Memorial to Thomas Seward Lovering 1896–1991

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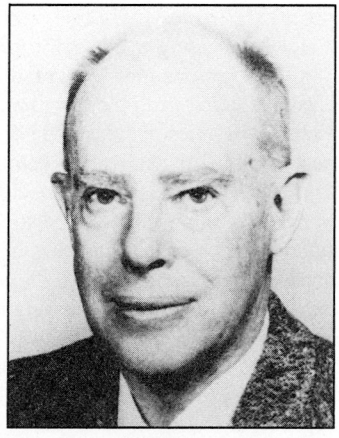

Thomas S. Lovering, a Fellow of the Geological Society of America for 64 years and its president for part of 1951 and all of 1952, died peacefully at his residence in Santa Barbara, California, on April 9, 1991. He was within about a month of reaching his 95th birthday when he succumbed to leukemia. Throughout his long professional career he directed his energies almost exclusively to geologic field studies, laboratory research, and university instruction in economic geology, and with only a few exceptions consciously avoided the temptation to assume many of the supervisory and administrative positions offered to him. Thus, he epitomized the definition of a true research scientist and teacher. To some who knew him as a scientific competitor, or only casually from his penetrating questions and comments at meetings and symposia, he often appeared brusque, argumentative, and somewhat egocentric. To his closest associates and coworkers, however, he was invariably courteous, generous, and steadfast in his support and friendship. To him, the search for scientific excellence was paramount and all else was secondary.

Tom, as he was known by his colleagues and a wide circle of acquaintances, was born in St. Paul, Minnesota, on May 12, 1896. During World War I he trained as a Navy aviation cadet, but the Armistice was signed before he was transferred to combat duty, and upon his discharge in 1919 he entered the Minnesota School of Mines. In 1922 he graduated with an E.M. degree and later in the same year enrolled in the graduate school of the University of Minnesota, where he received an M.S. degree in geology in 1923 and a Ph.D. in economic geology in 1924.

Tom's first position after completing his doctorate was an an instructor in the Department of Geology at the University of Arizona. He remained at Arizona for only one academic year, accepting a position in 1925 with the U.S. Geological Survey to conduct comprehensive studies of selected mining districts in the Colorado Front Range under the general supervision of B. S. Butler. In 1934 he terminated his full-time position with the USGS and became an associate professor of geology at the University of Michigan. During the following eight academic years he undertook many laboratory investigations, and also worked during the summer months for the USGS in Colorado, where he continued his studies of tungsten and base- and precious-metal mining districts and participated in regional mapping projects.

Upon the entry of the United States into World War II, Tom took a leave of absence from Michigan and rejoined the U.S. Geological Survey on a full-time war-service appointment to assist in the strategic minerals program. His wartime activities included the completion of several studies of mining districts in Colorado and the early phases of what became a long-range study of deeply concealed ore bodies in the East Tintic mining district of central Utah.

At the end of World War II, Tom returned to the University of Michigan, where he resumed his professorship in the Department of Geology and Mineralogy for the 1946–1947 academic year. By this time, however, his field research at East Tintic had reached a critical phase, and in 1947 he resigned from the faculty at Michigan and accepted a permanent position

with the Mineral Deposits Branch of the U.S. Geological Survey. From this time forward, his activities with the USGS progressed from field and laboratory studies in Utah and Colorado to several administrative, consultatory, and advisory roles in both the Geological Survey and Department of Interior. Later he became a United States delegate to mineral conferences throughout the world and a mineral resource consultant to other civilian and military federal agencies.

In 1966, at age 70, he retired from the Survey but continued to pursue both academic and research activities for many years, including authorship of several scientific papers, teaching, mineral consulting work, and worldwide travel.

Tom Lovering made significant contributions in a number of disciplines of geological science, including geologic mapping, ore-deposits studies, geochemistry, and the thermodynamics and cooling rates of igneous intrusions. He probably is best remembered for his studies of the geochemistry of magmatic hydrothermal wall-rock alteration in the Boulder County tungsten district, Colorado, and the East Tintic mining district, Utah, and its implications to the processes of ore deposition. Some 50 years ago, when other geologists and geochemists of considerable stature proposed that the zones of hydrothermally altered wall rocks associated with some ore deposits were formed contemporaneously with the deposition of the ore minerals, Tom and his coworkers were among the foremost to insist that the various alteration zones of many ore deposits were the products of wall-rock reactions with several differing solutions whose periods of activity had been separated by appreciable time intervals. In his view, the ore-stage solutions did little more than deposit the ore and latest gangue minerals. Tom also championed the concept that alteration at depth might be quite different from that produced at the same time closer to the surface, after the more active solutions had been modified by chemical and physical changes entailed in the deeper alteration. Thus, certain lateral changes observed in the wall rocks outward from a conduit might possibly suggest the changes to be found upward along the hydrothermal channelway.

Over the past four decades or so, much work has been done by others on the field, experimental, and theoretical relations of ore deposition and hydrothermal wall-rock alteration, a major part of which centers on the changes produced in complex base-metal– and sulfur-bearing solutions by changes in pressure and temperature, gas-phase separation, and reactions with local ground water and the minerals of the adjacent wall rocks. Some of the most recent of these modern studies still lead their investigators to conclude the probable contemporaneity of ore deposition and acidic wall-rock alteration. In contrast, many field geologists throughout the world have continued, as did Lovering, to recognize geologic relations that strongly indicate a significant separation in time between the periods of moderate to intense acidic wall-rock alteration and ore deposition.

At East Tintic Tom particularly enjoyed showing visitors an area where large volumes of acidic solutions had crossed over from altered veins and fractures in monzonite porphyry into massive dolomite and limestone, where they were abruptly cooled and neutralized. These solutions obviously did not deposit any ore minerals but instead formed a massive body of endellite clay and iron oxide whose chemical constituents clearly were derived from the leached and altered monzonite. Distinctly cutting the massive clay deposit is a relatively insignificant, narrow vein of galena-enargite ore that within several hundred feet joins a series of large horizontal replacement ore bodies in dolomite and limestone whose wall rocks show no evidence of acid leaching but only thin selvages of sericitic and baritic jasperoid. In Tom's estimation, these relations indicated a profound difference in composition between acidic argillizing solutions and the near-neutral ore-depositing solutions, thus confirming for him a somewhat disparaging comment once made by the great Butte geologist Reno Sales about a "turning on and off of spigots at the source."

Tom also was a lifelong advocate of detailed geologic mapping, and he believed that theoretical and experimental studies were valid only when closely linked with meticulous field observations and demonstrable physical relations. His geologic and alteration maps of the East Tintic mining district, Utah, which were prepared in collaboration with a number of younger associates, present much of the evidence that he marshaled in support of his theory of distinct and differing pulses of hydrothermal solutions; they show that at least two of the pulses were separated by readily recognizable geologic events. These maps, published as U.S. Geological Survey Mineral Investigations Field Studies Map MF-230, were widely used by private mining companies and exploration groups in the district, resulting over a period of a decade or more in the discovery and development of two new major mines and the delineation of four other mineralized zones that appear to be worthy of development.

Tom was particularly proud also of his contributions to the geologic map of Colorado published in 1935 in collaboration with W. S. Burbank, E. N. Goddard, and E. B. Eckel, and his geologic maps of the Colorado Front Range and the Front Range mineral belt that accompany U.S. Geological Survey Professional Paper 223, written in 1950 with Eddie Goddard.

As an exception to his long-standing rule to avoid administrative and supervisory positions if at all possible, Tom agreed in 1954 to become chief of the USGS Section of Geochemical Exploration. In large part this reflected his deeply held interest in the refinement and continued development of new mineral exploration techniques. On stepping down from this position in 1958, Tom served until his retirement as a senior research scientist within the Geologic Division, continuing his studies of the geochemistry of hydrothermal wall-rock alteration, advanced techniques of geochemical exploration, and worldwide mineral resource evaluation.

During his lifetime Tom received many honors, including his election to the National Academy of Sciences, the Distinguished Service Medal of the Department of Interior, the Penrose Medal of the Society of Economic Geologists, the Jackling Medal of the American Institute of Mining and Metallurgical Engineers, the Achievement Award gold medal of the University of Minnesota, and others. He was an active member and supporter of numerous scientific and engineering societies, some of which include the American Association for the Advancement of Science, American Geophysical Union, American Association of Mining, Metallurgical, and Petroleum Engineers, American Association of Petroleum Geologists, Clay Minerals Society, Geochemical Society, Geological Society of America, Society of Economic Geologists, and a particular favorite of his, the Colorado Scientific Society.

For approximately ten years after his retirement form the U.S. Geological Survey Tom maintained a residence near the Survey's regional headquarters in Lakewood, Colorado, but spent many winters in Tucson, Arizona, where he later accepted a research professorship in economic geology at the University of Arizona. During this time he also taught special courses in economic geology at the University of Texas, University of Utah, and other academic institutions. In 1976 he moved from Lakewood to Santa Barbara, California, where he became a research associate at the University of California, Santa Barbara. As with his other postretirement academic activities, this affiliation allowed him to interact with bright students and an outstanding faculty in the academic and research environment that he so greatly enjoyed.

Throughout the greater part of his years as a student and as a professional geologist Tom enjoyed the love, support, and companionship of his wife Corinne. He married Alexina Corinne Gray on October 11, 1919, shortly after his discharge from the Naval Aviation Corps. She was no stranger to the rigors of geologic fieldwork and cheerfully accepted the discomforts of wilderness camping in the Colorado Rockies, spartan lodgings in declining mining camps, and less than palatial accommodations in a wide variety of motels and hotels in small towns throughout the west. Corinne died on August 27, 1969. Finding his life lonely and incomplete in many ways without a close companion, Tom later married Mildred Stewart, with whom he

shared many common interests, especially extensive land and sea travel throughout the world. Millie also preceded him in death, on March 13, 1983.

Tom is survived by one son, Tom G. Lovering, a daughter-in-law, Dorothy, and two grandchildren, David and Karen.

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