

Obituary

Clifford Frondel 1907–2002



Clifford Frondel, prominent descriptive mineralogist, died peacefully in Winchester, Massachusetts on 12 November 2002 at age 95. Frondel was born in New York City and grew up on Long Island. He earned a degree in geological engineering from Colorado School of Mines in 1929, a Master's degree from Columbia University in 1936 and a PhD from Massachusetts Institute of Technology in 1939, under Martin J. Burger.

Frondel became a research associate of Harvard Professor Charles Palache who was engaged in the monumental revision of *Dana's System of Mineralogy*. Frondel was a prodigious worker who described 48 new species in the course of his long career. His extensive bibliography demonstrates the remarkably wide breadth of his interests, necessitated in part by his 'Dana' work. The seventh edition of *The System of Mineralogy* appeared in three volumes in 1944, 1951 and 1962. Although the junior author, Frondel wrote most of volume II and all of volume III by himself!

Frondel served as a civilian Senior Physicist in the Signal Corps of the War Department and Director of Research at Reeves Sound Laboratories in New York during World War II providing technical assistance for the quartz oscillator-plate industry. Quartz became a favorite subject to which he returned with the silica volume of *The System of Mineralogy* and in his final research papers on chalcedony and agates.

Frondel was appointed to the Harvard faculty in 1946 and retired in 1977. He published more than a dozen individual papers in uranium mineralogy. This research program culminated in publication of US Geological Survey Bulletin 1064, *Systematic Mineralogy of Uranium and Thorium*, a 400-page volume that is the basis of our modern understanding of radioactive minerals.

Frondel and coworkers notably advanced our understanding of Franklin, New Jersey especially poorly crystallized minerals such as the manganese oxides and the unglamorous rock-forming silicates. His book *The Minerals of Franklin and*

Sterling Hill – A Checklist published in 1972 is a benchmark in the study of that extraordinary mineral deposit.

In addition to his teaching of undergraduate and graduate students, which was a constant responsibility, Frondel served as Curator of Harvard's Mineralogical Museum for 32 years. He enriched the museum's collections enormously. The A.C. Burrage bequest with its fabulous gold specimens and beautiful Bisbee azurites and malachites was his most notable acquisition. However, most of his purchases of individual specimens and entire collections were clearly intended to support research. His most important museological legacy is the strong tradition of using the Harvard mineral collection for scientific research,

even to the extent of sacrificing rare and valuable specimens to destructive analysis.

Fronde! received many honours during his long life, notably the Becke Medal from the Austrian Mineralogical Society and the Roebling Medal of the Mineralogical Society of America. He is one of the very few for whom two mineral species have been named! Frondelite, the manganese analogue of rockbridgeite, named in 1949 by U.S. Geological Survey colleague Marie Lindberg recognizes his studies of pegmatite phosphates, and cliffordite, a uranium tellurite, named in 1969 by former graduate student Richard Gaines recognizes his studies of uranium mineralogy. His achievements have been an inspiration to many.

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