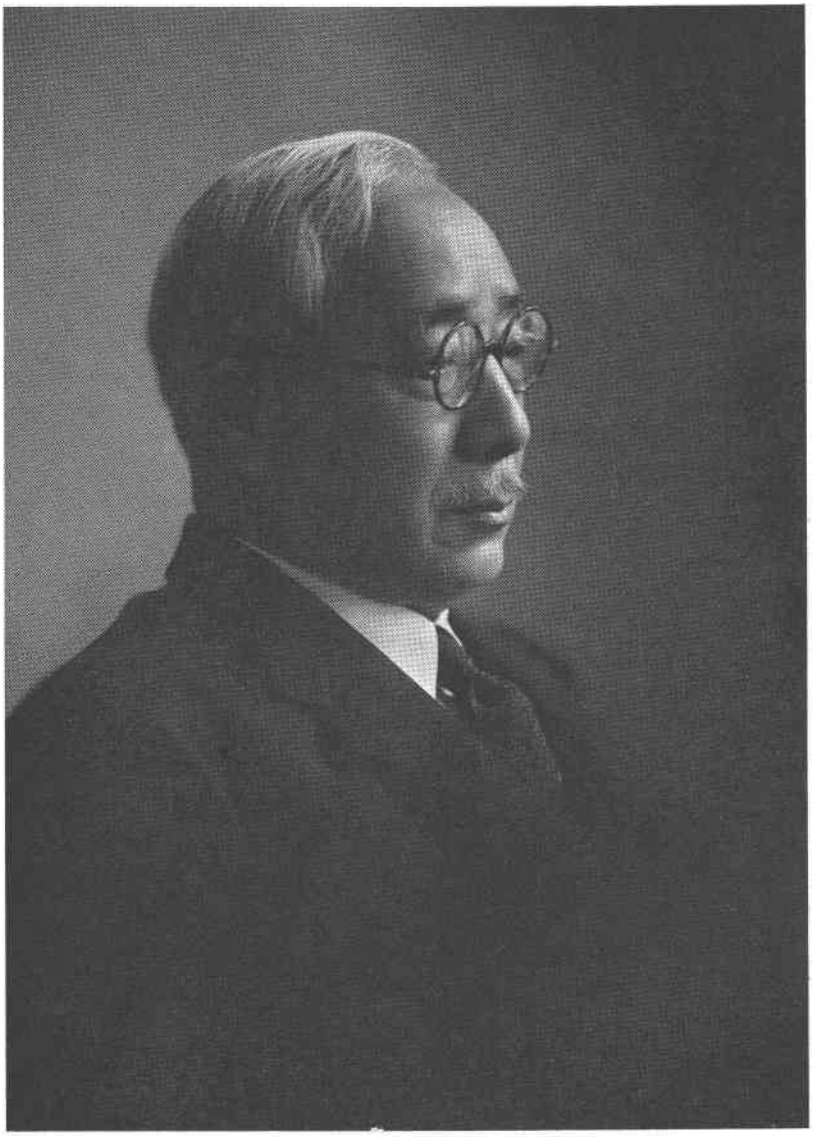
With the death of Dr. Shukusuké Kôzu, Professor Emeritus of Tohoku University on February 11, 1955, Japan lost one of the most prominent leaders in the field of mineralogy and petrology.

Prof. Kôzu was born on June 5, 1880, as the second son of a famous and wealthy family in Shiga Village, Nagano Prefecture in Central Japan. In 1902 he enrolled at the Imperial University of Tokyo (now University of Tokyo), where he studied geology under Professors B. Koto, K. Jimbo, and M. Yokoyama. Under the stimulating influence of Prof. Koto, who was the founder of petrology in Japan, he also became interested in petrology, and this interest determined his career. During the summer of 1904 he made a geological survey of the volcano Ontake in Central Japan, and in the following summer, 1905, he studied the volcano Norikura, which lies to the north of Ontake. In those days these high peaks (Ontake: 3063 m., Norikura: 3026 m. above the sea level) had few trails and very limited facilities, so he was obliged to camp for several weeks on the tops of these volcanoes, and to make topographic maps by himself. Upon graduation from the University of Tokyo in July 1905, he took a post-graduate course in petrology, and completed his thesis on these two volcanoes. They were later published as Reports No. 59 and No. 71, respectively, of the Earthquake Investigation Committee of Japan. These reports indicated his high ability as a volcanologist as well as a petrologist.

In 1907 he was appointed geologist of the Imperial Geological Survey (now Geological Survey of Japan) in Tokyo. While making his geological survey for sheet maps of Matsuyama, Hiroshima, and Fukae (spelled also Fukue), he found a basaltic rock with alkali feldspar, which had petrographic features similar to mugearite. Following the usual custom in descriptive petrography of that day, he named it "Fukaeite" after the name of the locality. Following this first discovery of alkalic rocks, he became interested in these rock groups like many other petrologists, and found various types of alkalic rocks from numerous localities in Northern Kyushu and Western Honshu of Japan and Korea. In so doing, Prof. Kôzu made a notable contribution to petrology, for up to that time no alkalic rocks had been known in Eastern Asia, and the region was considered as a typical petrographic province of the so-called Pacific type.

In 1911 he was appointed as lecturer of petrology at the University of Tokyo, and in the following year as lecturer at Tohoku Imperial University (now Tohoku University) in Sendai, the Geological Department of



SHUKUSUKÉ KÔZU
1880–1955

which was established in that year. He left Japan in January 1913 for study in America and Europe. First he went to Washington, D. C., and studied at the Geophysical Laboratory of Carnegie Institution of Washington, where he was deeply impressed by the new technique of high

temperature research on silicates, employed at the Laboratory. He made optical and thermal studies on the alkalic rocks and anorthite crystals from Japan. Later the knowledge and experience he obtained there helped him considerably. During his stay of more than a year at the Laboratory he became a close friend of Dr. H. S. Washington, with whom he had an opportunity to make a pleasant trip to Vesuvius and Stromboli in Italy in July 1914. Their friendship lasted until Washington's death in January 1934. In May 1914 he left the Laboratory for Europe.

Owing to the outbreak of the World War I he changed his original plan to study in Germany and Austria, and went to England instead. He studied at the University of Cambridge, under the guidance of Prof. Hutchinson, making a special study of the optical properties of feldspars. At this period his researches on the alkalic rocks of Dogo Island, and many other parts of Japan, as well as some anorthite crystals from Japan were published in the *Journal of Geology* (1911–13) and *Science Reports of Tohoku University, Series II* (1913–14) and his detailed description of the dispersion of the optic axes of alkali feldspars was reported in the *Mineralogical Magazine* (1915–16). Through these papers his reputation as a petrologist was firmly established. He went to Paris in 1916, where he stayed at the University of Sorbonne, and then returned to the United States, again paying a short visit to the Geophysical Laboratory.

Upon completion of his study abroad, which had taken more than three years, he came back to Sendai in July 1916, and was appointed as Professor of Mineralogy and Petrology at Tohoku University, the position which he held until his official retirement in March 1942. After his return to the University, his main interest shifted from alkalic rocks to the studies of thermal behavior in igneous rocks and their rock-forming minerals. He had held a strong opinion that physico-chemical principles should be applied for the solution of genesis of rocks and minerals. Thus the distinction between petrology and mineralogy on the one hand, and geology and paleontology, which had more intimate relation with biology on the other hand, became apparent. Therefore Prof. Kôzu and Prof. Yabe, then Head of the Geological Department of Tohoku University discussed the situation, and reached a conclusion that the Department should be divided into two independent institutes, i.e., the one of geology and paleontology, and the other of mineralogy and petrology. As the result the Institute of Mineralogy, Petrology, and Economic Geology was established in 1921, and ever since he served as Head of the Institute.

In this newly established Institute, Prof. Kôzu and his co-workers

made various experiments on such rock-forming minerals as feldspars, pyroxenes, amphiboles, micas, and zeolites. Not only ordinary optical methods and chemical analyses, but differential thermal analyses, quenching methods, and *x*-ray photographs, all of which were quite new techniques at that time, were employed in their study. Indeed he was the pioneer in Japan who introduced these methods to the study of rocks and minerals, and in so doing he advanced the knowledge of his contempories. During his *x*-ray study on moonstone from Korea with Dr. Y. Endo in 1921, he found that the double spots in the Laue photographs of a feldspar observed at lower temperatures became single spots upon heating, and thus he could demonstrate for the first time the existence of an exsolution phenomena in silicate solid solutions. Professor Niggli called this research the foundation of "Kristallpathologie," and the work has been referred to in many books and papers dealing with the physicochemistry of silicates. This may be considered as Prof. Kôzu's second notable contribution and will remain a classic in this field. All these papers were published in the *Science Reports of Tohoku University, Series III* (1921–29).

In 1929 he attended the Pacific Science Congress held in Java, and presented papers on these researches. When he returned from this trip, the volcano Komagatake in Hokkaido erupted violently after a long period of dormancy. Soon after this eruption he and his co-workers made a detailed survey of the activity. In 1930 he made his second visit to Europe and attended the International Union of Geophysics held at Stockholm in August 1930. The results of their survey of Komagatake were presented at this Union, and were later published in a *Memoir of Saito Hôonkai* (1932) and *Tschermak's Mineralogische und Petrographische Mitteilungen* (1934).

At that time the Geological Society of Japan was the only society concerned with the geology in Japan, and its Journal had not enough space to publish numerous papers on mineralogy and petrology. Therefore he took the initiative to establish a new society for the development of mineralogy and petrology. In 1929 the Japanese Association of Mineralogists, Petrologists, and Economic Geologists was founded and he was elected President of the Association, which position he retained until his death in 1955. Nearly every number of the Journal of this Association contained contributions by him and his co-workers covering a wide scope of petrology and mineralogy, and the Journal has served as a leading publication in this field in Japan.

For his meritorious achievement in thermal research of rock-forming minerals, the Imperial Academy (now the Japan Academy) voted in 1932 to award him the Academy Prize. In the same year he was also

elected to the Academy. As a consequence he never actually received the prize, because of a rule of the Academy that a member could not be a recipient of its prize. He made numerous contributions also to the Proceedings of the Academy thereafter.

After his long and distinguished service of thirty years at the University, he retired from teaching in March 1942 at the age of sixty-one, and became Professor Emeritus of Tohoku University. Subsequently he moved to Tokyo, where he was active as a member of the Academy as well as the Chairman of the Committee for Exploration of Rare Element Minerals. In 1944 he went to Korea to study such minerals. In the following year his residence was unfortunately burned by an air raid and he moved back to his native home in Shiga Village, Nagano Prefecture. He and his co-workers made a geological survey in the vicinity of the village, which lies immediately south of the famous volcano Asama. The result of this joint study was recently published as a posthumous work (*Geology of Kitasaku Province*). In 1951 as a former visiting investigator at the Geophysical Laboratory he contributed for the Bowen volume a paper on the Japanese twins of quartz, a subject in which he had been interested for many years.

Professor Kôzu was a member or a fellow of many scientific societies both here and abroad. He served as Vice-President of the Volcanological Society of Japan (1931–45), President of the Geological Society of Japan (1938–39), and President of the Japanese Association of Mineralogists, Petrologists, and Economic Geologists (1929–55).

When young, Professor Kôzu possessed such good health that he could camp out on the high peaks for many weeks, but he developed tuberculosis during his stay in Paris, and later suffered from heart disease and other physical disabilities. When he became professor, he was a bachelor and lived in his laboratory at the Tohoku University. In spite of his poor health, he used to work on his experiments, often until midnight, and then go to sleep on his "bed" which was a pile of large wooden sample boxes in the corner of his laboratory. It was often said that he conquerred his illness by his strong will. However, after a critical illness in 1951, his health continued to decline until he passed away in 1955 from general weakness at the age of seventy-four at his new residence in Kamakura.

Professor Kôzu's publications number nearly 260 and most of the papers since 1920 are joint works with his associates. They are all characterized by accurate data on optical, chemical, and thermal properties of rock-forming minerals, and the application of the principles of physico-chemistry to the understanding and genesis of igneous rocks.

As a man, Professor Kôzu was very honest and sincere. As a teacher,

he gave inspiring lectures to arouse in his students an intense and abiding interest in rocks and rock-forming minerals. His ability as a leader was indeed remarkable. His sincere and vigorous attitude toward his study was highly respected by his co-workers, his students, and all who came in contact with him. As he possessed poor health he had little interest in outdoor sports, but instead had various other hobbies, such as playing *go* (Japanese chess), singing *utai* (chanting of Japanese traditional drama text), collecting Japanese paintings, and potted plants of pine and azalea. Such was his enthusiasm even in these cases, that the wide garden of his residence in Sendai was filled with hundreds of potted pine plants. His most favorite "hobby," however, was the study of rock-forming minerals, to which he devoted his entire life.