

Memorial of Harold Lloyd James, 1912–2000

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Harold Lloyd James is widely recognized for his trail-blazing interpretations of the field relationships and petrology of the metamorphosed and structurally complex iron-rich sedimentary rocks known as “iron-formation.” Although his research focused on northern Michigan, the fundamental contributions he made there have proven applicable worldwide for the sedimentary iron deposits that constitute the bulk of the world’s iron ore resources. Prior to James’ work, the unusual chemical and mineralogical character of iron-formation was attributed to metamorphism and hydrothermal alteration of iron-rich carbonate sedimentary rocks. However, James peered through the veil of metamorphism and subsequent local oxidation, unraveling the spatial relations among lithologies, recognizing features that distinguished their protoliths, deciphering their primary igneous and sedimentary patterns, understanding their structural and petrogenic affiliations, and showing that the iron-rich assemblages of rocks exhibit a systematic and oft-repeated sequence of intergradational facies that reflect the integrated sedimentary environments of ancient marine basins. That reconstruction provides a powerful tool to locate the economically important oxide facies rocks that represent the principal economic targets, and to unravel structural complexities in terrains containing iron-formation. His constructive influence extended far beyond his own scientific work as friend, mentor, and colleague to many associates, as an active member of the geologic community, and culminating in service (1965–1971) as Chief Geologist of the United States Geological Survey.

Harold Lloyd James (known to his many friends and colleagues as Hal) was born on June 11, 1912 in Nanaimo, British Columbia, the eldest of five children of Evan and Blodwen James who had emigrated from Wales in 1911. The family moved to Bellingham, Washington in 1923, and his naturalization was completed in 1940. Hal attended public schools in Nanaimo and Bellingham and graduated from the latter’s Whatcom High School in 1933 at the age of 20, having spent six years of full-time work to supplement his family’s finances. He began college at Western Washington University in 1934 but soon transferred to Washington State University, majoring in Mining Geology. He repeatedly interrupted his formal education to recoup his finances by working as a coal miner, but he emerged with a Bachelor of Science in Geology as a member of Phi Beta Kappa, with highest honors in 1938. He was the first of his family to graduate from college.

His is an excellent example of an immensely productive career whose direction and accomplishments hinged several times on good fortune and generous support from supervisors, educators, and family, combined with his own persistent quest



for long-range betterment rather than immediate gratification. Perhaps his best good fortune came on February 13, 1936, when he married the former Ruth Graybeal. Ruth provided steady support and encouragement for more than 53 years; they raised four sons: David E., Robert C., Hugh L., and Herbert T.

In 1938 James began a career-long affiliation with the United States Geological Survey as a summer field assistant to Charles Park who was mapping the manganese deposits of the Olympic Peninsula, Washington. He started graduate work in 1938 at the University of Washington, working summers for the USGS and in 1940, before completing a degree, transferred to Princeton. There he obtained an assistantship with Harry Hess who held a reserve commission in the Navy and was called to active duty in 1942, whereupon James took over as instructor in mineralogy.

He began full time USGS employment in June 1942 as part of the Strategic Minerals Program. James worked on a variety of strategic minerals in the northwest, concentrating on chromite deposits near Red Lodge, Montana, which he used as his Princeton Ph.D. dissertation (1946). In August 1943 he was transferred to a more sustained study of the lead-zinc ores of the Metaline district, Washington. In contrast to the targets of his many, brief, prior studies of strategic minerals, domestic supplies of lead and zinc were sufficient; and James felt that his efforts were inappropriately applied. Therefore, in early

1944 he sought a commission in the Navy. This action induced his supervisors to transfer him to the USGS's Military Geology Unit that performed terrain analysis to benefit military operations. It was a busy and satisfying task, and it even had some humor. For example, although his security clearance was at the "Secret" level, some of his reports were immediately stamped "Top Secret," so that he was forbidden to view his own work. In early 1945 he was transferred to the Engineering Terrain Intelligence Team based in Hawaii. The Team worked intensively in a secluded underground facility near Schofield Barracks, providing tactical support by producing detailed maps on very short notice for operations in the Pacific Theater. In 1945 the Team began examination of southern Kyushu and was scheduled to follow the initial landings to provide close support for the combat engineers. The Hiroshima and Nagasaki A-bombs terminated that plan, and James returned to Bellingham.

In November 1945 he was assigned to a joint USGS-State of Michigan study of the iron deposits in the Iron River-Crystal Falls district, a task that he accepted unenthusiastically because the intellectual challenges were ill defined. What at first seemed a mundane assignment soon evolved into an opportunity to unravel geologic intricacies about iron resource occurrences that had theretofore been undecipherable and to clarify the geologic history of the oldest part of northern Michigan. Several other geologists made significant contributions, but it was James that assembled the regional picture, inserted the iron deposits into their genetic context, and prepared three classic papers. The first in 1954 definitively described the stratigraphic relations among the facies of iron-formation. The second, in 1955, explained the nodal pattern of metamorphism in northern Michigan and established the relation between the metamorphic grade and the character of the iron ore. The third, in 1958, assembled and clarified the stratigraphic relations among the diverse older Precambrian rocks throughout northern Michigan. In 1953 and 1954 he interrupted his studies in Michigan to become Visiting Lecturer at Northwestern University for the spring terms where he taught graduate courses in Mineral Deposits and Petrology.

In 1954 James was transferred to the newly opened USGS center in Menlo Park, California, but before he settled in too deeply he was selected for a two-year tour as Assistant Chief of the large Mineral Deposits Branch in Washington. He returned to Menlo Park in 1958 and began a field study of the bedded iron deposits in the older Precambrian rocks of southwestern Montana. In 1961 he took a position as Professor of Mineral Deposits at the University of Minnesota where his work on iron deposits continued and included a then-innovative study with Robert Clayton on the fractionation of oxygen isotopes among iron minerals and silica. He remained affiliated with the USGS and in 1965 was called on for a four-year term in Washington as Chief Geologist where he managed more than two thousand scientists and support personnel working on topics including oil and gas, uranium, astrogeology, paleontology, regional geology, geophysics, and, of course, mineral deposits. He initiated a program of environmental geology within the USGS. This charge was extended until 1971 when, following the USGS traditional practice of recycling scientists into

and out of administrative assignments, he returned to Menlo Park to pick up the trail of those ancient rocks in southwestern Montana. In 1974 he retired but retained an official affiliation with the USGS as Research Geologist until 1996, continuing work in Montana and remaining involved in national and international professional affairs. He and Ruth moved to Port Townsend, Washington. After Ruth died in 1989 he moved to Bellingham and continued to contribute to the earth science literature until the mid 1990s.

Harold James was active in scientific and professional organizations serving as: Councilor of the Mineralogical Society of America (1964–1966); Councilor (1959–1962) and Associate Editor of the *Bulletin* (1964–1966) of the Geological Society of America; Member (1967–1984) and Chairman (1976–1984) of the Subcommittee on Precambrian Stratigraphy of the International Union of Geological Sciences; National Program Chairman (1961–1962), Councilor (1962–1965), and President (1970–1971) of the Society of Economic Geologists which honored him with its Penrose Medal in 1976; and Associate Editor, *Precambrian Research* (1973–1992). He was Chairman of the Governor's Advisory Committee on the Minnesota Geological Survey (1961–1963). He served as Chairman of the Section of Geology in the National Academy of Sciences (1969–1972) and served on the Report Review Committee (1984–1991), National Committee on Geology (1969–1971), Commission on Natural Resources (1973–1978), Board on Mineral and Energy Resources (1977–1979) and Board on Radioactive Waste Management (1978–1982). The Department of the Interior awarded him its Distinguished Service Award in 1966. He was a member of Phi Beta Kappa, Sigma Xi, Phi Kappa Phi, and Sigma Gamma Epsilon.

We remember Hal for his penetrating questioning, contagious smile, ready humorous quips, and compassion for his associates; and although most of us were accustomed to seeing his uneven gait, a consequence of combining youthful exuberance with a toboggan and a precipitous hill, it scarcely slowed him. He died by his own hand April 2, 2000, at Ruth's gravesite in Bellingham.

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