

# Memorial to John Elliott Nafe

## 1914–1996

JACK E. OLIVER

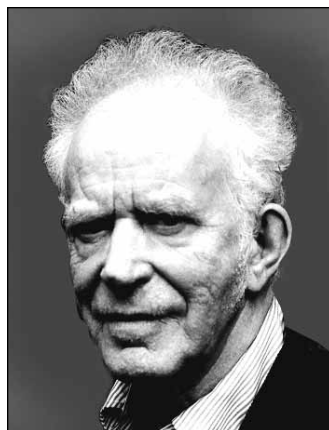
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John Elliott (Jack) Nafe was a superb scientist, with breadth that encompassed many disparate specialties of science and with depth and vigor that made him a tower of strength in science and in the organizations he served. He was a creative and versatile researcher, an outstanding and admired teacher, and a highly regarded and dedicated administrator. At the Lamont-Doherty Geological Observatory where he spent most of his career, Jack was a critical factor in the success of that organization as it grew, during the decades of the 1950s, 1960s, and 1970s, from a handful of scientists into a world-renowned scientific institution under the overall direction of Maurice Ewing.

Regardless of the nature of the problem he faced, whether it be an enigma at the frontier of science, a challenge in bringing a difficult concept to students, or the unraveling of a twisted web of bureaucracy and administration, Jack could be depended upon to apply rigor, sound reasoning, and a firm basis in fundamentals to the solution. Each time a topic new to him arose, he demanded of himself, and others concerned, that it be understood from the ground up. His insistence upon doing science “right,” his selflessness, and his openness and willingness to help others do so, made him a guiding light and a pillar of strength in the Lamont organization, which regularly encountered and tackled previously unexplored matters at the forefront of earth science.

Jack’s penchant for science manifested itself at an early age. An article in a Detroit newspaper in 1926, when Jack was 12, described a museum there set up by boys 9 to 15 years old. On the list of staff members was chief scientist Jack E. Nafe! Jack had a yen for adventure, particularly on the high seas, that also manifested itself in his youth. He interrupted his college education to spend two years as a seaman on ships traveling to Europe and South America. He had a lifelong interest in collecting fossils, often traveling far out of his way for that purpose. Though most of his formal scientific education was in physics, and in spite of important early achievements in that subject, Jack eventually turned to earth science, mostly geophysics, where he could bring together his scientific expertise with those other subjects and those far-flung global activities that he loved.

Jack’s higher education included a B.S. degree (with distinction) in 1938 from the University of Michigan, and a master’s degree in 1940 from Washington University where he did research on cosmic rays. He was briefly an assistant in physics at Columbia University before World War II began. From 1941 to 1946 he served his country in the U.S. Navy, teaching electrical engineering and physics at the Naval Academy in Annapolis and reaching the rank of lieutenant commander. After the war, he returned to Columbia, where he was an instructor teaching physics (I was one of his students), and conducting research on molecular beams with Edward Nelson under the direction of I. I. Rabi, the distinguished Nobel scientist and prominent government advisor. Jack received the Ph.D. in 1948 for a thesis on the hyperfine structure of hydrogen



and deuterium. It was an invited paper at the 1947 meeting of the American Physical Society.

He next held a faculty position and taught for two years at the University of Minnesota, but then returned to Columbia to serve as director of research at Hudson Laboratories, where the university carried out advanced studies of underwater sound.

In 1953, Jack joined the Lamont Geological Observatory (now the Lamont-Doherty Earth Observatory), where he would spend the remainder of his career. He quickly became a key factor in many of the observatory's scientific activities as it moved through its formative early years, (The observatory was begun in 1949). Jack, his wife Sally, and their two young daughters lived in one of the residences on the grounds of the former Thomas Lamont estate and were an integral part of the observatory's inner social circle as well.

At first Jack was moved from project to project at Lamont, as the occasion demanded, spreading his classy brand of scientific rigor and expertise throughout the group of still younger scientists and students struggling for achievement and advance in science there. He was welcomed by all, he never sought credit or thanks for his many contributions, and he seemed to find ample personal satisfaction and often delight in just knowing that a particular piece of science was done well.

His efforts and activities for Lamont were hardly confined to the Observatory grounds, however. During the 1950s, 1960s, and 1970s he made numerous research cruises, often as chief scientist, and he traveled throughout much of the world—to the Gulf of Mexico, the Caribbean, Iceland, Spain, Mauritius, Australia, New Zealand, the Mediterranean, Japan, and Russia, among other locales. Most of his cruises were on Lamont's research vessel *VEMA*, but he also sailed on ships of the U.S. Navy and on Argentinian, Spanish, Canadian, British, Turkish, and Russian research vessels. It was a time when humans were developing an unprecedented level of understanding of a large part of Earth—the ocean basins—and scientific discovery and adventure abounded.

As just one example, on a cruise with Jack as chief scientist, *VEMA* dropped some small explosive charges in the sound channel of the ocean near Australia, and the resulting sound was detected at Bermuda, nearly halfway around the globe! This phenomenon is now the basis for modern attempts to measure variations in average ocean temperatures and hence climatic change.

In 1955, Jack was appointed to the faculty of the Department of Geology at Columbia University, and in 1958 became a full professor, a position he held until retirement in 1980. He taught a variety of courses in geophysics and in physical and historical geology. Jack also played an important role in higher levels of the university. He was chairman of the Committee on Instruction of the Faculty of Pure Science and a member of University Council and of the executive committee of the Graduate School of Arts and Sciences. All the while he maintained his research efforts at Lamont.

From 1962 to 1965, Jack was chairman of the Department of Geology. He saw the department through some trying times as it sought to accommodate and adjust to the burgeoning and sometimes overpowering presence of more than a hundred Lamont scientists and a comparable number of graduate students, most hyperactive because of the revolutionary hypothesis of plate tectonics. Jack did the job well. As always he seemed a powerful glue that held the various units together and strengthened them and the overall structure in the process.

On the research side, Jack was author or coauthor of many scientific papers. He is especially well-known for his work with Charles Drake, which resulted in the classic Nafe-Drake curve that relates velocity of elastic waves in rocks and sediments to the density of the medium. His publications cover a wide range of topics, from his early work in physics on hyperfine structure of hydrogen and deuterium, to the theory of elastic waves in the earth, to seismic refraction studies of sites throughout the world, to the solid state physics of rock components.

Often Jack worked with someone or with a group, generously and unselfishly shoring up the effort whenever the need arose. I can recall the time when Jim Brune, then a young graduate student at Lamont, had a very clever and innovative idea for visualizing the process of dispersion of seismic surface waves. Jack quickly helped him turn the raw idea into a first-class scientific publication. That is just one example to make the point that Jack's contributions to science cannot be fully appreciated merely by examining a list of his publications.

In 1976, Jack suffered a stroke and was partially incapacitated physically, but not mentally. He continued to teach, still imparting to his students his special brand of depth and rigor and thoroughness, and also a bit of his indomitable spirit. In 1980, Jack retired from Columbia and Lamont, but memory of him lingers there in the minds of all who knew and worked with him. The reading room of the Lamont library is named for him and is a lasting reminder of his stimulating and uplifting presence and his insatiable love of good reading material.

In 1980, Jack moved to Vancouver, B.C., where he lived until he passed away on April 6, 1996. A special memorial service for him at Lamont-Doherty shortly thereafter attracted many distinguished scientists and colleagues who paid tribute to him. Appropriately, and as Jack would have wanted it, the affair was primarily a celebration of Jack's wonderful life, career, and achievements, rather than an occasion solely of grief and regret.

Jack was born on July 22, 1914 in Seattle, Washington. In 1941, he married Sarah (Sally) Underhill. They were devoted to each other and their marriage provided support for Jack in his professional career and surely added to his longevity following his stroke. The union produced two daughters, Mary Malcolm (Mackie) Chase and Katharine (Kate) Elliott Kenah, both of whom married earth scientists and both of whom are active professionally in their own fields. There are six grandchildren.

Jack was well recognized by his peers. He was a Fellow of the Geological Society of America, the American Physical Society, the American Association for the Advancement of Science, the American Geophysical Union, and the Royal Astronomical Society. He served on more advisory panels and committees than can be cited individually here. His greatest legacy to the scientific community, however, may be the respect and the memory of his dedication to science that remains in the minds of those who knew him.

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