Memorial to Stanley William Lohman 1907–1992

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Few people have enjoyed the canyonlands of eastern Utah and western Colorado as much, and no one has done more to tell their geologic story than Stanley W. Lohman, who died January 12 in Denver. Stan, as he was known to all his friends, was one of the "giants" of the science of hydrogeology, having played a major role in its development through half a century. He was a man of prodigious memory and diverse talents. In addition to his principal disciplines of geology and hydrogeology, he was a musician, mathematician, electronics specialist, excellent photographer, gifted technical writer and editor, and above all, a teacher who helped train hundreds of young professionals in hydrogeology. Contrary to the old saw, "Jack of all trades; master of none," he was a master of many fields.

Stan was born May 19, 1907, the son of Herman and Elizabeth Young Lohman. His family were pioneers in southern California, having arrived there in 1886 when the population of Los Angeles was little more than 40,000. The home where Stan was born was built by his father in the village of Colegrove, now known as Hollywood. The period of Stan's youth saw the early development of the moving picture industry, and scenes for several of the early silent movies were filmed at the Lohman's large house and grounds on Santa Monica Boulevard. Stan was educated in local schools where he was active as a clarinetist in grade school, high school, and college orchestras and bands.

His interest in geology was sparked by the activities of his older brother, Kenneth E Lohman, another noted U.S. Geological Survey geologist. Ken entered Throop College of Technology (now California Institute of Technology) in 1916. He later became a commercial photographer and was hired by a mining company to make photomicrographs of diatoms from diatomaceous marl being mined near Lompoc, California. Ken was so intrigued by the amazing structures of the diatoms that he began to study them and, hence, developed an interest in geology. Ken returned to Caltech as a sophomore in the geology department in the fall of 1926. Stan, meanwhile, had become a freshman at Caltech in 1925 and joined Ken in 1926 as a sophomore in the geology department.

A Bachelor of Science degree with honors was granted to Stan by Caltech in 1929. He continued as assistant in mineralogy at that school until the summer of 1930 and completed graduate courses leading to an advanced degree. In the summer of 1930, he joined the Ground Water Branch of the U.S. Geological Survey and began a series of hydrologic investigations in northeastern Pennsylvania. These studies were completed in 1938 and submitted to Caltech as his thesis for the degree of Master of Science, which was conferred in 1938.

Oscar E. Meinzer, the father of hydrogeology and then Chief of the Survey's Ground Water Branch, was gathering and training a corps of young geologists and engineers who were destined to preside over the rapidly expanding new science of hydrogeology. They included, in addition to Lohman, such well-known scientists as Kirk Bryan, Albert Fiedler, Max Leggette,

Arthur Piper, Nelson Sayre, Harold Stearns, C. V. Theis, Harold Thomas, David Thompson, and many others who have left an indelible imprint on the new science.

Stan's first assignment with the Survey was to continue the ground-water studies begun by Max Leggette in a cooperative study between the USGS and the Pennsylvania Geological Survey. He worked first in northeastern Pennsylvania and, in later years, in north-central and south-central Pennsylvania, after which he established a network of observation wells—the first such statewide network operated by the Ground Water Branch. A shortage of cooperative funds severely reduced the program in Pennsylvania, so Stan was assigned several investigations in Michigan and North Carolina, culminating in a detailed study of the Elizabeth City area, where he ran the third Thiem test ever recorded in America. The Elizabeth City study was a significant milestone in his career, not only for the Thiem test but also because he met Ruth Harris, whom he married on April 14, 1933, at Elizabeth City.

The extended drought in the Great Plains that accompanied the great depression caused severe water problems throughout the West and resulted, in 1937, in a cooperative agreement between the USGS and the Kansas Geological Survey to study the ground-water resources of the state. Stan initiated the program with a study of the Wichita area, with the view of enabling the city to develop a much-needed new water supply. The first well he measured, and the first well in a statewide network of observation wells, was on my family farm north of Wichita. I had not yet been exposed to hydrogeology and, unfortunately, destroyed the well by moving the sand point to another part of the farm! The Wichita area study was very successful, and a new well field was developed by the city just in time to meet the explosive water demands of the aircraft and associated industries stimulated by World War II. The projected 20-year growth in water consumption in Wichita was exceeded in little more than two years!

As the drought continued, the Kansas cooperative program was expanded and a district office was established at Lawrence with Stan as geologist-in-charge. This was among the first of the statewide district offices to be established by the Ground Water Branch, and it helped set an organizational pattern that was continued and expanded by the Branch throughout the country. Stan assembled and trained a young staff and supervised their work for the next five years, during which county-wide studies of the geology and ground-water resources of the High Plains were made.

After the Kansas program was well established, Stan was asked, in 1945, to begin a new program in Colorado with a district office in Denver, where he lived for the rest of his life. One of the first of many water problems he faced as district geologist was the rapidly declining head (or pressure) in artesian wells in the Grand Junction area. He began a study there in 1946, thus initiating his great love for and long study of the canyonlands of western Colorado and eastern Utah. It was indeed fortunate that, concurrent with Stan's study of the Grand Junction artesian basin, fellow Survey scientist C. E. Jacob was developing a new mathematical formula to determine transmissivity and storage coefficient of an artesian aquifer by means of nonsteady flow to an artesian well of constant drawdown. As the Grand Junction artesian basin appeared to fit the technical conditions required of the formula, Stan agreed to test it by means of a series of flow tests. To conduct the tests, a method of accurately measuring rapidly changing head as the well discharged was required, so Stan designed and built a new and unique inkwell mercury gage. The gage was used to test all the flowing wells in the Grand Junction area as well as many wells in Baca County and the San Luis Valley, Colorado. The formula was thoroughly verified and has become a standard; it is commonly known as the Jacob-Lohman formula.

Activities as district geologist continued for several years with the supervision of major ground-water studies in the San Luis Valley, the South Platte Valley, and the High Plains. Work progressed on the Grand Junction project but, because of his broad experience and valued

became staff geologist and in 1956 branch area chief of the Rocky Mountain area. For eight years he supervised technical and administrative matters and reviewed all technical reports from more than a dozen district offices.

The year 1959 marked the end of Stan's 22 years of administrative duties, which had left too little time for personal research, and marked the beginning of the most rewarding and productive period of his technical career. He retired in 1974 as senior research geologist but continued part time as a rehired annuitant until 1981 at which time he had completed 51 years of service—exactly half the 102-year history of the U.S. Geological Survey.

While Stan was working on the Grand Junction area, he was approached by several National Park Service superintendents and park naturalists at Colorado National Monument who urged him to prepare an account of the geology of the Monument in terms understandable by the layman—a report that could be sold at the visitor center. The result was "The geologic story of Colorado National Monument," which was published locally. In this report, Stan demonstrated a crisp new approach to scientific writing. He told the story of the Monument chronologically, geologically, geographically, and historically. The report was an immediate "best seller" and was soon out of print. An enlarged version with color photos and professional graphics was published later by the U.S. Geological Survey. Stan's great interest in the canyonlands led him to prepare similar lay-reader reports on Canyonlands and Arches National Parks. These popular reports have undergone many printings, the first editions being out of print within a year. Because of the popularity of these reports, Survey geologists prepared similar lay-reader reports for Yellowstone National Park, Grand Teton National Park, the Uinta Mountains, and Lake Powell.

Stan was not only interested in lay-reader reports; he was also deeply concerned about the many erroneous and inconsistent definitions of ground-water terms. As a result of a memorandum that he prepared and circulated among colleagues expressing the need for new definitions of hydraulic conductivity and permeability in consistent units, the Survey established a Committee on Redefinition of Ground-Water Terms of which Stan became chairman. After many months of deliberations, the committee completed a report whose definitions have become the standard of the profession.

His wide reputation as a scientist and teacher led to an invitation in 1967 to deliver a series of lectures on ground-water hydraulics at the Second Ground-Water School of the Australian Water Resources Council at Adelaide. During this trip, he also lectured at the Victoria Geological Society, the University of Canberra, and the University of Auckland. Many months had been spent in preparing these lectures, and they were so successful and popular that he was asked to expand the lecture notes into a complete technical report. The result was his classic volume *Ground Water Hydraulics*, which has undergone six printings, including one in Spanish. The report is used by universities throughout the world as a textbook and as a standard reference.

The great love Stan had for teaching was one of his finest attributes and, in the long run, may have contributed more to the science of hydrogeology than any of the other of his many endeavors. In the early 1950s, the Ground Water Branch began a series of short courses to train the many postwar recruits and to acquaint the older employees with new techniques. Stan became a regular instructor in these courses and in advanced short courses that were held later. He lectured scores of times at these courses and at courses for foreign trainees, at the Survey's Water Resources Division Training Center, at district offices, at universities, at technical societies and seminars, and elsewhere. The Distinguished Lecture Committee of the American Association of Petroleum Geologists chose him in 1966 to deliver a series of illustrated lectures to selected lay groups during AAPG's 50th anniversary year. He has also presented technical papers at UNESCO meetings in Toulouse and at the Congress of the International Society of Photogrammetry in Lisbon.

Field trips were an integral part of many of the courses and seminars; hence, Stan led

dozens of one- to three-day trips through the Rocky Mountains and canyonlands explaining their geology, hydrology, and local history. Several of the trips were for meetings of national technical societies. Road logs were prepared by him for guidebooks published by organizations such as the Geological Society of America, the Rocky Mountain Association of Geologists, the Colorado Scientific Society, and the International Association of Petroleum Geologists.

Stan was active in many technical organizations and served on many committees. He was a Fellow of the Geological Society of America, a Fellow of the American Geophysical Union, and a member of the American Association for the Advancement of Science, the American Association of Petroleum Geologists, the American Institute of Professional Geologists, the American Water Resources Association, the Society of Economic Geologists, the Rocky Mountain Association of Geologists, the Colorado Scientific Society, and the New Mexico Geological Society. He received many honors during his career, including the Distinguished Service Award of the Department of Interior, the Distinguished Service Award of the Hydrogeology Division of the Geological Society of America, Honorary Member of the American Water Resources Association, and Honorary Life Member of the Colorado Scientific Society. He was the author of 70 reports.

Stan is survived by his wife of nearly 59 years, Ruth Harris Lohman; by sons William, Terry, and Robert, all of Denver; by his brother, Kenneth E. Lohman, of Fairfax Station, Virginia; and by seven grandchildren and four great-grandchildren. He leaves a void in the lives of all who knew him.

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