

MICHIGAN COPPER!



THE MINERALOGICAL RECORD

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COVER: COPPER, 8 cm,
from the Keweenaw County
fissure veins, Michigan. MIM
Museum collection; ex Wayne
State University collection.
James Elliott photo.

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THE KEWEENAW COUNTY FISSURE MINES

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Copper-bearing “fissure” veins are one of the three primary types of copper deposits (along with conglomerates and amygdaloids) identified in the Lake Superior District. One of the most economically and mineralogically important clusters of these deposits was located in Keweenaw County, Michigan. The four mines discussed in this special issue of the Mineralogical Record are the most important of those. This short article serves as an introduction to the discussion, covering the regional history and geology of this, the world’s most important native copper deposit. Many mineral specimens from the district have lost their provenance and can no longer be attributed to a specific mine. Some of the finest of these are illustrated here.

HISTORY

The articles contained in this issue discuss in detail the four most important copper mines which primarily exploited so-called “fissure vein”-type deposits in what is now Keweenaw County, Michigan. These mines were among the earliest industrial mining efforts in the Lake Superior District. Native American mining, starting as early as 8000 years ago, and French and British attempts in the 1700s, resulted in only trivial copper production by modern standards (Chaput, 1971). Although these mines were only minor producers compared to the massive amygdaloid and conglomerate-hosted lodes to the south which would be developed later, at least two, the Cliff mine and the Central mine, were profitable for a significant part of their history, and their early success brought much-needed capital to the district which allowed for the discovery and development of the major deposits.

As in many new districts, the Keweenaw County deposits also attracted a great deal of speculation that companies took full advantage of. In order to secure funding from investors, companies often exaggerated (or outright lied about) the quality of their deposits. As

a result, misinformation abounds about these old mines, particularly as concerns the earliest part of their histories. While the authors have made their best efforts to make sure that the accounts herein are consistent and as accurate as possible, the reader should keep in mind that some misinformation may have been inadvertently repeated here. In a letter from geologist Jacob Houghton to State Geologist Lucius Hubbard dated July 17, 1897, Houghton describes some of these exaggerated reports in the possession of a Captain Paul (Joseph Paul had been agent of a tiny prospect called the Garden City mine during the 1850s and 60s):

Captain Paul was an excitable, quick speaking Cornishman. One time, in his store near the Cliff mine, I spent an hour or two looking into those volumes [old company reports], and when putting them up on the shelf, I remarked “Captain, those reports are very interesting.” “Pack of lies, pack of lies” retorted the Captain. “Well,” I said, “You wrote a good many of them yourself.” “No difference, no difference, had to lie, had to lie, stockholders wouldn’t pay assessments.”

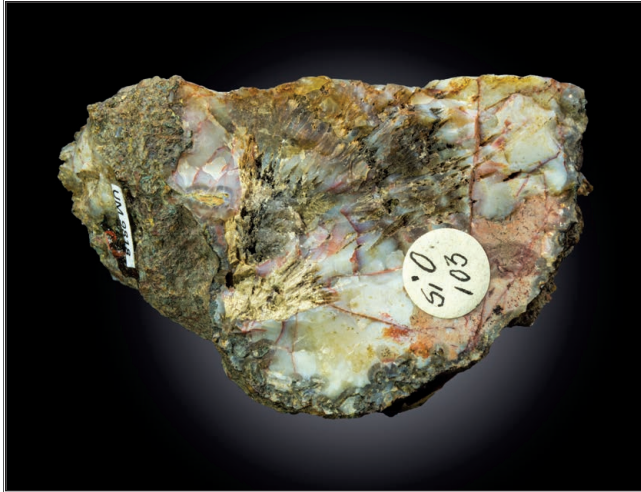


Figure 5. Agate (two views), 5.5 cm, from Agate Harbor, Keweenaw County, Michigan. While not a particularly compelling specimen to look at, this is nonetheless a very important specimen. The paper label on the back states “Agate Har. July 24 '40.” This specimen was one of those collected by Douglass Houghton in 1840 during the expedition that would produce the seminal 1841 report which triggered the first major mining rush in United States history to the Keweenaw Peninsula. University of Michigan collection (now cared for at the A. E. Seaman Mineral Museum under the Michigan Mineral Alliance); Chris Stefano photos.



Figure 6. Copper crystals colored red and black by coatings of cuprite and tenorite, 16.7 cm, from one of the Keweenaw County fissure mines. While this exceptional specimen is clearly from one of the fissure veins based on the matrix and other characteristics, it is not possible to attribute it to a specific mine. Sean Finneson collection; Tom Spann photo.





THE CLIFF MINE

Keweenaw County, Michigan

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The Cliff mine, located at the base of an impressive basalt cliff southwest of Eagle River, Michigan, is one of Michigan's earliest copper mines and the first to turn a profit. The economic success of the Cliff mine drove the spread of copper mining in Upper Michigan as a whole. Fine specimens of copper, silver and other minerals collected by miners dazzled mineralogists who had never seen copper specimens of such quality. Although surviving specimens from the Cliff mine are fewer in number than those from later mines, they hold a special place in collectors' hearts because they were the first.

INTRODUCTION

The Cliff mine was not the first mine in Michigan's Keweenaw Peninsula, but it was the first to turn a profit. Actually, to say that the Cliff turned a profit is a bit of an understatement: it was practically a bonanza, returning more than \$2.5 million in dividends to stockholders on an initial investment of about \$110,000. This fabulous profit margin spurred strong investment in other properties, few of which performed anywhere near as well. Without the success at the Cliff mine, it is likely that mining in the Lake Superior District would have taken far longer to develop.

From a mineralogical standpoint, the Cliff mine, like other vein-type occurrences, had a somewhat different character than most other copper deposits in the region. Unfortunately, relatively few specimens with proper locality attribution have survived, but many of those are of exceptional quality.

Because it was the first success, and because of the fine specimens which it produced, the Cliff mine is the obvious starting point for a detailed look at the history and mineralogy of the Lake Superior District.

LOCATION

The Cliff mine is located in southwestern Keweenaw County, Michigan (which makes up the northern end of the Keweenaw Peninsula) about 6.5 km southwest of Eagle River, Michigan. The mine location is at the base of a picturesque cliff of basalt (the Greenstone flow) which forms a prominent feature across much of Keweenaw County. Today, all buildings at the site are in ruins and have been overgrown by the thick Keweenaw forest; they are not readily visible from Cliff Drive, which passes between the mine site and the town site. The only indication of the presence of a former mine visible from any distance is a large dump pile, which has remained mostly unvegetated (in part because of regular visits by rockhounds and mineral collectors hoping to find a nice copper specimen to take home). The West Branch of the Eagle River crosses the property, but at this distance upstream it is really no more than a creek about a meter wide which can be crossed fairly easily with a good jump.

The climate is cool and temperate, with short, wet summers during which temperatures rarely exceed 90°F, and long, cold winters with exceptionally heavy snowfall. The Cliff site is near



Figure 26. Calcite crystal, 3.2 cm, from the Cliff mine. Originally in the collection of mine captain John Daniell, it was acquired by Clarence Bement in 1873. The specimen spent time in the collection of the American Museum of Natural History and then went to Phil Scalisi. Now in the William Severance collection; Jeff Scovil photo.

Figure 27. Chalcocite crystal on copper, 1.2-mm view, from the Cliff mine. Copper sulfides like chalcocite are exceedingly rare in the Lake Superior District (outside of the White Pine mine), but as this specimen demonstrates, they are not totally unheard of. Bob Nagel collection; John Jaszczak photo.



Figure 29. Copper, twinned crystal on prehnite, 0.8 mm, from the Cliff mine. John Jaszczak collection and photo.



Figure 28. Copper wires with prehnite, 1-cm view, from the Cliff mine. These wires are extremely elongated single crystals of copper. Collected by Marc Wilson on the dumps in 2003. Marc Wilson collection; Debra Wilson photo.

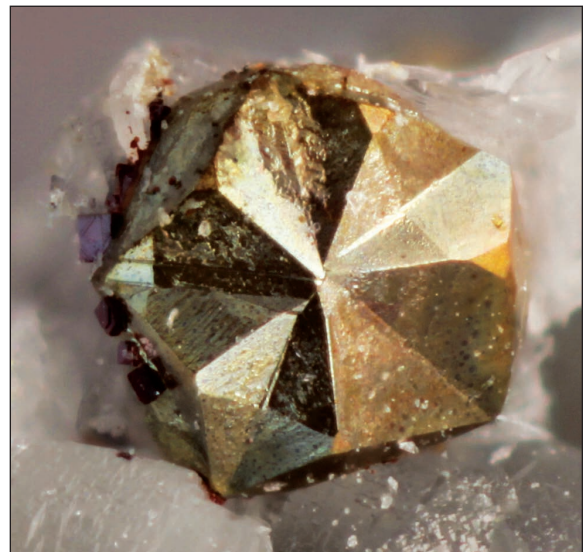


Figure 30. Copper, approximately 20 cm, from the Cliff mine. Yale Peabody Museum collection; Peter Cristofono photo.



Figure 31. Copper crystals, 15 cm, from the Cliff mine. Ex Chicago Field Museum collection. Phil Persson (Persson Rare Minerals) specimen; Annette Slade photo.



Figure 32. Copper cubes, 7 cm, from the Cliff mine. Mike Bergmann collection; Chris Stefano photo.



Figure 33. Copper crystal, 4 cm, from the Cliff mine. Carl Francis collection; Chris Stefano photo.



THE CENTRAL MINE

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Until the development of the Kearsarge Lode in the early 1890s, the Central mine was among the largest and most profitable copper mines in the Lake Superior District, and it played an important role in the development of the region. While best known for its world-class crystallized copper specimens, the Central mine has also produced fine examples of crystallized silver, calcite, datolite and more.

INTRODUCTION

The Central mine, located along the prominent greenstone bluff north of Highway 41 and above the East Branch of the Eagle River in northern Keweenaw County, Michigan, is one of the premier early copper mines of the Lake Superior District. It is well known for its superb and varied crystallized mineral specimens, some produced during its long history of operation and others found later on its extensive dumps. Opened in 1854, the Central mine was the first mine in the Lake Superior District to turn a profit in its first year of operation, and the town that sprang up at the site played a major role in the social and economic development of Keweenaw County. While the Central mine closed in July of 1898, it continued to be a source of superb mineral specimens, particularly crystallized copper, into the 20th and now 21st centuries, as new generations of collectors armed with shovels and metal detectors have taken notable finds from the extensive dumps.

LOCATION

The Central mine is situated on the eastern side of the prominent greenstone bluff that forms the spine of the northern part of the Keweenaw Peninsula, north of Highway 41 and above the East

Branch of the Eagle River. The townsite of Central, located just below and west of the mine workings, can be reached via a short unpaved road which leads north from highway 41 for approximately 500 meters. Other than a few historical signs and restored miners' homes, little remains at the Central mine site to hint at the importance of the mining operation that existed there a century ago.

The climate in this part of the Keweenaw Peninsula is highly influenced by the presence of Lake Superior. Winters are long, cold and snowy (with snow from early October to April), and there are short, cool summers from May to September. Snowfall averages about 610 cm (240 inches) per year, with a record of nearly 10 meters (390 inches) recorded at the nearby townsite of Delaware in 1979 ("Keweenaw Snowfall Record," *Eagle Harbor Web*, retrieved July 19, 2021). Elevations in the area range from around 250 to 500 meters above sea level, and vegetation is dominated by typical northern hardwood forest species along with spruce and pine. The ridgeline of the greenstone bluff locally consists of "balds" where only flat-lying *Krummholz* composed of small, gnarled pine trees and Canadian alpine plants can withstand the near-constant winds and extreme winter conditions.



Figure 33. Copper crystals, 17.5 cm, from the Central mine. Ex John T. Reeder collection. A. E. Seaman Mineral Museum collection; Chris Stefano photo.

Figure 34. Copper crystals, 5 cm, from the Central mine. Ex John Ydren collection. Phil Scalisi collection; Breck Kent photo.



Figure 35. Copper crystals, 18.3 cm, from the Central mine. Heritage Auctions specimen; Mark Mauthner photo.

Figure 36. Copper in hopped cubic crystals, 6 cm, from the Central mine. The unusual color of this specimen suggests that the copper may contain some silver. Mike Bergmann collection; Chris Stefano photo.





THE COPPER FALLS MINE

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The Copper Falls mine, located in northern Keweenaw County, Michigan, was one of the earliest mines opened in the Lake Superior District. Despite its lack of economic success, it operated for more than 50 years and produced numerous fine specimens of copper, silver and associated minerals which grace public and private collections throughout the world.

INTRODUCTION

The Copper Falls mine was opened in 1845 and operated almost continuously until at least 1901. With such a long history, one would expect to learn that the mine was a great success. However, despite producing more than 25 million pounds of copper over its lifetime, the Copper Falls mine never turned a long-term profit, only paying dividends to shareholders a few times and never returning the initial investment. Continuous hopes that it would suddenly turn profitable kept it running despite the history of failure. Thanks in part to the long life of this economically unsuccessful mine, many fine specimens of copper, silver and other minerals were recovered by miners. In addition, the relatively high elevation of the Copper Falls mine kept the upper levels of the workings dry, allowing fearless mineral collectors access until the recent sealing of the abandoned shafts and adits.

LOCATION

The Copper Falls mine is located in northern Keweenaw County, Michigan, approximately 4 km southwest of Eagle Harbor, Michigan. The site is accessible off of the Eagle Harbor Cut Off road which connects US highway 41 to Michigan State highway 26. The Copper Falls area has a rugged topography with several ridges

exceeding 200 meters above the level of Lake Superior. Valleys are filled with small lakes, swamps and small creeks. The most important of these is Owl Creek. Owl Creek contained showings of native copper in a small waterfall, hence the “Copper Falls” mine name. No buildings survive at the mine site, but dump piles from the various workings still exist and are popular hunting grounds for rockhounds and tourists.

HISTORY

The Copper Falls mine was one of the earliest to operate in Michigan’s Keweenaw Peninsula, opening in 1845 (Butler and Burbank, 1929). See the short article entitled “The Keweenaw County Fissure Mines” at the beginning of this issue for a summary of the early history of the district that led to the development of mines like the Copper Falls.

According to Foster and Whitney (1850), interest in the Copper Falls site was initially sparked when explorers discovered hammerstones and other Native American mining implements in the vicinity. The property was originally leased by David Henshaw in 1843 (Western Historical Company, 1883). The first discovery of mineralization on the property, in a waterfall along a small creek, came in 1843 or 1844 (Butler and Burbank, 1929). A copper-bearing

Figure 12. Analcime crystals colored red by hematite inclusions, 10 cm, from the Copper Falls mine. Specimens like this were quite common at the Copper Falls mine. Ex Lucius L. Hubbard collection. A. E. Seaman Mineral Museum collection; Chris Stefano photo.



Figure 13. Analcime crystal, 2.5 cm, from the Arnold mine. The Arnold mine was a nearby property which worked the Ashbed flow and nearby veins, much like the Copper Falls. Specimens from both mines are very similar, as evidenced by this analcime crystal. Chris Stefano specimen and photo.

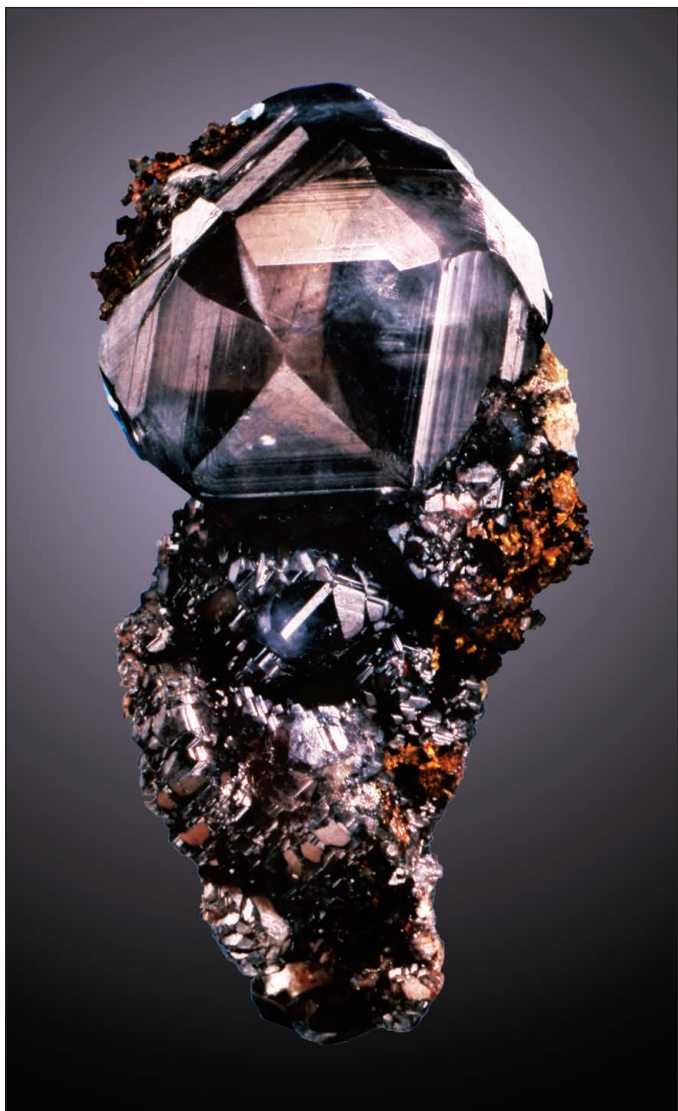


Figure 14. Apophyllite crystals, 7.5 cm, from the Copper Falls mine. Ex Clarence Bement collection. American Museum of Natural History collection; Chris Stefano photo.

Figure 15. Calcite colored black by inclusions, 6.4 cm, from the Copper Falls mine. Ex Clarence Bement and Phil Scalisi collections. William Severance collection; Jeff Scovil photo.

then the agent of the Copper Falls mine. White crystals, more typical for the species, are also not uncommon. Analcime with copper inclusions is known from the locality—first noted by Foster and Whitney (1850). Etched crystals exceeding 1 cm are reported in the Petherick extension of the Copper Falls vein.

Calcite CaCO_3

Like many Keweenaw County copper mines, Copper Falls has produced some exceptional calcite crystals. Copper inclusions in calcite were noted as early as 1850 by Foster and Whitney. Although the Copper Falls mine is not a particularly noteworthy occurrence of these highly sought-after Keweenaw classics, several very good

Figure 27. Copper crystals, 6.5 cm, from the Copper Falls mine. Phil Scalisi collection; Breck Kent photo.

Figure 28. Copper crystals, 9 cm, from the Gribble Vein, 4th level of the Copper Falls mine. Collected in 1982 by Ross Lillie and Bob Barron. Ross Lillie collection; Chris Stefano photo.

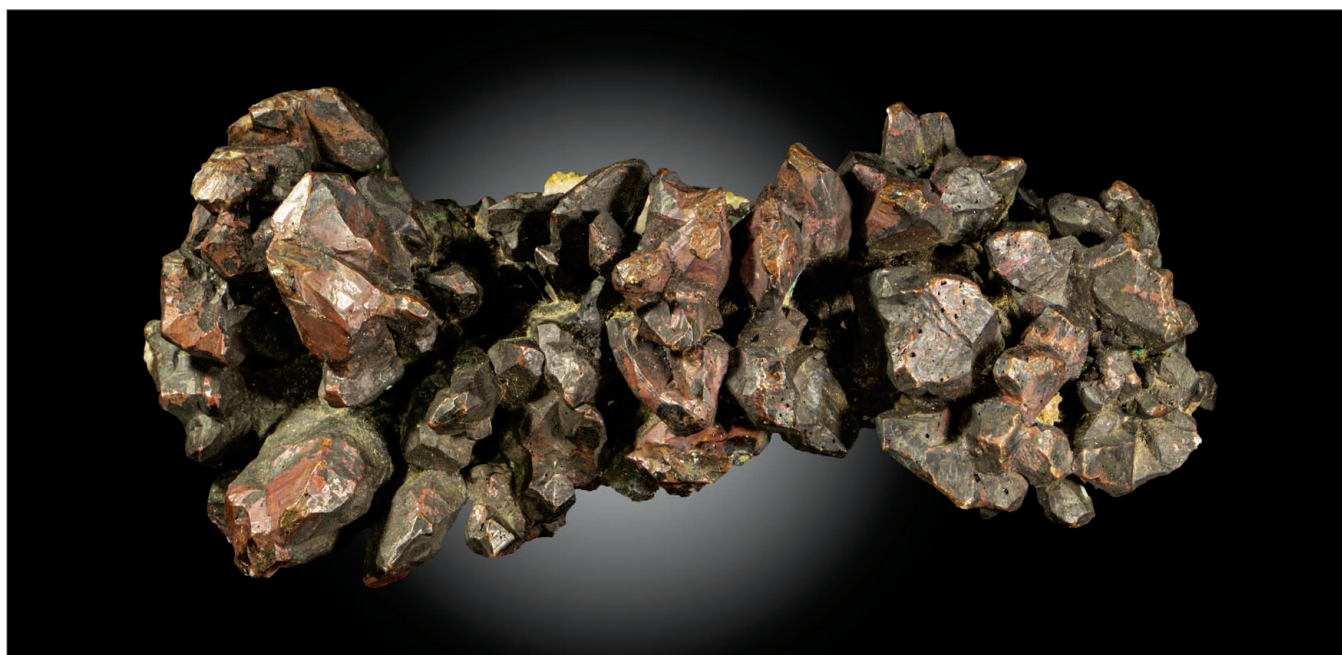


Figure 29. Copper crystals, 10 cm, from the Copper Falls mine. Ex Lucius L. Hubbard collection. A. E. Seaman Mineral Museum collection; Chris Stefano photo.



THE PHOENIX MINE

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The Phoenix mine, actually a series of copper mines and prospects located at the base of the rugged greenstone bluff that forms the spine of northern Michigan's wild and fabled Keweenaw Peninsula, is legendary among mineral collectors for its world-class specimens of native copper as well as fine examples of crystallized silver, analcime, calcite and numerous other minerals.

INTRODUCTION

The Phoenix mine was opened as the Lake Superior mine in 1844 by the Bay State Mining Company, who sank several shallow shafts on an outcropping fissure vein. The mine was renamed the Phoenix mine in 1849, and operated with few interruptions until June of 1905, producing a total of 16,632,536 pounds of copper and 25,000 ounces of silver during its operating life.

The Phoenix mine consists of several significant mineralized fissure veins, at one time worked separately: the Robbins (or West), Phoenix, St. Clair and Babbitt veins. While economically it contributed little to the overall copper production of the Lake Superior District, the Phoenix mine became a household name in the mineral collecting community thanks to the numerous world-class specimens of crystallized native copper and associated minerals it produced during its more than 50 years of operation. Superb mineral specimens from the Phoenix mine can be found in museums and private collections around the world, and many Michigan Copper Country connoisseurs consider it a leading locality in the district for fine minerals.

LOCATION

The Phoenix mine is located in northern Keweenaw County, Michigan, approximately 4 km southwest of Eagle River, Michi-

igan. The site is accessible near the junction of US highway 41 and Michigan State highway 26, at the former town of Phoenix, now the site of just a few homes and one seasonal business. The Phoenix townsite lies east-southeast of the main greenstone bluff, an approximately 200-meter-high escarpment which forms the "spine" of the Keweenaw Peninsula and hosts the copper deposits exploited by the Phoenix mine. Elevations in the area range from 254 to 459 meters, and vegetation is dominated by typical northern hardwood forest species along with spruce and pine. *Krummholz*, a mixture of small, gnarled and stunted pine trees and Canadian alpine plants, occurs on ridgelines such as the main greenstone bluff; this vegetation, characteristic of subarctic and subalpine tree line landscapes, speaks to the extreme winters experienced in this part of Upper Michigan. Flatlands below the ridgelines and closer to Lake Superior are dominated by swampy ground with black spruce, northern white cedar and tamarack.

HISTORY

Much of the following history has been taken from the Western Historical Company (1883) book, *The History of the Upper Peninsula of Michigan*. Other sources are cited as necessary.

The Phoenix group of mines was among the earliest of the fissure



Figure 8. Analcime crystal with apophyllite, 5 cm, from the Phoenix mine. Marc Wilson collection; Debra Wilson photo.

Figure 9. Analcime crystals, 6 cm, from the Phoenix mine. This style of analcime crystals with the epitaxial overgrowth of a later generation of analcime appears to be unique to the Phoenix mine—a rare instance when a specimen which has lost its provenance can be attributed to a specific mine in the Lake Superior district with any degree of confidence.

Ex Donald C. Gabriel collection. A. E. Seaman Mineral Museum collection; Chris Stefano photo.



Figure 10. Analcime crystals with copper, 5 cm, from the Phoenix mine. Ex Robert Rann collection. Phil Persson (Persson Rare Minerals) specimen; Annette Slade photo.

Figure 11. Analcime crystals with amber-colored pseudocubic calcite crystals, 5.5 cm, from the West vein of the Phoenix mine. The amber-colored pseudocubic calcite crystals on this specimen are believed to be unique to a find on the West vein of the Phoenix mine. A. E. Seaman Mineral Museum collection, ex Donald C. Gabriel collection; Jeff Scovil photo.



Figure 42. Copper crystals, 8.8 cm, from the Phoenix mine. Fine Minerals International specimen; James Elliott photo.

Figure 43. Copper colored red by a coating of cuprite, 5 cm, from the Phoenix mine. Marc Wilson collection; Debra Wilson photo.



Figure 44. Copper chisel chip fan, 17 cm, from the Phoenix mine. This is an artifact, made by the miners as gifts for important visitors to the mines and to show their skill with a hammer and chisel. This particular fan was on display in the Calumet and Hecla Company offices for many years. James Hird collection; Chris Stefano photo.

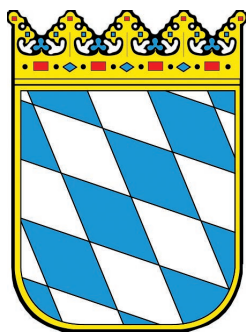


Figure 45. Copper crystals with apophyllite, 4 cm, from the Phoenix mine. American Museum of Natural History collection; Chris Stefano photo.

Venezuela called simply, perhaps even reverently, “The Crystal”; and the curlicued “Gold Horn” specimen from the Ground Hog mine, Colorado.

- The “Aurora” gold nugget from Australia, discovered in April 2010 and weighing 51.3 pounds.

So that’s the scoop, complete with a frozen shower of gold, from Denver 2022. Soon, very soon now indeed, I’ll be sending such ravings your way again, but from MUNICH. Stay healthy and happy, keep cool and all that, until then.



Munich Show 2022

by Thomas P. Moore

[September 28–October 2]

Look at those dates on the line above, then look at the dates in any previous Munich report in this magazine: yes, the 2022 Munich mineral show took place almost a full month earlier than usual. On the positive side, this meant that incoming visitors could catch the leaves of the lindens, birches and oaks coming closer to their full yellow-gold pomp than we’re used to seeing in Munich, but of much greater practical interest was that the 2022 Munich Show overlapped in time with *Oktoberfest*, the greatest beer bash in the world, which began on September 16 and ended on October 2, when the mineral show also ended. Because of the ambient spirit of *Oktoberfest*, there were crowds of beery carousers everywhere in the city, but these were especially thick when you got anywhere near the *Theresienwiese* (“Theresa’s Meadow”), the spacious fairgrounds—decades ago the site of the mineral show itself—where *Oktoberfest* roared from 10:00 in the morning to past midnight each day.

Time was, long ago, when I would have happily joined in the fun—for *Oktoberfest* indeed *can* be fun, with Bavarian brass bands thumping out beer-drinking music; girls and guys, self-consciously festive in *Dirndles* and *Lederhosen* respectively, taking the loop-de-loop rides, then going again to the beer tents, then roistering arm-in-arm down the fairways . . . and then of course there’s the *Bier* itself, the world’s best, as everyone says (all right: as *I* say). Ah, but now I was older, traveling alone, and on a mineralogical mission. And the only hotel rooms that were available when I booked (many months in advance) lay directly *across the street* from the border of the *Theresienwiese*. This latter circumstance meant that *Oktoberfest*, with its nova lights and screaming rides and beery songs, sent all of that oompah gusting into my room every night, and did little, let’s say, to mitigate normal jetlag. But prospective travelers to Munich should note that, as we’re assured by Munich Show manager Christoph Keilmann, the 2023 show will revert to its usual time slot in late October/early November. Let’s hope that the prices of things in general will have returned to normal by that time as well, and let’s further hope that the Euro-dollar exchange rate will still be around the record-low, dollar-favorable 1:1 that it was in this autumn of 2022.

The show was a little diminished, as it had been in the previous,

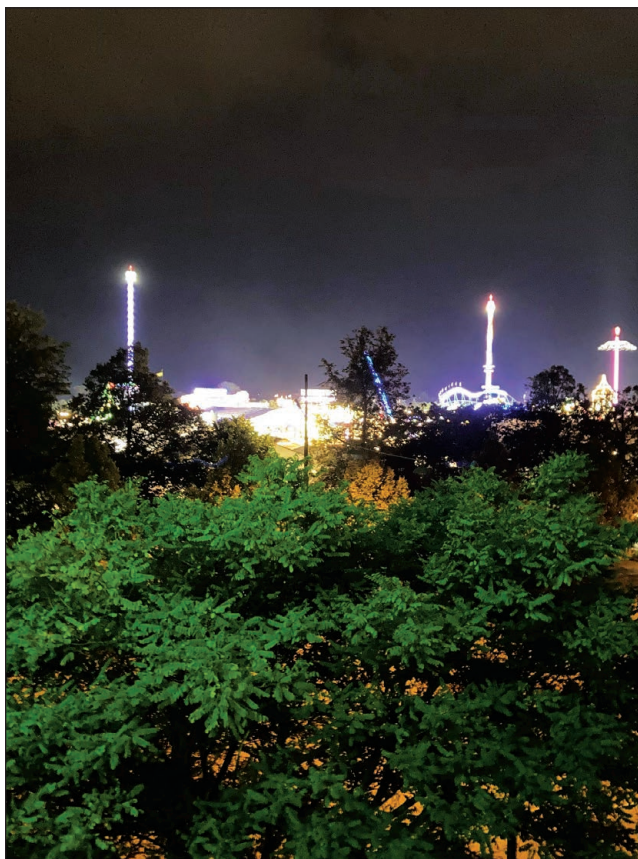


Figure 26. Oktoberfest by night, from neighboring hotel room window. Tom Moore photo.



Figure 41. Bastnäsit-(Ce), 5.4 cm, from Zagi Mountain, Khyber Pakhtunkwa Province, Pakistan. Ghulam Mustafa (*Fine Art Minerals*) specimen; Mark Mauthner photo.



Figure 42. Zircon, 3.1 cm, from the Harcho mine, Astor Valley, Shigar district, Gilgit-Baltistan, Pakistan. Flavio Bacchia (*Zoic SRL*) specimen; Mark Mauthner photo.



Figure 43. Chalcopyrite, 11.5 cm, from the Tongshankou mine, Daye district, Huangshi, Hubei Province, China. Jordi Fabre specimen; Mark Mauthner photo.

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