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MEMORIAL OF HISASHI KUNO

January 7, 1910–August 6, 1969

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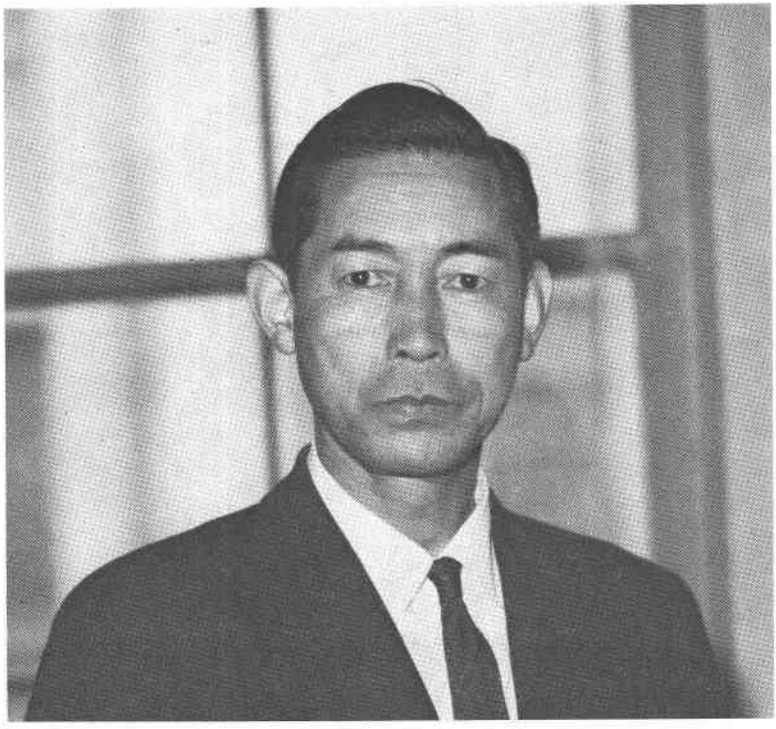
On August 6, 1969 petrologists of the world lost an eminent leader and a prolific researcher in their science. Early this morning at 2:30 a.m. Professor Hisashi Kuno of the University of Tokyo passed away of a stomach cancer in a hospital in Tokyo.

Professor Kuno was born on January 7, 1910 at Kanda in the central part of Tokyo, the eldest son of Mr. Kamenosuke Kuno, a Japanese painter. After finishing primary and secondary schools in Tokyo, he went to Sendai to attend the Second High School, where he was so interested in geology, that he determined to be a geologist. However, he spent most of his time in mountain climbing and skiing. In 1929 he enrolled at the Geological Institute, Tokyo Imperial University (now University of Tokyo). Under stimulating influence of Professor Seitaro Tsuboi he was interested in petrology. In 1930 there occurred North Izu Earthquakes in Izu peninsular to the west of Tokyo, and he decided to study the volcanic rocks in this region. This was the start of his life work on the petrology of Izu-Hakone region of nearly forty years. After graduation in 1932, he continued to study the volcanic rocks for one more year at the graduate school.

In the early 1930's, when Kuno was a student, the crystallization of pyroxenes from magma was discussed by many investigators, among whom were Barth, Bowen, Schairer and Tsuboi. The genesis of basalt



Hisashi Kuno

magmas, started by the classical paper of Kennedy, was also debated by many petrologists. It was quite natural, therefore, that Kuno was fascinated by these items. As can be seen by perusing the list of his bibliography, his most important contributions are concerned with these two items, *i.e.*, basaltic magmas and crystallization of pyroxenes.

In his first paper, a joint work with Tsuboi, Kuno called attention for the first time to the common occurrence of cristobalite or tridymite in the groundmass of quartz-free basaltic and andesitic rocks, accounting for the modal quartz. In 1933 he was appointed as assistant of the Geological Institute. Among many papers published in this period, *Petrological notes on some pyroxene andesites from Hakone volcano* (1936) was outstanding in that it was filled with numerous optical data and the estimated chemical composition of rock-forming minerals. He had acquired a highly trained skill in microscopic work, and the optical data of rock-forming minerals of high precision have been indeed the "hallmark of Professor Kuno." Besides he first accomplished a very painstaking work of separation of pyroxenes in the fine-grained groundmass for chemical analysis. Indeed it was his belief that the groundmass gives more crucial information for the genesis of volcanic rocks than the phenocrysts.

Based on these petrological data he showed the crystallization course of pyroxenes from rock-magma (1936), suggesting that pigeonite forms as stable phase even at intratelluric stage if iron content of the magma is high.

The detailed geologic map of the Hakone volcano published in 1938 was the result of his five-year field work on this volcano, and shows his ability as a keen field geologist. There is an anecdote that one of the faults inferred in this map was actually found when a highway was constructed some years later. Some parts of the Geology of Hakone volcano" were published later in 1950 and 1951, but unfortunately the main part remained unpublished, because he had been too busy in writing "more important" petrological papers.

In 1939 Kuno was promoted to Assistant Professor of petrology of the same university. He was drafted in July 1941 and had been in military service as a soldier in Manchuria in northeastern China, for the greater part of the World War II. Fortunately, however, through the kind arrangement by his commander, Kuno was allowed to study at night the manuscript of the petrology of the Hakone volcano. During this period he was given a rare chance to study one of uranium-bearing pegmatites in Manchuria. Later he published interesting results of his studies on paragenesis of minerals of the pegmatite.

In September 1946, after one year of hard life since the end of the war, he was sent back to Japan. Although passengers were not allowed to

carry any documents, he could fortunately bring back most important data of pyroxenes for his paper.

After coming back again to academic life, he completed *Petrology of Hakone Volcano and the Adjacent Areas, Japan* by which he obtained his D.Sc. degree in 1948. To his regret difficult postwar situation in Japan precluded its publication until 1950, when the paper was published in Bulletin of the Geological Society of America. It is interesting that the paper by Tilley, who attained independently the same conclusion on the origin of the volcanic rocks of Izu region, was also published in 1950. Kuno recognized, in his paper, two different rock series in this district, one characterized by the presence of monoclinic pyroxene and the other by hypersthene in the groundmass and designated them "pigeonitic rock series" and "hypersthenic rock series," respectively. He regarded the former (corresponding to tholeiite series) to be products of straight fractionation of tholeiitic magma, whereas the latter (calcalkalic rock series) was formed from the same magma through contamination of granitic crustal materials.

At that time I was studying at the Geophysical Laboratory of Carnegie Institute of Washington, and I could see how highly his paper was estimated by the American petrologists. By this paper Kuno had established his international reputation as a petrologist.

In the following year through the grant of the Geological Society of America he went to Princeton University, where he studied on pyroxenes for a year. Personal contact with many American petrologists, especially Harry H. Hess was most rewarding. On his way back to Japan in 1952 he visited the ciassical locality of Duluth Gabbro on foot for scores of miles, owing to the lack of other means of transportation. Such was his enthusiasm and his energy! In Hawaii he succeeded in finding granophyric veins in the tholeiite which later provided the basis of his important contribution on Hawaiian magmas.

For his meritorious achievement on the petrological study of pyroxenes for more than twenty years, Professor Kuno was awarded the Japan Academy Prize in 1954. His first book *Volcanoes and Volcanic Rocks* published this year has been well received as a standard textbook in this field.

In 1955 he was appointed Professor of Petrology of the University of Tokyo. In spite of the increased burden as a full professor his production of papers was never suppressed. In "Differentiation of Hawaiian magmas" (1957), Kuno, from the presence of granophyric patches, proved the possibility of generation of granitic magma from tholeiite magma simply through fractional crystallization, and he also suggested that the depths where partial melting of upper mantle peridotite occurs decide

whether tholeiite magma or alkali olivine basalt magma is produced. By applying this hypothesis to the Japanese island arcs, he found a close relation between the depths of the earthquake foci in the mantle and the nature of the magma generated at these depths, and concluded that tholeiite magma is produced at depths shallower than 200 km, and alkali olivine basalt magma at depths greater than 200 km. This model was supported by the results of the recent high pressure experiments on the systems containing olivine and pyroxene, or on natural rocks.

With the increase of petrochemical data, however, Kuno noticed the wide distribution of basaltic rocks intermediate in composition between tholeiites and alkali olivine basalts, and rich in alumina, and assigned them a role of the primary magma, the third one besides tholeiite and alkali olivine basalt magmas (1960). Recent experiments on natural basalts by Green and Ringwood also suggest that the high-alumina basalt magma is formed at depths intermediate between the other two magmas.

Around 1959 Kuno was suffering from a slight tuberculosis and had to stay at home for rest for several months. When I visited his home, I found him sitting on his bed with a solid model of four-component system in his hand, and thinking over the origin of basalt magmas! Fortunately after recovering from this, he has enjoyed good health until recently he fell ill with a cancer.

In 1961 Kuno was invited by Americana Geological Institute under auspices of the Visiting International Scientist program, and made a lecture tour through sixteen universities and institutions. He was also invited as a visiting professor of petrology in 1964 to the University of Minnesota.

International Symposium on Volcanology was held in Tokyo in 1962, and Kuno was responsible for organization of the symposium as General Secretary, and did fine job also as a leader of field excursions. Following his idea, the field excursions were carried out alternately between the scientific sessions, saving tiredness due to listening continuous presentation of papers. This method was also followed in the next volcanological symposium in New Zealand, and other conferences. The success of this symposium was in great part attributable to Professor Kuno's idea, energy and enthusiasm.

With the progress of the Upper Mantle Project in the early 1960's he also made many studies on the nature of the upper mantle, especially its petrologic features, and presided a section of petrology and volcanology in the Upper Mantle Committee during the Pacific Science Congress held in Tokyo in 1966. Genesis of andesite has also been a great concern to him, and upon his proposal, an international symposium on the origin of andesite was held in Oregon University in 1968. Kuno's own concep-

tion on this subject is represented in "Origin of andesite and its bearing on the island arc structure" (1968), a presidential address at the meeting of International Association of Volcanology in Zurich.

In his studies Kuno has always drawn his conclusions from his wealth of accurate data on natural rocks and minerals, aided by the evidences provided by experiments. For example, in order to clarify the nature of upper mantle he studied the ultramafic inclusions enclosed in basaltic rocks. Thus he approached the problems from a view point of a "field petrologist." He himself has not made any experiments under high temperature and pressure conditions, and sometimes mentioned that the experiments led the petrology up to 1930's, as exemplified by the works of Bowen and others, but the field petrology now leads the experiments in recent years. Such was his conviction on his way of approaches. Needless to say, however, he had a keen interest and deep understanding in the results of experiments, and has used the experimental data at most.

In addition Kuno's works covered wide fields of earth sciences, including paleomagnetism, isotope geology, geochronology, and the formation of island arcs, especially in his later years.

Recently he had much interest in the petrology of the moon, and was registered as one of the principal investigators on the returned lunar samples. In spite of his illness, he showed up in televisions for many hours, on the day when the Apollo 11 landed on the moon, giving explanations on its significance and the rocks of the moon. It was a great pity that he could not touch the samples returned by the Apollo 11.

Kuno devoted a large amount of time and made efforts for the development of the scientific societies home and abroad. In collaboration with Prof. T. Minakami and others, Kuno tried to re-organize the Volcanological Society of Japan which had been dormant for about twenty years. In 1955 this Society began its renewed activity in the fields covering geology, geophysics and geochemistry of volcanoes, and since 1960 Kuno served as President for many years. His many honors include; Honorary Fellow, Geological Society of America (1958), Honorary Member, Geological Society of London (1962), Foreign Honorary Member, National Academy of Science (1963), President, Volcanological Society of Japan (1960–68), President, International Association of Volcanology (1963–67), Vice-President, International Union of Geodesy and Geophysics (1968–69), Vice-President, International Union of Geological Sciences (1968–69), President, Geological Society of Japan (1968–69) and Honorary Fellow, Mineralogical Society of America (posthumous).

As a man he was courteous and modest. However, so far as science is concerned, he was always critical and determined, and tolerated no compromise. He had a sense of humor and sometimes his jokes aroused big laughter among his friends, especially after a few cups of "sake" or beer.

As a teacher he always gave inspiring lectures to arouse in his students intense interest in petrology and volcanology, and spared neither time nor effort to give appropriate advice and suggestions. He has trained many excellent petrologists, among whom are A. Miyashiro, Y. Seki, S. Aramaki, I. Kushiro and others. Always youthful in outlook, his hobby was mountain climbing and skiing. I recall many pleasant ski tours through Zao volcano with him, and cheerful evenings we spent together in a cottage, where he sang his favorite *Grinderwalder Lied* at fireside.

He is sadly missed by his wife, Kimiko Kuno, his son, Takashi, his daughter, Shizuko and his grandson, Akira, who was only six weeks too late to meet his grandfather.

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MEMORIAL OF HUGH DINSMORE MISER

December 18, 1884–August 1, 1969

GEORGE V. COHEE, *U. S. Geological Survey, Washington, D. C. 20242.*

On August 1, 1969, one of our most eminent geologists, Dr. Hugh Dinsmore Miser, died of a heart attack at his home in Washington, D.C., at the age of 84 years. Hugh Miser was born at Pea Ridge, Arkansas, December 18, 1884, the son of Jordan Stanford and Eliza (Webb) Miser. He received his early education in the local schools at Pea Ridge and then attended the University of Arkansas where he was under the influence of Professor A. H. Purdue, who inspired him to major in the field of geology. He received his Bachelor's degree in 1908 and his Master's degree in 1912. He had worked for the U. S. Geological Survey as Geologic Aide in the summer of 1907; in 1910 he was appointed Junior Geologist on a full-time basis and in 1912, Associate Geologist. He advanced to the