

Foreword

This issue of *The American Mineralogist* is dedicated to Professors Clifford Frondel and Cornelius S. Hurlbut, Jr., who have recently retired from the Department of Geological Sciences, Harvard University. Both men have played a pivotal role in mineralogy, through textbooks and monographs and through extensive original studies spanning the entire mineral kingdom. In a way, they mark the end of a renaissance period in descriptive and determinative mineralogy and both were involved with the vast outpouring of new information in mineralogical science. They continued and extended the developments of mineralogy of their immediate predecessors Professors Charles Palache and Harry Berman.

Colleagues, former students, coworkers, and scientists who worked on allied problems have submitted papers to this issue. The response was most gratifying and is yet another testament to the dynamism of these two men.

Cliff and Connie have been deeply involved in teaching mineralogy, X-ray and optical crystallography, and crystal chemistry, and have contributed mightily to the major textbooks and compendia in the science. Cliff joined with Palache and Berman in Vol. 1 of the Seventh Edition of Dana's System, contributed heavily to Vol. 2, and was sole author of Vol. 3 on the silica minerals. His interest in silica can be traced back to his work on quartz oscillator plates during World War II and continues to this day in his research on silica fibers, chalcedonies, and the preparation of new forms of silica through treatment of layer silicates by leaching of the large cations, recrystallization, and X-ray diffraction analysis of the products. Connie produced the extensively rewritten Dana's Manual of Mineralogy with Edition 15 in 1941, then a new edition about every ten years. The 19th Edition was further extended with much new material in crystal chemistry, jointly with Cornelis Klein, who at one time was a Research Associate with Cliff at Harvard. A decade ago, Connie produced *Minerals and Man*, a popular book geared to those interested in naturalism in the inorganic world, very sensitively arranged and written.

Cliff and Connie to this day maintain a deep interest in the aesthetics of minerals. They regularly attend the annual Tucson Gem and Mineral Show and display exquisite cabinets of superb specimens from the Mineralogical Museum at Harvard. Always in great demand by the admiring amateur community, they extend "the classroom to the world" and deliver numerous lectures to clubs, small and large. Both count among their friends amateurs as well as professionals, and keep in contact with major dealers of specimens, advising them and purchasing fine specimens for the Harvard Museum. In an age where specialization plays an ever-growing role, how admirable that these busy men continue the glorious traditions of the past which led to the great museum collections we all adore!

Both Cliff and Connie have minerals named in their honor. Frondelite, a basic manganous ferric phosphate, acknowledges his work on this perplexing group of accessory minerals from pegmatites; he was further honored by cliffordite, a uranium tellurite, acknowledging his extensive work on the systematology of the uranium and thorium minerals, which was communicated in a large series of papers in the Fifties and culminated in the *U.S. Geological Survey Bulletin 1064* in 1958. Hurlbutite, an anhydrous phosphate of calcium and beryllium and an important structure type, was found at the type locality in New Hampshire in large crystals deceptively resembling feldspars but without cleavage. Both men named many new minerals, spanning a host of families, with representatives among phosphates, uranyl salts, and minerals of the unique Franklin-Sterling Hill ore deposits in Sussex County, New Jersey. Connie's interests have turned more recently to the borate minerals, and he, jointly with Lorenzo Aristarain, has contributed to the descriptive mineralogy of several new species, and visited playa deposits in the United States and Argentina. Cliff first described whitlockite, an acid calcium phosphate related to apatite in structure, found as relatively large crystals from the type locality at the Palermo Mine, North Groton, New Hampshire, one of his favorite haunts. He subsequently found it as a constituent in certain phosphorite deposits, purging the literature of incompletely characterized synonyms in the process. This mineral is closely related to an important phase in urinary calculi, which were carefully scrutinized by him and Dr. Prien in a detailed account of the crystal chemistry and determinative techniques in a classic work in the field published thirty years ago. Perhaps his

most amusing sleuthing was in a short paper in 1962 where type native tantalum was shown to be not the element but tantalum carbide, TaC!

The contributions in this issue span a wide range of topics, since Cliff's and Connie's contributions have covered a lot of ground and scarcely a mineral family is untouched. Including piezoelectric crystals, studies on sulfosalts, the quartz minerals, synthesis of complex silicates, geochemistry of germanium and scandium, polytypism of zinc sulfide, the uranium minerals, phosphates, arsenates, tellurites, borates, pegmatites, and Franklin, New Jersey, scarcely a stone is left unturned. It is indeed an honor and privilege to dedicate this issue to two great men.

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