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# A FAREWELL TO OBSOLETE PYROXENES


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*"The names of 105 pyroxenes or altered pyroxenes have been formally discarded by the CNMMN and are therefore obsolete."*

Morimoto et al. (1988)

A part of my past is gone: jeffersonite, bronzite, ureyite, and fassaite are no longer mineral species.

The Subcommittee on Pyroxenes (Morimoto et al, 1988), under the authority of the International Mineralogical Association's Commission on New Minerals and Mineral Names (CNMMN), has brought order to the chaos of pyroxene nomenclature. Of 125 historic pyroxene names only 20 remain. Old friends enstatite, diopside, and augite are safe. Jadeite, pigeonite, and spodumene survived, along with recently-coined esseneite, jervisite, and petedunnite. But more than 100 names are banished - officially obsolete.

We needed the taxonomic housecleaning, yet I can't help feeling a bit sad. Mineral names, like those of old friends, can trigger vivid memories of faces and places. Certain species' names evoke images of a day 20 or 30 years ago - images as sharp and clear as a black-and-white photograph.

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I was no more than ten years old when I unearthed my first specimen of jeffersonite, now prosaically denoted "zincian manganoan diopside." My passion for minerals began in the late 1950s when my family moved to Ridgewood in northern New Jersey. I had always collected something - stamps or bottle caps or baseball cards - but the minerals of north Jersey were special. So many beautiful species, every specimen unique, just waiting to be found. And of all the New Jersey localities Franklin was the best.

My Dad and I made the hour drive two or three times a year. We'd leave in early afternoon and collect for a few daylight hours at the dump. Dinner at a local cafe occupied the twilight hours, and then back to the dump for a light show. Dad used his electrical engineering skills to perfect a powerful, compact ultraviolet light. We'd punish the trunk of our '55 Buick with blocks and boulders of calçite and willemite for indoor display and an outside fluorescent rock garden. The journey home was always a wild affair, with our exhaust pipe periodically scraping bottom and headlights pointed crazily up, blinding oncoming drivers on the winding Sussex County roads.

My collection of Franklin species included several matrix-bound coarse black crystals of jeffersonite, the rare zinc- and manganese-bearing pyroxene and one of the first all-American minerals. Discovered by Philadelphia mineralogists Lardner Vanuxem and William Keating (1822), it was named for the great aging statesman and devoted amateur naturalist, Thomas Jefferson. I thought it wonderful that a locality so close to home should have its own historic and rare - even unique - minerals. I treasured my small chunks of franklinite, willemite, zincite, and jeffersonite.

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Wilfred Welsh introduced me to bronzite, the distinctive bronzy-lustered pyroxene variety now renamed "ferroan enstatite." I was an eighth grader at Benjamin Franklin Junior High School when Bill became my science teacher. Our classroon, with its massive black benches and wooden cabinets filled with chemicals, glassware, and other educational paraphernalia, might have been a typical all-purpose lab. But Bill transformed that room into something extraordinary by filling all the glass display cases on the right side of the room with fine mineral specimens from his magnificent private collection.

Seeing my unabashed interest in his treasures, Bill Welsh soon took me under his guidance, helping to focus my undisciplined collecting enthusiasm into a more analytical study of rocks and minerals. He recommended books and periodicals, directed me to nearby collecting localities and museums, and welcomed me into his home to study his collection (and enjoy Mary's cooking). And over the course of that pivotal year Bill Welsh gave me more than 100 fine specimens that he had collected himself: chabazite and heulandite from Nova Scotia, galena and chalcopyrite from Joplin, beryl and tourmaline from Maine. And there was a chunk of bronzite, I forget from where. It was by no means a great display piece, neither colorful nor euhedral. But the specimen had character - an honest, sturdy rock-forming mineral with a strong, purposeful name. Bill Welsh taught me the importance of the everyday minerals that form our planet, so when I think of bronzite I remember Bill.

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The late Dave Wones, my freshman geology professor at MIT, dispelled any doubts I might have had about mineralogy as a career. What a teacher! Always animated and enthusiastic, strict and demanding but fair, he captivated us with stories of the genesis of different minerals, the atomic origins of distinctive mineral properties, and the then incomprehensible power of the earth to transform one mineral into another by squeezing and baking. I was hooked.

Dave emphasized rock-forming minerals: blue-collar phases like feldspars, micas, amphiboles, and pyroxenes that do most of the geological work. We had to memorize the names and formulas of dozens of species. They were, he assured us, the essential vocabulary of the working mineralogist. As if to emphasize the dynamic nature of that vocabulary Dave one day came to class with the story of an exciting discovery - a new pyroxene had been found as an accessory mineral in iron meteorites. Clifford Frondel and Cornelis Klein (1965), two mineralogists working just up the Charles River at Harvard, had made the find. The new pyroxene, named ureyite in honor of the Nobel Laureate Harold Clayton Urey, possessed a striking emerald green color and a distinctive composition rich in sodium and chromium. Dave Wones made his class feel part of the ureyite discovery; mineralogy was no static thing when presented by such a man. To me ureyite epitomized that excitment.

The name ureyite didn't last long. Frondel and Klein acknowledged that the new species was in some respects similar to the mineral kosmochlor, a meteoritic phase incompletely described seventy years earlier. The authors argued (and at the time CNMMN agreed) that kosmochlor was poorly named and, at best, a fortuitous match with the distinctive chromium pyroxene. Ureyite was approved. Unfortunately for Harold Urey, the CNMMN has now changed its mind: ureyite is out and kosmochlor is in.

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My first real job as a mineralogist began in 1976 when I came to the Geophysical Laboratory. I planned to work on high-pressure minerals as a postdoctoral fellow with staff crystallographer Larry Finger. Larry is a whiz at working with computers and designing automated experiments and for two decades he has applied his expertise to intriguing geological puzzles. I thought myself well trained in mineralogy, but in our first joint study, completed just a few months after my arrival, Larry taught me things about minerals I had never even imagined. He showed me how a few single mineral grains might reveal the existence of ancient cataclysms that altered the entire solar system. The object of his lesson was the rare pyroxene fassaite (now called ferrian aluminian diopside), the major mineral component of the Angra dos Reis meteorite.

Pyroxenes have a memory. The everyday elements magnesium and iron can reside in either one of two different pyroxene structural sites, denoted M1 or M2. Given sufficient time and suitable temperture history, the magnesium atoms will favor M1 while iron will concentrate in M2. Such "ordered" pyroxenes are usually found in slowly-cooled rocks. But at high temperatures - above 1000 degrees C - the iron and magnesium atoms won't settle down; they fill both M1 and M2 in a random pattern. Rapid-chilling may "freeze in" this disordered arrangement. X-ray diffraction experiments, if carefully performed, can locate magnesium and iron atoms, and thus provide a clue about pyroxene cooling history. By studying Angra dos Reis fassaite Larry and I hoped to deduce if the meteorite was once hot and, if so, how quickly it had cooled.

Larry worked his crystallographic magic on a microscopic fassaite chip smaller than a grain of salt. A computer precisely oriented the tiny crystal in an x-ray beam and supervised data collection, a process that took several days. The tens of thousands of numbers that constitute the nuts and bolts of an x-ray experiment were stored on magnetic tape. It took Larry less than one afternoon to analyze those data, and the answer was unambiguous: iron and magnesium were largely disordered. Angra dos Reis fassaite must have come to equilibrium at a temperature in excess of 1000 degrees, typical of the hot interior of a small planet. But the crystal had cooled so rapidly - probably in a matter of hours - that reordering of the elements could not proceed. One possible conclusion (in our minds the most compelling) was that we had found direct evidence for the breakup of a planet that generated the asteroid belt, as well as many of the meteorites that grace museum collections.

That pyroxene specimem was special. One tiny grain brought home the power of mineralogy to reveal the existence and character of entire worlds, as well as their destruction. Special minerals deserve special names, so I will miss fassaite and all the word now conjures for me.

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Mineralogists possess the power to create mineral names - names that honor friends and colleagues, commemorate places and events, and acknowledge distinctive chemical or physical properties. I'm especially delighted with welshite, wonesite, and fingerite - all named for my friends and teachers of the past two decades. It is also fitting that mineralogists should have the means to strike down names that no longer serve a purpose. Science must move on, unswayed be sentiment. But the acts of creation and destruction are not symmetrical. A new name fills a void - something where nothing existed before. A name rendered obsolete, however, does not disappear; it lives on in the collective memories of those who knew it. Though they no longer exist in the lexicon of the mineral sciences, I will remember jeffersonite, bronzite, ureyite, and fassaite, along with those who introduced them to me.

References:


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