Victor Vacquier (1907–2009)

PAGE 264

Ingenious geophysicist Victor Vacquier died on 11 January 2009 at the age of 101. He is widely known for developing the fluxgate magnetometer. When modified for use at sea, it, and the later proton precession magnetometer, made the observations that established plate tectonics. In Victor's view, however, his most significant achievement was the gyrocompass for dead reckoning navigation.

Victor's parents, Victor Alfonse Vacquier, a physician, and Tatiana Isnard Vacquier, lived in St. Petersburg, Russia, when he was born on 13 October 1907. In January 1920 the family fled across the frozen Gulf of Finland in two horse-drawn sleighs. Of French origin, they tried farming in France.

Victor and his mother moved to the United States in 1923, helped by philanthropist and diplomat Charles R. Crane. After finishing high school in Madison, Wisc., Victor attended the University of Wisconsin, where he received his B.S. in electrical engineering in 1927 and his M.A. in physics in 1928.

Early Work in Magnetics

Victor became a U.S. citizen in 1929, one year before beginning his professional work at Gulf Research and Development Company in Pittsburgh, Pa., in 1930. There he interpreted vertical magnetic profiles taken from the Orinoco River in Venezuela, improving upon existing methods for what came to be known as deep magnetic sounding. While designing an instrument to measure weakly magnetized samples, he built a fluxgate magnetometer centered on a pair of parallel cores of high-permeability alloy. The magnetometer's coils were magnetized past saturation in opposite directions by an alternating current source; if an outside magnetic field existed in the same direction, one core saturated earlier in the cycle and the other saturated later. The difference in the onset of saturation measured the ambient magnetic field. The magnetometer could be used in moving vehicles, ships, and airplanes, and later aboard spacecraft.

During World War II, Victor and his colleagues at Gulf used the device to build better magnetic antitank mines, and they also developed a more sensitive version of the magnetometer to detect submerged submarines. After those successes, Victor's supervisor urged him to develop similar equipment for use on airplanes; although he thought the task was nearly impossible, he did so. He tested the equipment, named Magnetic Anomaly Detector (MAD), aboard a PBY flying boat in Rhode Island and then from a blimp in New Jersey.

In 1942, Victor transferred to Columbia University's Airborne Instruments Laboratory, in Mineola, N. Y., where a different variety of MAD was being developed that did not depend upon gyroscopic stabilization. Victor then joined the Sperry Corporation in Garden City, N. Y., where he led a group developing better gyrocompasses for the U.S. Navy Bureau of Ships. The Mark 19 gyrocompass was put into use in 1953, and a Mark 23 model developed by Victor's group later was used on army tanks in terrain where landmarks were sparse.

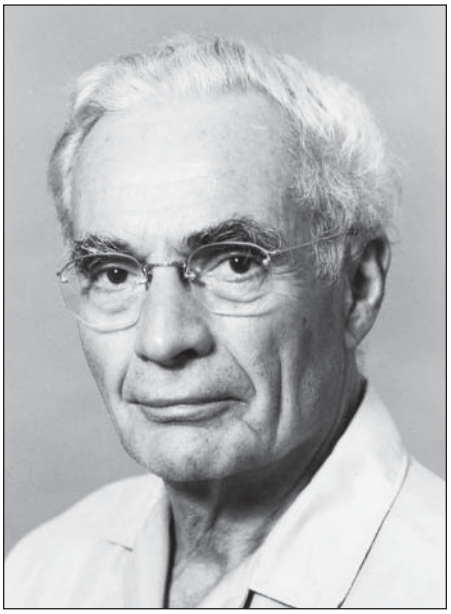
Into the Academic World

In 1953, Victor began working at the New Mexico Institute of Mining and Technology in Socorro. There he experimented with finding water by induced electrical polarization, a feasible but expensive prospect.

In 1957, he was appointed research physicist and placed in charge of the magnetometer program at the Marine Physical Laboratory of the Scripps Institution of Oceanography (at that time an independent graduate school of the University of California). He had sought a position at Scripps after learning about work on magnetometer measurements in the Pacific Ocean being done there by Ronald Mason and Arthur Raff on the U.S. Coast and Geodetic Survey ship *Pioneer*. He became a professor at Scripps in 1962, a rare achievement for someone without a Ph.D.

Victor went to sea on many surveys in addition to those of the *Pioneer*, and he quickly recognized that certain magnetic patterns on the ocean floor were repeated elsewhere, but at considerable distance. In the Pioneer fracture zone in the northeastern Pacific Ocean, the interval between the repetition of a magnetic pattern was 256 kilometers. Further measurements on the Mendocino escarpment west of northern California showed an offset of 1186 kilometers. These results implied a large displacement of the ocean floor. The ability to explain this startling offset without requiring continuous relative motion across either side of an inactive fracture zone was a key piece of evidence leading to the rapid acceptance of the theory of plate tectonics proposed by J. Tuzo Wilson in 1965.

In 1961, Victor took charge of the heat flow program at Scripps with the specific objective of examining the relation between heat flow and distance from the crest of the mid-ocean ridges. Using the pronounced magnetic anomaly to delineate the axis, he demonstrated a strong correlation between high heat flow and the crest of the mid-ocean ridges. With follow-up work in the western Pacific, he confirmed the existence of nearly uniform and relatively low heat flow values in the deep ocean of the western Pacific, confirming a similar relation that had been observed in the deep basins of the North Atlantic. These data led directly to the currently accepted thermal model for the creation of the oceanic lithosphere.



Victor Vacquier

Separately, he measured terrestrial heat flow in lakes in Africa and South America and in oil fields in Indonesia and Brazil. In the terrestrial work, he devised methods for determining reliable temperatures at the bottom of oil wells and determining the thermal conductivity of the surrounding rocks from standard well-logging techniques.

Victor obtained a number of patents for his geophysical inventions, and he received scientific honors including the John Adam Fleming Medal from AGU in 1973 and the Alexander Agassiz Medal from the U.S. National Academy of Sciences in 1995. His book *Geomagnetism in Marine Geology* was published by Elsevier in 1972.

A compulsive tourist, Victor was legendary for his explorations of local cultural sites during port stops. Friends and colleagues will remember his good humor, his thoughtfulness to others, and—by those who went to sea with him—his ability to fix things. Those whom he mentored will cherish his kindness and interest in their lives and his enthusiasm for new or exciting discoveries.

Victor was married to Vera Vinogradoff from 1931 to 1961. In 1966, he married Mihoko Wada, who devotedly assisted him in his scientific endeavors as his eyesight declined. He is survived by Mihoko; a son from his first marriage, Victor D. Vacquier, a professor emeritus at Scripps Institution of Oceanography; and four grandchildren.

—ELIZABETH N. SHOR, La Jolla, Calif.; E-mail: betty.shor@gmail.com; and JOHN G. SCLATER, Scripps Institution of Oceanography, University of California, San Diego, La Jolla