

Memorial to Charles Milton

1896–1990

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Charles Milton, a Fellow of the Geological Society of America, died on October 4, 1990, at the age of 94. Charles was born in New York City on April 25, 1896, the son of an immigrant woodcarver from the Jewish pale of Czarist Poland. In his infancy the family moved to London; they eventually settled in Chicago.

After some years of odd jobs, wandering around the country as a hobo, and brief attendance at various colleges and universities, an elementary mineralogy correspondence course from the University of Chicago that he enrolled in stimulated and excited him in the subject that was to become his lifelong love and vocation. He enrolled in the University of Illinois, where he worked under W. S. Bayley. Although almost all of his training in geology and mineralogy was at Illinois, he never fulfilled the requirements to obtain a degree. He received his bachelor's degree from the University of Iowa in 1922 after a field course and a semester of residency.

During these years he continued his hobo travels as “blind baggage” on passenger or express trains, in preference to freight trains. It was during this period that he often traveled to famous mineral localities such as Magnet Cove, Arkansas, an area and state to which he subsequently devoted much time studying.

In 1926 he abandoned academic life and worked for Sun Oil and Dutch Shell as an exploration geologist prospecting for oil in the jungles of Venezuela. Returning to the United States, he enrolled in Johns Hopkins University where he received his Ph.D. degree in 1929. During and after this time he worked for Sinclair Oil Company in New York City and in Angola. Returning from Africa, in time for the stock market crash of 1929, Charlie worked for Johns Hopkins University and consulted for the Bethlehem Steel Company on open hearth slag. In 1931 he accepted the position of junior mineralogist with the U.S. Geological Survey in Washington, D.C. He was employed by the USGS until his mandatory retirement in 1965.

Then he moved to the Department of Geology at George Washington University, Washington, D.C., as a research professor until the formal appointment ended in 1974. He continued to work at the university as the self-styled “quondam research professor” until the mid-1980s. After that he maintained an office and laboratory at the USGS in Reston, Virginia, and frequently worked there with colleagues until a fall in late 1989 left him bedridden.

With the Survey, he was to a large extent an expert consultant, working on mineralogical and petrographical problems brought in by more field-oriented Survey geologists. While most of the tasks resulted in internal reports, perhaps only briefly referenced in publication, Charles never considered a job finished until a scientifically satisfactory conclusion was reached. Samples submitted by the public exercising their right as taxpayers to seek help and information from the government came to him during most of his career, and while a sight identification and



reply sufficed for the great majority, even with these he was not satisfied until an identification was certain. A set of black pebbles from a British Guiana river bed, brought in by a man primarily interested in importing tropical fish, started an investigation that culminated after some 24 years in a USGS Professional Paper unraveling the complex mineralogy of chromium oxide and hydrated oxides and demonstrating that merumite was a complex mixture of six or more phases, including four new minerals.

His publication record of more than 160 articles, most coauthored with more than 65 different persons, attests not only to his versatility in geologic research but also to his ability to work successfully on research teams. Charles conducted geological and mineralogical research on a diversity of subjects from many sources worldwide, including one of the first descriptions of the volcanic rocks from Paricutin, Mexico; ore deposit studies at Silver Mine, Missouri, Potosi, Bolivia, the Comstock Lode, Nevada, and the Mackinaw Mine, Washington; and a study of the problems of cleaning a granite-faced building.

In the later half of his career, his research was focused in two areas, the Green River Formation in Utah, Colorado, and Wyoming, and the alkalic rocks of Arkansas. The Eocene Green River Formation, although lacustrine in origin, is unique in having unusual authigenic mineral species. Charles documented many species from this environment, some previously known to form only in igneous or metamorphic settings and some entirely new. With the late Hans P. Eugster of Johns Hopkins University, he modeled the physical-chemical conditions extant during mineral formation.

Although primarily a laboratory scientist, Charles enjoyed travel and field work, and he made many trips to such favorite areas as the Green River, Arkansas, and British Guiana, and one notable excursion to collect the "natrocarbonatite" lavas of Oldoinyo Lengai, Tanzania. Partly as relaxation from the pressure of war-related work during World War II, Charles, together with Allan P. Bennison, did some of the first detailed bedrock geologic mapping of quadrangles in northern Virginia, including the future site of the U.S. Geological Survey headquarters in Reston. At a time when basement samples usually signified little more than the failure of an oil company's wildcat well, he realized their geologic importance. He obtained and studied samples of all available basement cores and chips from Florida and the Georgia coastal plain; his findings were published by the respective state surveys.

From his initial visit to Arkansas before receiving his bachelor's degree he developed a lifelong interest in its mineralogy and petrology, particularly at Magnet Cove. His initial contribution was his description of the zirconium garnet, kimzeyite, and he continued to investigate the mineralogy of Magnet Cove until his death. He initiated the critical compilation of the mineralogy of the entire state; it was completed by J. M. Howard of the Arkansas Geological Commission and published in 1987 as State Bulletin 23, with a dedication to Charles Milton.

Throughout his career, Charles had a proclivity and an enthusiasm for the study and description of new mineral species. He collaborated in the description and naming of 21 new minerals. Many of the names he used were those of respected and admired friends and associates such as Robert Garrels, Frank Grimaldi, Vincent McKelvey, William Pecora, Edward Dwornik, John Straczek, and Philip Abelson. Although he enjoyed the detective work involved in the description of a new mineral, he also was equally enthusiastic about discrediting mineral species, and he discredited ten. To this end, Charlie was deeply involved in the investigation of moissanite (SiC) and the question of its legitimacy as a mineral. He published on this subject for more than 50 years. Only recently has moissanite (or some polymorph of SiC) been found as a solid inclusion in diamond.

Charles was awarded the Distinguished Service Award, the Department of the Interior's highest honor. He was a Fellow of the Geological Society of America, a life Fellow of the Mineralogical Society of America, and a member of the American Association for the Advancement

of Science, Society of Economic Geologists, Geological Society of Washington, Mineralogical Association of Canada, Philosophical Society of Washington, and Washington Academy of Sciences. He served on the councils of the Geological Society of Washington and the Mineralogical Society of America.

In 1932 he married Leona Kohn and settled in a large house, surrounded by a hardwood forest in Forest Glen, Maryland, in what was then the far country suburbs of Washington, D.C. There they raised two sons, Daniel and Michael, who became a geologist and lawyer, respectively. Leona worked as a librarian at Walter Reed Medical Center. She was also a talented artist and her work was displayed in their house and his office. Leona died in 1986, but Charlie continued to live on Beechbank Road, going to the Survey once or twice a week. Never too old to try something new, Charlie, at the age of 90, purchased a home computer and learned to use it.

SELECTED BIBLIOGRAPHY OF C. MILTON

- 1929 (with Singewald, J. T., Jr.) Greisen and associated mineralization at Silver Mine, Mo.: *Economic Geology*, v. 24, p. 569–591.
- 1930 (with Singewald, J. T., Jr.) An alnoite pipe, its contact phenomena and ore deposition near Avon, Mo.: *Journal of Geology*, v. 38, p. 54–66.
- 1931 (with Ohrenschall, R. D.) The occurrence of moissanite (silicon carbide) in sediments: *Journal of Sedimentary Petrology*, v. 1, p. 96–99.
- 1935 Jarosite in tuff from Potosi, Bolivia: *American Mineralogist*, v. 20, p. 176–178.
- 1938 (with Johnston, W. D., Jr.) Sulphate minerals from the Comstock Lode, Nevada: *Economic Geology*, v. 33, p. 749–771.
- 1939 Metamorphism of a granitic dike at Franklin, New Jersey: *Journal of Geology*, v. 47, p. 161–175.
- 1944 Notes on volcanic rocks from Paricutin, Mexico: *American Geophysical Union Transactions*, 25th Annual Meeting, Part 4, p. 618–621.
- 1952 *Igneous petrology of Sussex Co., N.J. (guidebook)*: Trenton, New Jersey Department of Conservation and Economic Development, 28 p.
- 1953 (with Eckel, E. B.) Reconnaissance of superficial phosphate deposit near Minas, Uruguay: *Economic Geology*, v. 48, p. 437–446.
- 1955 (and Conant, L. C., and Swanson, V. E.) Sub-Chattanooga residuum in Tennessee and Kentucky: *Geological Society of America Bulletin*, v. 66, p. 805–810.
- 1958 (with Boucot, A. J., MacDonald, G.J.F., and Thompson, J. B., Jr.) Metamorphosed middle Paleozoic fossils from central Massachusetts, eastern Vermont, and western New Hampshire: *Geological Society of America Bulletin*, v. 69, p. 856–870.
- (with Milton, D. J.) Nickel-gold ore of the Mackinaw Mine, Snohomish County, Washington: *Economic Geology*, v. 53, p. 426–447.
- 1959 (and Eugster, H. P.) Mineral assemblages of the Green River Formation, in Abelson, P. H., ed., *Researches in geochemistry*: New York, John Wiley & Sons, p. 118–150.
- 1960 (and Chao, E.C.T., Axelrod, J. M., and Grimaldi, F. S.) Reedmergnerite, NaBSi_3O_8 , the boron analogue of albite from the Green River Formation: *American Mineralogist*, v. 45, p. 188–189.
- (and Fahey, J. J.) Classification and association of the carbonate minerals of the Green River Formation: *American Journal of Science*, v. 258-A, p. 242–246.
- 1965 (and Hurst, V. J.) Subsurface “basement” rocks of Georgia: *Geological Survey of Georgia Bulletin* 76, 56 p.
- 1966 (with Smith, J. W.) Dawsonite in the Green River Formation of Colorado: *Economic Geology*, v. 61, p. 1029–1042.

- 1968 The "natro-carbonatite" lava of Oldoinyo Lengai, Tanzania: Geological Society of America Annual Meeting Program, p. 202.
- 1969 (and Grasty, R.) "Basement" rocks of Florida and Georgia: American Association of Petroleum Geologists Bulletin, v. 53, p. 2483–2493.
- 1972 Igneous and metamorphic basement rocks of Florida: Florida Bureau of Geology Geological Bulletin No. 55, 125 p.
- (with Eisenberg, K. S.) Case history of a structural-granite cleaning problem: First International Symposium on Deterioration of Building Stones, LaRochelle, France, Proceedings.
- 1976 (and Dwornik, E. J., Finkelman, R. B., and Toulmin, P., III) Slag from an ancient copper smelter at Timna, Israel: Journal of the History of Metallurgy Society, v. 10, p. 24–32.
- (with Stone, C. G.) Lithium mineralization in Arkansas: U.S. Geological Survey Professional Paper 1005, p. 137–142.
- (and Appleman, D. E., Appleman M. H., Chao, E.C.T., Cuttitta, F., Dinnin, J. I., Dwornik, E. J., Ingram, B. L., and Rose, H. J., Jr.) Merumite: A complex assemblage of chromium minerals: U.S. Geological Survey Professional Paper 887, 29 p.
- 1978 (and Dwornik, E. J., Estep-Barnes, P. A., Finkelman, R. B., Pabst, A., and Palmer, S.) Abelsonite, nickel porphyrin, a new mineral from the Green River Formation, Utah: American Mineralogist, v. 63, p. 930–937.
- 1984 (and Vitaliano, D. B.) The non-existence of moissanite: International Geological Congress, 27th, Moscow, Proceedings, pt. 5, sec. 10, p. 107–108.
- 1987 (with Appleman, D. E., Evans, H. T., Jr., Nord, G. L., and Dwornik, E. J.) Delindeite and lourenswalsite, two new titanosilicates from the Magnet Cove Region, Arkansas: Mineralogical Magazine, v. 51, p. 417–425.
- 1989 Oldoinyo Lengai natrocarbonatite lava: Its history: International Geological Congress, 28th, Washington, D.C., Abstracts, v. 2, p. 441.