



IN MEMORIAM

Luna Bergere Leopold
Professor of Earth and Planetary Science and Landscape Architecture, Emeritus
UC Berkeley
1915 – 2006

Luna Bergere Leopold, professor of earth and planetary science and landscape architecture, emeritus, at the University of California, Berkeley, for 14 years (1972-1986), died of heart and lung failure at his home in Berkeley on February 23, 2006 at the age of 90.

Leopold was born on October 8, 1915 in Albuquerque, New Mexico, the son of Estella Bergere and Aldo Leopold, the noted environmentalist. He earned a bachelor's degree in civil engineering from the University of Wisconsin in 1936 and worked with the New Mexico Soil Conservation Service from 1937 to 1940. From 1940 to 1946, he served in the U.S. Army Weather Service and the Army Air Force Corps of Engineers. He received a master's degree in physics and meteorology from the University of California, Los Angeles in 1944 and was chief meteorologist for the Hawaiian Pineapple Institute from 1946 to 1950. In 1950, he began a 22-year career with the U.S. Geological Survey as hydraulic engineer. That year he took a short leave from the survey and earned a Ph.D. in geology at Harvard University. He became chief hydrologist in the U.S.G.S Water Resources Division in 1956 and senior research hydrologist in 1966. In 1972 he joined the faculty at Berkeley and taught until his retirement in 1986.

Leopold won many honors during his career. In 1958 he won the Kirk Bryan Award of the Geological Society of America and a Distinguished Service Medal from the U.S. Department of the Interior. He became a member of the National Academy of Sciences in 1968 and a fellow of the American Academy of Arts and Sciences in 1969. He was also a fellow of the American Philosophical Society and the California Academy of Sciences. In 1991 he was awarded the National Medal of Science. Among his other honors were the Cullum Medal of the Royal Geographical Society, the Linsley Award of the American Institute of Hydrology, the Henry P. Caulfield Jr. Medal of the American Water Resources Association, and the Robert E. Horton Medal of the American Geological Institute. Upon his retirement in 1986, Leopold received the Berkeley Citation, one of the University of California, Berkeley's highest honors. He also received honors from Belgium, the Netherlands, Canada, Scotland, Spain and Israel.

Leopold made the U.S. Geological Survey a premier research institution in the field of hydrology and in many ways helped create the field. His pioneering research played a crucial role in moving the field of geomorphology towards the quantitative field it has become. He made fundamental discoveries about the nature of rivers and the self-scaled geometries that apply to all rivers whether they are in sand boxes or drain entire continents. There has been no greater influence on the field of geomorphology in the past 50 years than Luna Leopold. According to Leopold's colleague Thomas Dunne, a professor of environmental science and management and of earth science at University of California, Santa Barbara, "In 1969, he practically invented the Environmental Impact Statement through its design and early application to problems such as the proposed Trans-Alaska pipeline and Everglades jetport. It can be fairly said that Luna Leopold has changed

the way this society approaches environmental problems and conducts environmental science in the service of people and the natural environment." Leopold's "most lasting accomplishment will probably be the huge number of people, both within science and in other intellectual pursuits from government to literature, whom he has motivated to develop and promote environmental science and to absorb it into the 'natural way of doing things' so that it is enduring and committed to human welfare," Dunne wrote.

Luna Leopold strongly believed in the important role of scientists in society. He was an advocate for ethics in science and a defender of the value of esthetics as a reason to protect the natural world. He demonstrated that simple, systematic observations of natural processes (and the keeping of good field notes) would reveal how nature worked and emphasized what one could do with the simplest resources, such as a ruler, a watch, and an orange to gauge the flow of a river.

He published almost 200 scientific papers on a broad range of topics, including fluvial processes and geomorphology, hydraulics, climate, soils, and flood control. His first publication appeared in 1937, "Relation of Watershed Conditions to Flood Discharge: A Theoretical Analysis", and his most recent (2005) publication was "Geomorphic Effects of Urbanization in Forty- one Years of Observations". Few have written papers spanning 68 years, and fewer still have had such an influence on a field or on society. He was also the author of numerous books, including two seminal works, *Fluvial Processes in Geomorphology*, with M.G. Wolman and J.P. Miller (1964); and *Water in Environmental Planning* with T. Dunne (1978). In addition, he wrote books and articles on water, river meanders and other fluvial processes for the layperson, including *Water: A Primer* (1974), *A View of the River* (1994), and *Water, Rivers and Creeks* (1997).

Leopold had few heroes, perhaps only one, Ralph A. Bagnold, who wrote the seminal *The Physics of Blown Sand and Desert Dunes*. When Leopold was head of the Water Resources Division of the U.S. Geological Survey, he and Bagnold designed equipment and carried out the first scientific experiments on the transport of sediments in running water. They became fast friends, each recognizing the tremendous talent of the other. They took trips together to see various geological phenomena, one, in 1966, on a raft down the Colorado River before rafting on the Colorado became popular. Bagnold described this trip later as perhaps the greatest trip of his life. They continued their scientific collaboration for the rest of their professional lives, producing a large number of pioneering papers on hydrology.

After retirement Leopold spent much time at his house in Pinedale, Wyoming, continuing his research and teaching at the nearby Teton Science School. He had designed and built the house himself with the help of friends and his family, even collecting the cobblestones himself to construct a magnificent fireplace and chimney in the living room- dining room. In addition to this house, he had bought an old log cabin constructed before 1900 in Pinedale that was going to be destroyed for new construction. He dismantled it and rebuilt it on a lot overlooking a beautiful glacial lake in the Wind River Range about 20 miles from his house. He kept the cabin secret from most people and used it as a hideaway for Barbara and himself when guests at his house, who often poured in unannounced, became too numerous.

In the hills around his cabin Leopold had found flaked tools of quartzite knapped from the local Eocene cobble beds. Some tools appeared to be of recent origin but others looked very old, their once sharp edges now blunted. Leopold and his colleague, Garniss Curtis, founder of the Berkeley Geochronology Center, looked for some means of dating them. They both believed that the most worn were thousands of years old, and Leopold completed a paper describing the hills and terraces upon which they were found. But without physical data to back them up, no publisher would accept his paper. He got a break in 2005 when he had a visit from Claudio Vita- Finzi at Pinedale. Vita- Finzi had published a paper with Leopold in 1998 on changes in the rivers of Europe and North America. On the outwash terraces of the last glaciation they found clearly knapped tools abraded and polished. High winds off the receding last glacier had bombarded them with finely ground bedrock dust. This was the proof needed to support a crude date of 10,000 years or more for the age of the artifacts.

Luna and his wife Barbara were sociable and when at home in Berkeley had frequent small parties for friends and visitors. Drinks and hors d'oeuvres of various kinds were served, together with assorted excellent wines. Soon, tongues became loosened and everybody joined in laughter and in conversation. However, Luna was less talkative than his guests. He would seldom start a subject to discuss but would wait to be asked questions, then give brief comments. This contrasted markedly with his behavior at his cabin in Pinedale. There he was the relaxed convivial host, telling stories, asking questions and laughing uproariously. 2004 was their last summer in Pinedale. Barbara, long ill with untreatable leukemia, died later that year. Luna missed her terribly, but said, "We both had been told by our doctors we had very little time left, but we decided to live our lives as

fully as we could", and they both did.

Leopold is survived by his first wife, Carolyn Leopold Michaels of Rockville, Maryland, and four children, Bruce Leopold of Baltimore, Maryland, Madelyn Leopold of Madison, Wisconsin, stepson T. Leverett Nelson of Chicago, and stepdaughter Carolyn T. Nelson of Madison. He also leaves behind three siblings, Nina Leopold Bradley of Baraboo, Wisconsin, A. Carl Leopold of Ithaca, New York, and Estella B. Leopold of Seattle, Washington. Another brother, A. Starker Leopold, died in 1983.

Garniss Curtis
Doris Sloan
Rudy Wenk