G E O P H Y S I C I S T S

Karl K. Turekian (1927–2013)

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Karl K. Turekian, geochemist and educator extraordinaire, passed away on 15 March 2013. He was 85. Karl's career spanned 6 decades and saw geochemistry evolve from a field largely documenting the distributions of chemical elements on Earth to, as he put it, "a tool that…has pervaded the entire field of Earth sciences." In large part, Karl Turekian was responsible for guiding that evolution.

Karl enrolled at Wheaton College during World War II, but after one semester he enlisted in the U.S. Navy. He graduated after the war and was recruited to graduate school by J. Laurence Kulp, also a Wheaton alumnus, to join the nascent geochemistry group developing at Columbia University and the newly established Lamont Geological Observatory (now Lamont-Doherty Earth Observatory). His Ph.D. research focused on the geochemistry of strontium (Sr) and strontium isotopes. The diversity of applications of Sr as a geochemical tracer set the stage for Karl's later career and his application of geochemistry broadly to Earth surface processes.

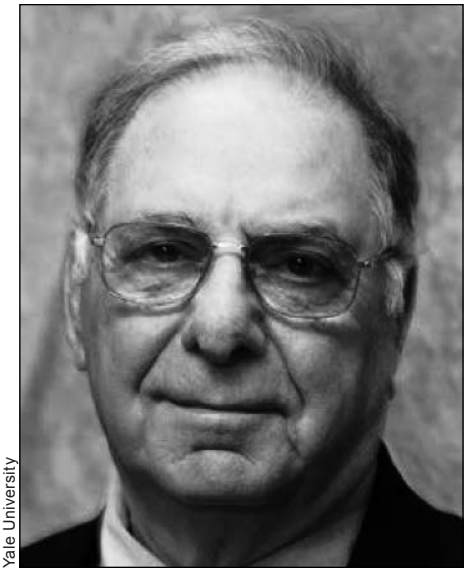
After receiving his Ph.D., Karl joined the faculty of Yale University, where he spent his entire academic career and held numerous chaired positions, including most recently Sterling Professor of Geology and Geophysics Emeritus. He was instrumental in the growth of the Department of Geology (later Geology and Geophysics) and in highlighting the role of geochemistry as one of the department's strengths. During his early years at Yale, Karl focused on documenting and understanding the distributions of trace elements in freshwater, seawater, sediments, and ancient and modern marine carbonates. His interests in the evolution of Earth's atmosphere, models of the early history of Earth, and meteorite composition set the stage for some of the first analyses on lunar rocks and soils returned to Earth with the Apollo astronauts.

Karl realized that many trace elements interact strongly with particles in aqueous systems and that this "great particle conspiracy," as he called it, led to trace element scavenging and removal from the oceans. During the 1970s, Karl's group began the systematic application of natural radionuclides to characterize Earth surface processes in groundwaters, rivers, lakes, coastal and deep-sea deposits, and the atmosphere. The property of radioactivity made these tracers particularly suitable as clocks or chronometers to determine rates of processes. The proving ground for many of these approaches was the nearby Long Island Sound estuary. Its proximity to Yale and unique characteristics made it a perfect natural laboratory for using natural radionuclides—particularly those of the uranium and thorium decay series—to determine rates of scavenging, sediment transport and redistribution, sediment mixing by organisms, sediment accumulation, and radionuclide mass balances. These efforts complemented the ongoing research of other Yale faculty in sediment diagenesis (Robert Berner), benthic ecology (Donald Rhoads), and sediment transport and deposition (Robert Gordon) and made for an especially exciting time intellectually for students, postdoctoral scholars, and visiting investigators.

The 1980s saw Karl focus on using radionuclides—in particular, lead-210, beryllium-7, and cesium-137—to study atmospheric transport processes and apply these tracers to determine fluxes of other atmospherically transported chemical species such as stable lead and sulfate. This period also saw an increasing focus on the geochemistry of osmium (Os) and its isotopes. Karl recognized that the $^{187}Os/^{186}Os$ ratio could be used as a fingerprint for meteoritic versus terrestrial osmium and thus as a test of the hypothesis proposed by Luis W. Alvarez and colleagues that a large bolide impact occurred at the Cretaceous/Paleogene (K/Pg) boundary, as suggested by the high iridium content found in boundary clays at Gubbio (Italy) and Stevns Klint (Denmark). Indeed, Karl's work with Jean Marc Luck on samples from Stevns Klint supported the extraterrestrial hypothesis, and so geochemistry influenced interpretations of the K/Pg boundary in other fields such as sedimentology and paleontology. These results formed the basis for numerous graduate student Ph.D. theses in the 1980s and 1990s by a cohort of students who focused on Os geochemistry and whom Karl dubbed the "Wizards of Os."

Karl was a seminal organizer and participant in many multi-investigator coordinated science programs such as the Geochemical Ocean Sections Study (GEOSECS), the Sea-Air Exchange (SEAREX) Program, and the Atmosphere-Ocean Chemistry Experiment (AEROCE). Arguably, these programs paved the way for the large multidisciplinary studies that are now common in the marine and atmospheric sciences.

Throughout his career, Karl nurtured and supported a very large number of undergraduate and graduate students, postdocs, and visiting scientists who passed through his laboratory and are now dispersed in business and academic positions worldwide. He taught numerous courses and seminars at Yale but noted that his most important "course" was his midmorning coffee "hour." There, discussions were lively and wide-ranging, often with an emphasis on "one data point and a good idea."



Yale University

Karl K. Turekian

In addition to the numerous papers coauthored with students, postdocs, and other colleagues, Karl authored, coauthored, and coedited many books on the geochemistry of Earth and its oceans, including *Handbook of Geochemistry* and *Treatise on Geochemistry.* He also served as editor of *Journal of Geophysical Research, Global Biogeochemical Cycles, Earth and Planetary Science Letters, Geochimica et Cosmochimica Acta,* and *Proceedings of the National Academy of Sciences.*

His accomplishments were recognized through his election to the National Academy of Sciences and the American Academy of Arts and Sciences and his receipt of the Goldschmidt Medal of the Geochemical Society, AGU's Maurice Ewing Medal, and the Wollaston Medal of the Geological Society of London, as well as an honorary Doctor of Science degree from Stony Brook University. As proud as Karl was of the accomplishments of his students and postdocs, pride of place was reserved for his family—his wife Roxanne, son Vaughan, and daughter Karla, who survive him.

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