

MEMORIAL RESOLUTION

FREDRICK CHRISTIAN KRUGER

(1912-1997)

Fredrick Christian Kruger, Donald and Donald M. Steel Professor emeritus of Applied Earth Sciences at Stanford, died in his home in Woodside, California on February 9, 1997. He was 84. "Fritz", as he was known to friends and colleagues, had an enviable international reputation for his accomplishments in the mineral industry and in academia. In both milieus he leaves professional associates and "descendants" who know and honor him as – in the words of one close friend – *El Forjador de Profesionales*, a demanding, yet caring and supporting, often lifelong, tutor and mentor.

Fritz was born on April 1, 1912, in St. Paul, Minnesota. His parents were of German and Swedish extraction. In 1936 he married Helene Vivian Anderson and the family had two children, a son Kurn Fredrick, born in 1939 and a daughter, Jan Christian, born in 1945. An enthusiastic, dedicated professional, Fritz was devoted to his family as well and with them enjoyed fishing, canoeing, camping, swimming (he was a varsity letterman in swimming), golf, photography, and collecting books, objets d'art, stamps, and coins. A family friend recalls that Fritz loved his home and garden and that he and Helene enjoyed entertaining and were very gracious hosts. He was a "marvelous dancer, and usually, after dinner, music was put on and we all danced for a couple of hours. Fritz and Helene were a beautiful and graceful couple on the dance floor." In addition to Helene, of Woodside, and Jan, of Chappaqua, N.Y., Fritz is survived by his two grandchildren, Avery Christian Anderson and Ethan Hunter Anderson, and his son-in-law, Robert Steven Anderson, also of Chappaqua.

Fritz's education started in the public schools in St. Paul. He earned his Bachelor of Science degree in geology and chemistry in 1935, and his Master of Arts in geology and metallurgy in 1936, both at the University of Minnesota. Fritz earned his Ph.D. in geology in 1941, at Harvard with a dissertation entitled "The Structure and Metamorphism of the Bellows Falls Quadrangle of New Hampshire and Vermont". Throughout his career as an M.S. and Ph.D. student, Fritz collected valuable academic experience as an Assistant Instructor (1935-36) and Teaching Fellow (1938-41) at Minnesota and Harvard, augmented with an appointment as Instructor (1936-38) at Dartmouth College. In 1958, during the second phase of his career in the mineral industry, Fritz broadened his professional scope by completing a course offered by the American Management Association.

Upon graduation from Harvard in 1941, Fritz was employed by the Cerro de Pasco Corporation as Geologist, and quickly rose to Assistant Chief Geologist. The

family embraced life in Peru, becoming fluent in Spanish and developing an enduring interest in indigenous art, crafts, and culture. It was at Cerro de Pasco that his reputation as a mentor in the professional development of junior colleagues was born.

Fritz left Cerro de Pasco in 1949, for a position as Visiting Lecturer at Northwestern University from January to June of that year, and then joined the faculty at the University of Tennessee as an Associate Professor, where he remained until 1952. While at Tennessee, Fritz served as consultant for Cleveland Cliffs Iron Company, the Tennessee Valley Authority, and Cerro de Pasco.

In 1952, Fritz returned to the mineral industry as Assistant Chief Geologist for the Reynolds Metals Company, and then in 1957 joined the International Minerals and Chemical Corporation (IMC) as Chief Geologist. At IMC he advanced through positions as Director of the Mining and Exploration Department, then Vice President in charge of the Mining and Exploration Division. In 1963, he was made a member of the Board of Directors of IMC, Ltd., and in 1964 he was appointed to the Board of Directors of IMC Development Corporation.

His experience with Cerro de Pasco, Reynolds Metals and IMC gave Fritz experience ranging from detailed mine geology and mining methods, and corporate organization and team building through global resource assessment and market analysis. Throughout his career, he also served as consultant to over 60 corporations, government agencies, and universities. In 1965 he organized a symposium entitled "Finding Minerals for Expanding Economies and Exploding Populations", contributing the lead paper himself and editing the resulting volume. The symposium attracted representatives from industry, academia, and government. All of this led to accumulation of an extremely diverse set of personal experiences and professional friends and accomplishments. It also led to a reputation as one of the leading economic geologists of the U.S., and through service on education committees of the American Geological Institute, as a champion of improved geological curricula and individual faculty development. His 1966 resume listed earlier, technical publications ranging from "Laboratory Exercises for General Geology" (1936) to "The Geology of the Bellows Falls Quadrangle of New Hampshire and Vermont" (1946) and "Lead and Zinc Deposits of the Cerro de Pasco Copper Corporation in Central Peru" (1948), and "approximately three file drawers" of his own technical reports – a rich mine of material for publications, innumerable talks and lectures, and, as we shall see, much appreciated classes and seminars at Stanford.

Stanford's Dean Richard Jahns and his faculty discovered Fritz and appointed him Professor and Chair of the Mineral Engineering department in 1966, replacing Professor Evan Just, who retired that year. Fritz was selected for the chairmanship in recognition of his life-long integration of education and international professional practice, a career that produced a man almost unique among our faculty, in that he

qualified as a geologist, a mining and mineral processing engineer, and a mineral economist – successful in industry and education. This breadth prepared him well to revitalize the departmental mission of educating students for versatile careers in the mineral industry. Other faculty were concentrating on technical education and research. Fritz greatly expanded the second half of the departmental mission, focusing on integration of geology and technology with economics and business strategy to enable students to excel in the business world. He did this in several ways, by establishing an informal cooperative curriculum with the Stanford Graduate School of Business for one. Within the department, he used techniques novel in the earth sciences, most notably by designing courses and course sequences that integrated academic study with case histories often presented by professionals enlisted from industry, independent study, and reports on problems derived from the case histories or new developments, visits to active mining and metallurgical operations. “classes were often like intimate board meetings”.

These seminars and courses sometimes included recommendations to the cooperating company. In these cases, student reports might include results if recommendations were adopted. One student recalls that “classes were often like intimate board meetings”. Course topics ranged from geology-based exploration for ore deposits, technical design and appraisal of development and mining plans, and economic assessment of markets and mineral production projects. Throughout, Fritz’s personal experience and that of his network of friends and associates in the industry were used to illustrate problems and opportunities in career planning, and formed the basis for helping students find appropriate employment. Many of the seminars involving project development and case studies were held in extremely popular, open ended sessions at the Kruger home in Woodside, hosted graciously by Helene. These seminars are recalled as the most influential learning experiences enjoyed by many of Fritz’s students. Fritz is remembered as one of the few faculty members who showed students how to bridge academia and industry.

In 1974, a reorganization of the School of Earth Sciences led to expansion of the scope of Department of Mineral Engineering from mining, mineral processing, and extractive metallurgy to include economic geology and exploration, mining engineering, mineral economics, resource management, and environmental geosciences or hydrogeology and engineering geology. The name was changed to Applied Earth Sciences (AES) to reflect the new, interdisciplinary mission. Fritz continued as chair of AES, guiding the department through its transformation and its heyday in mineral economics until he retired in 1977.

Shortly after he joined Stanford, Fritz was commended by Stewart Udall, then Secretary of the Interior, for service in the Department of Interior’s Metals and Minerals Unit of the National Defense Executive Reserve. In 1971, the School and the University recognized Fritz’s accomplishments at Stanford by appointing him to the

Donald and Donald M. Steel Professorship in Earth Sciences. In 1972, he was honored again by appointment as Associate Dean of Research in the School of Earth Sciences. Fritz served the University in many other ways. He was a member of the Research Advisory Committee (1971-1976), the Energy Studies Advisory Committee (1974-1976), the Committee on Latin American Studies (1969/1970), for example, and was a member of one of the early budget adjustment program advisory committees.

In 1967 Fritz was selected Henry Krumb Lecturer and in 1970, Centennial Lecturer by the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME). In 1972, he was general chairperson of the AIME National meeting and received the Institute's Hardinge Award. He was cited as "a prominent educator, geologist, and administrator in the field of nonmetallic minerals", and for laudable accomplishments in the evaluation and development of worldwide potash, phosphate, and fluorspar resources. He was elected a Distinguished Member of AIME in 1975. Fritz was active in other professional societies as well. He was, for example, a Fellow of the Geological Society of America (1948-74), a councilor (1963-65), and Trustee of the S.E.G. Foundation (1972-76) for the Society of Economic Geologists (1975), and very active in the Society of Mining Engineers of the AIME, for whom he served on the board of directors and as regional vice president.

Perhaps the highest accolades have come from former students, one of whom stated that Fritz Kruger was "a most influential man in his life" and a career-long friend—" and for that, above all else, I will be forever grateful."

George A. Parks, Chair
Ronald J. P. Lyon
John W. Harbaugh

We are grateful to the many friends, students, and colleagues who provided us with facts, memories, and tributes. Fritz will be missed and long remembered.