In Memoriam

Dale C. Krause, Ph.D.

(27 December 1929 – 17 August 2007)

Dr. Dale C. Krause, Ph.D., the internationally respected marine geophysicist and UNESCO diplomat, died on Friday, 17 August 2007, in Anaheim, California. He was 77. He succumbed after a long battle against prostate cancer.

Dr. Krause was an early pioneer in the investigation of active submarine geological features and systems and plate tectonic processes. He graduated from California Institute of Technology in 1952 with a Bachelors of Science degree in Geology. After a stint as a mining geologist in the high desert of Yauicocha, Peru, he was drafted into the army and served two years as an army topographic surveyor in Alaska, Panama and Chile with the Inter-American Geodetic Survey.

In 1956, he pursued graduate studies at the Scripps Institution of Oceanography, University of California in La Jolla earning his Ph.D. in 1961 under the direction of William Menard. His graduate research focused on the geology, heat flow and tectonics of the southern continental borderland west of Baja California, Mexico. This was one of the earliest systematic studies of the numerous submarine basins now known offshore in southern California, a unique and important geologic province in the world ocean. He loved working at sea, and participated in 13 oceanographic cruises throughout the Pacific, five as chief scientist, again contributing to early discoveries of the ocean basins at a time when so little was known or understood about their character and formation. Krause's offshore California work not only contributed to greater understanding of California margin development, but also the discovery of new basins themselves, During his surveys of the California Borderland Province in 1960, Krause discovered recent submarine volcanic activity as he was “popping rocks” off the Popcorn Ridge. Following from this pioneering work, Krause was honored in October 2005 by the naming of the “Krause Volcano”, a sea floor volcano near Guadalupe Island, identified and mapped by Scripps' scientists working on the R/V Roger Revelle. Appropriately, this ship is not only affiliated with the Marine Science Institute, University of California Santa Barbara but is named after the great scientist and his former mentor.

In 196-62, after a US National Science Foundation postdoctoral fellowship at the New Zealand Oceanographic Institute where he worked on south Pacific marine geology, Krause was recruited by Dean John A. Knauss, as one of the founding faculty members of the Graduate School of Oceanography at University of Rhode Island. He served as a professor from 1962 to 1973, leading 12 of 23 scientific cruises involving a wide range of integrated approaches including bathymetric and magnetic surveys, seismic profiling, bottom sediment sampling and rock

dredging, bottom photography, and computer analysis. During this period his research focused on the origin and development of submarine basins of the central North Atlantic, the Caribbean, and the South and Western Pacific. This led to the publication of 36 scientific papers in distinguished journals including *Nature, Science and the Geological Society of America Bulletin.* His scientific perspective was further broadened with visits to the Institute of Oceanography Moscow at USSR Academy of Sciences Exchange Fellow (1968), and the Department of Geodesy and Geophysics, University of Cambridge, UK (1969). He was a founding member of the Law of the Sea Institute at the University of Rhode Island.

In 1973, Krause was appointed as the Director of the Division of Marine Science at UNESCO (United Nations Educational, Scientific and Cultural Organization) in Paris, France. This post carried diplomatic status with final rank equivalent to Deputy Assistant Director General for Science. For 16 years, he successfully led a novel strategic approach, that integrated both natural and social sciences and in doing so demonstrated how social and scientific development can nurture each other. The primary focus of this program was to support and promote the development of marine science at national and international levels in developing world countries. This was accomplished through the development and strengthening of university teaching and other training and the sponsorship of research programs and laboratories.

The UNESCO program led by Krause, in addition to pressures related to the Law of the Sea Conference process, yielded major results such that by the end of the 1980's a majority of developing countries had established basic marine science capabilities. This was an especially busy time for Dale Krause, with official missions to no less than 32 countries as well as negotiations and resulting contract awards with many others. For three decades beginning in 1960, marine science grew by 10 times in the world. Yet the relative growth in developing countries outpaced the industrialized countries so that by 1983 the number of marine scientists in the developing world equaled the total number for the rest of the world in 1970. Krause and his UNESCO team encouraged an integrated approach to physical, chemical, biological and geological oceanography, advanced training in ocean engineering, and the strengthening of the interface between marine environmental management and marine resources. These regional initiatives in the developing countries served as a catalyst to generate national commitments including large extra budgetary projects for marine science research.

After retiring from UNESCO, Krause returned to active scientific research for the next 15 years. He joined the Marine Science Institute, University California, Santa Barbara as Senior Research Scientist in 1992. His research built upon his original investigations of the southern California Borderlands. He also investigated northern California to Oregon margin by examining the development of the Mendocino Ridge due to interaction between the Pacific Tectonic Plate in the south and eastward moving Juan de Fuca Plate to the north. He participated in two research cruises that utilized multibeam SeaBeam surveys, submersibles, remote Advanced Tethered Vehicles, real-time video and bottom sampling with swath-sounding manipulators. Additionally, he worked on complexity in the self-organized marine biological system, such as fractal distribution of plankton patchiness as a product of ocean turbulence, and plankton behavior; pelagic biogeography in the context of climate change and society, and the ecological impact of ocean eddies. At UC Santa Barbara he was a strong and enthusiastic supporter of the marine science academic program and of the graduate students' research, but overall he is mainly remembered as an intellectual with an intense interest in the pursuit of knowledge and understanding of the natural world.

Fellow scientists around the world recall Krause's passion for world-class science, collaboration across boundaries, nations and frontiers, as well as his commitment to managing the earth's environment and declining resources through sustainable development, while enhancing the quality of life for all. His infectious enthusiasm and deeply held respect for his colleagues inspired and impacted several generations of scientists, and the shape of marine science itself. His great sense of adventure and discovery along with his love of the sea echoed the legacies of the original oceanic explorers.

Dale Krause is survived by his daughter, Tara Krause, an artist in Los Angeles, and his son, Dan Steiner, a business executive, and his wife, Michele of West Windsor, New Jersey. The legacy of his love of science and sense of wonder lives on in his five grandsons, Gregory Steiner, Matthew Steiner, Ryan Steiner, Ariel Krause Halibi, and Raphael Krause Palit. Predeceasing him is his former wife, Sarah Rockey Steiner of Westerly, Rhode Island.