Memorial to Julian Royce Goldsmith
1918–1999

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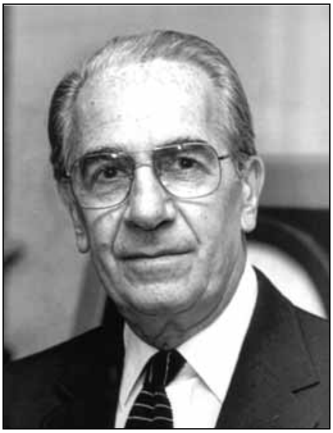

Julian R. Goldsmith died January 23, 1999, after a long struggle with leukemia. His career spanned the formative period of modern experimental geochemistry, of which he was an important developer. He left to his science a rich legacy of contributions. To his associates he left treasured memories of practical advice, pungent anecdotes, and human kindness.

Julian's father, Mitchel Goldsmith, was born in Oklahoma Territory and went to Chicago as a young man, where he met and married Julian's mother, Cecilia Kallis, and established himself in the paint-manufacturing business. One of Julian's memorable anecdotes reveals the uncompromising decency of the Goldsmith family tradition. Once Al Capone, the Prohibition Era mobster, entered the paint and varnish factory in Cicero, Illinois, on a neighborhood organizing mission. The furious elder Goldsmith abruptly ushered the nonplussed gangster to the door. Capone never bothered Mitchel Goldsmith again. Mitchel died in his mid-50s of heart failure, a fate that might well have befallen Julian but for advances in medical knowledge and Julian's remarkable self-discipline at a crucial stage in his life.

Julian's only academic association was with the University of Chicago. He and Ethel Frank met there as undergraduates and were married shortly after graduation in 1940. Julian's graduate studies at Chicago were interrupted by World War II, when he was summoned to defense research at the Corning Glass Works in New York. Two of the Goldsmith's three children, Richard and Susan, were born there. The Goldsmiths returned to Chicago after the war, and Julian completed his Ph.D. work in 1947. In 1947, Julian became a research associate at the University of Chicago, in 1951, an assistant professor, in 1955, an associate professor, in 1958, a full professor, in 1969, a distinguished service professor, and in 1990, an emeritus professor.

Julian's Ph.D. thesis advisor was Norman L. Bowen: it was from the most influential petrologist of the 20th century that Julian learned experimental work. Julian liked to reminisce about their camaraderie. Once, he dropped a petrology course that he had signed up for under Bowen. When the latter was handed a notice from the departmental office saying "Drop Julian," Bowen, an extraordinarily strong man, came up quietly behind Julian in the lab, lifted him well off the floor, and dropped him. Many reminiscences of the Bowen era and later times are recorded in Julian's article "Some Chicago Georecollections" (*Annual Reviews of Earth and Planetary Science*, 1991, v. 19, p. 1–16).

The laboratory that Julian inherited in 1947 upon Bowen's departure from Chicago was a simple one, consisting of a few open-air high-temperature ovens. In the late 1940s and early 1950s, Julian added several externally heated hydrothermal pressure vessels of the newly developed "cold-seal" design. An X-ray diffractometer greatly expanded his analytical capability beyond the polarizing microscope techniques used by earlier experimentalists. By 1950, Julian had built a reputable experimental laboratory on the third floor of Rosenwald Hall, the old geology building.

Julian was instrumental in bringing Fritz Laves to Chicago from Germany in 1948. Laves was an eminent X-ray crystallographer widely known for his work on intermetallic compounds. Goldsmith and Laves combined their talents to produce some of the most notable contributions to experimental mineralogy of the 1950s. This work centered around silicon-aluminum order-disorder relations in feldspars, including pioneering work on experimental thermal disordering of well-ordered natural potassium feldspar, or microcline. They developed important X-ray diffraction methods of characterizing the degree of atomic ordering in alkali feldspars. Their work revealed the multifarious complexity of natural feldspars. As Julian put it, in his inimitable way, "Every little feldspar has a story of its own."

In 1954, Fritz Laves left Chicago to become head professor at ETH in Zurich. By this time the University of Chicago had a secure place in the world of experimental mineralogy: Julian was awarded the Mineralogical Society of America Award in 1955 for important early-career achievements. Meanwhile, the Goldsmiths had added son John to their family, and had moved into the University of Chicago neighborhood a few blocks from the campus.

Julian next turned his attention to experimental phase equilibrium relations in the rhombohedral carbonates. This work was carried out over several years with numerous colleagues and students, notably Don Graf, Al Gaines, and Hugh Heard. Their work continues to be used as a primary reference in the study of carbonate minerals. The complex relations between solid solution and cation order-disorder that they discovered added much to the conceptual framework of mineralogy.

In the 1960s, Julian's energies were diverted increasingly to administration and consultation, as associate dean of the Physical Sciences Division at Chicago, president of the Geochemical Society (1965), board member of the National Science Foundation (1964–1970), and chairman of the Chicago Department of the Geophysical Sciences (1963–1971), formed in 1961 from a merger of the old geology and meteorology departments. The department embodied a daring new concept, in which the fluid-earth and solid-earth sciences were combined into an integrated unit. The ultimate success of this venture is evidenced by the number of major academic departments in this country that subsequently made the same reorganization. Mainly through Julian's initiative, NSF provided substantial funding for a new building, the Henry Hinds Laboratory, which was completed in 1968. Julian, more than any other person, was the prime architect of the Department of the Geophysical Sciences. He was named the Charles E. Merriam Distinguished Service Professor in 1969.

The enormous task of building an academic department finally started to take its toll on Julian's health. A few years after the move into the new building, Julian stepped down as chairman and returned full-time to research and teaching. At the same time, he embarked on a fitness regimen that won the admiration of his colleagues. He lost 30 pounds and 60 mm of systolic pressure, and he began to exercise regularly. His energy and enthusiasm for research were inspirational for the entire department. During the late 1960s and the 1970s, Julian and I worked together on the calcite-dolomite solvus (published in 1969), the alkali feldspar solvus (1974), and a series of papers on that hybrid feldspar-carbonate mineral family, the scapolites (1975–1977). During this productive period, Julian found time to serve as president of the Mineralogical Society of America (1971) and the Geological Society of America (1975). I joked to Julian, who was a lifelong fan of the Chicago Cubs, that his election to three society presidencies was like winning the coveted batting "triple crown" of baseball. He quipped that he ended up being elected president of everything he ever joined, starting with his model airplane club in high school.

Julian's career-long ambition was to produce some definitive information on silicon-aluminum order-disorder relations in the feldspars. Goldsmith and Laves had found out a lot about how to disorder natural well-ordered low-structural-state feldspars, and subsequent workers had succeeded in synthesizing low albite (sodium feldspar), but no one had come close to demonstrating reversible order-disorder relations of the feldspars over a range of temperatures. In the early 1980s, Julian found, more or less accidentally, that he could experimentally disorder and reorder albite at pressures above 10 kilobars, and at temperatures of only 700–900 degrees C, without any added mineral fluxes. His first announcement of this astounding finding was greeted with skepticism by his colleagues (including me), because of the notorious slowness of the disordering process even at much higher temperatures, and the seeming impossibility of reordering at low temperatures. Julian eventually found that the mysterious reaction-enhancing agency was not merely high pressure, but hydrogen, which was liberated from adsorbed water in the NaCl pressure medium by reaction with the graphite heater sleeve in his apparatus. The hydrogen was converted to the hyperactive monatomic state by passage through the platinum sample container. For some reason, the effectiveness of the monatomic hydrogen flux is exponentially dependent on pressure.

This discovery was a dream come true for Julian. He spent the rest of his career exploiting it, with some remarkable results. In the mid-1980s, he and Dave Jenkins produced the first reversed thermal order-disorder curve for albite and definitive hydrous melting pressure-temperature relations for both high and low albite. Julian and Bob Clayton succeeded in experimentally measuring equilibrium oxygen isotope partitioning among many major minerals at high temperatures and pressures; they carried out their important work in this most basic geochemical tracer and thermometer system with the collaboration of several postdoctoral associates, including Alan Mathews, Yukihiro Matsuhisa, and Tom Chacko. In the late 1980s, Julian carried on alone, pursuing his dream of synthesizing, for the first time, microcline, or ordered potassium feldspar. He found out that he could disorder natural microcline at much lower temperatures than attained by Goldsmith and Laves, and succeeded in making intermediate ordering states in K-feldspar, but he was never able to synthesize a well-ordered microcline. After years of unsuccessful efforts, he concluded ruefully, but with characteristic humor, that "Man was not meant to make microcline."

An inspiring aspect of Julian's career is that he produced much of his most important work after the age of 60, when most scientists are contemplating retirement. He was awarded the Hess Medal by the American Geophysical Union in 1987 and the Roebling Medal, the Mineralogical Society of America's highest award, in 1988, in recognition not only of his brilliant earlier achievements, but also of his ongoing contributions. Julian retired officially in 1990, but continued full-time research under NSF sponsorship.

Chronic leukemia eventually put an end to Julian's research. He had suffered from this malady for years, but he rarely mentioned it, and it didn't seem to affect his awesome zest for research, or his roguish and unquenchable humor, which was always the great leavening agent in our lab. His mere presence in the department as an emeritus professor was a stabilizing factor during difficult periods, so great was the esteem his colleagues had for him. When he stopped coming in to work in the mid-90s, the department realized a major loss.

A memorial service for Julian Goldsmith was held February 27, 1999, in the Bond Chapel at the University of Chicago for a standing-room-only group of his family, friends, and colleagues. On the first anniversary of his death, Julian's and Ethel's family, now including six grandchildren, placed portions of his ashes in and around the university and in the beautiful woods of his beloved Indiana Dunes.

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