

## ***The New Cornelia Mine, Ajo, Pima County, Arizona***

Les Presmyk

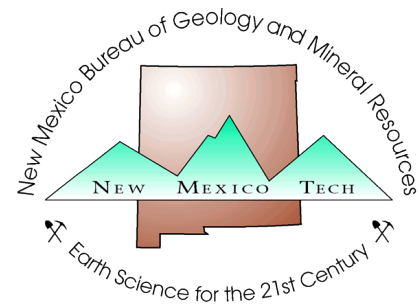
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The annual [New Mexico Mineral Symposium](#) provides a forum for both professionals and amateurs interested in mineralogy. The meeting allows all to share their cumulative knowledge of mineral occurrences and provides stimulus for mineralogical studies and new mineral discoveries. In addition, the informal atmosphere encourages intimate discussions among all interested in mineralogy and associated fields.

The symposium is organized each year by the [Mineral Museum](#) at the [New Mexico Bureau of Geology & Mineral Resources](#).



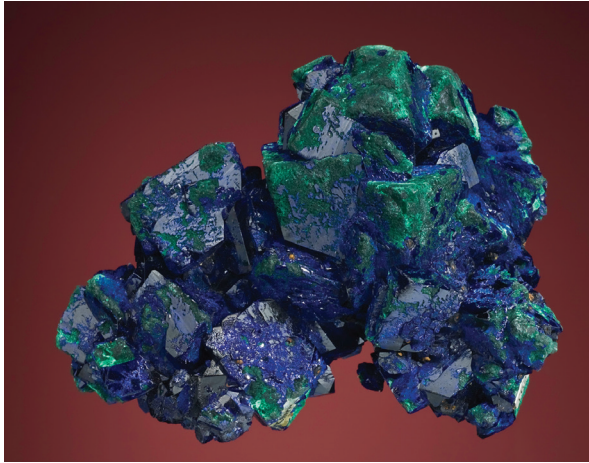
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# The New Cornelia Mine, Ajo, Pima County, Arizona

—Les Presmyk

The New Cornelia mine at Ajo, Arizona has a long and storied history. Most of it good and a bit of it infamous and notorious. Not like Tombstone and Bisbee with hangings and bank robberies resulting in multiple deaths but there were more than a few investors and miners who lost substantial sums of money due to deceit and fraud. Copper, at least not in Arizona, just does not seem to inspire events like silver and gold has done.



**Azurite, Ajo**

In the early 1850s, disappointed gold seekers began returning from California to head back east and recover their lives and finances. A few stopped in what was then still part of Sonora, Mexico, searching for gold in the normally dry river beds. In 1853 this all changed with the Gadsden Purchase, which added land south of the Gila River and established the border between Arizona, New Mexico, and Mexico. Once this southern border was established the territories of Arizona and New Mexico were configured but they looked a bit different than today. President Lincoln established the two territories and current boundaries in 1862.

The mineral deposits at Ajo, supposedly named for wild garlic in the area but probably more appropriately named by the natives in the area for vivid blue and green minerals they used in face paint colors, attracted some of the earliest interest by American explorers and prospectors. The greens and blues of the copper oxides stood out in stark contrast to the dark iron-rich rock. Unfortunately, the precious metal values from gold and silver found in most of the other copper deposits around Arizona were more elusive here. Although these deposits were the earliest lodes sampled, productive mining remained elusive for over 60 years.

From the 1850s to the early 1900s the deposits at Ajo went through a series of claims, financial pratfalls and bankruptcies with claims being sold and resold and consolidated. For its first 60 years, Ajo produced more schemes than real mines. The ores were relatively low grade compared to other copper districts in Arizona. For example, the early carbonate ores of Bisbee and Morenci were rich enough (10% to 20%+) to be sent directly to the smelter. Ajo's carbonate rocks were more in the order of less than 5%. So, besides technology not being available to refine this material, water was a constant issue and of course, high transportation costs. The first shipment of 11 tons of hand sorted, high-grade material had to be hauled by 20 mule teams (one ton per wagon) to Yuma, placed on a ship to San Francisco and then shipped to Swansea, Wales for processing. While this ore was worth \$400 per ton it was not sustainable and the mining shut down.

When the New Cornelia mine shut down in 1984, it was notable because it was the oldest and longest continually mined open pit copper mine in Arizona. Since that time both the Morenci and Ray mines can now lay claim to that title but the New Cornelia was the first and the longest lived open pit mine, having started in 1916.

The real production phase of Ajo started around 1910 following the success of mining and milling large volumes to reduce the per pound cost of producing copper from lower grade deposits at Bingham Canyon, Utah. Three companies started work at Ajo but it was ultimately John C. Greenway, the general manager of the Calumet and Arizona Mining Company in Bisbee, who decided to start drilling in 1911 to delineate the potential orebody. While this work continued and various claims were acquired, the other issue, not the least important by any means, was how to treat the carbonate and oxide copper ores. This was the first successful and legitimate oxide leach process developed for treating this lower grade material. Greenway and Dr. Louis Ricketts developed this process, starting with a 1 ton plant, ramping it up to 40 tons per day for the next year and with this success, built a 5,000 ton capacity plant to treat these ores.

From 1912 to 1916 a lot was happening in the Ajo area. The railroad was completed from Gila Bend, the town was built, the open pit mine was begun, the leach plant and electrolytic refinery was constructed and just as important, a water source about seven miles away along with a pumping facility and pipeline was installed. May 1, 1917 was a momentous day in Ajo. The leach plant was completed but it was not until June 18 that the first copper cathodes were



**Copper, Ajo**

shipped out of town. This plant operated until 1930 and processed 17 millions tons of ore averaging 1.3% copper. By 1923, enough sulfide mineralization had been delineated that the construction of a concentrating mill was justified and went into operation in January 1924. With the consolidation of the Phelps-Dodge Corporation and the Calumet and Arizona Mining Company in 1931, Ajo became the New Cornelia Branch of the Phelps-Dodge Corporation.

## Minerals and Collecting History

Thomas and Gibbs list 40 species of rock-forming, hypogene and alteration minerals in their 1983 Mineralogical Record article on Ajo. They also list 55 secondary minerals. From this list copper, azurite, malachite (and malachite pseudomorphs), shattuckite, ajoite, papagoite, calcite and cuprite are the most notable.

While there were certainly azurite and malachite specimens uncovered during the first forty years mining, and especially the carbonate and oxide ores, virtually no verifiable specimens exist before the mid to late 1950s. In this time period, expansion of the open pit to reach deeper sulfide ores encountered areas rich in both azurite and malachite specimens, large native copper crystals, masses of crystallized shattuckite and two new copper silicate minerals, ajoite and papagoite. During the late 1950s and early 1960s specimen production from Ajo hit its heyday.

The native copper specimens were unlike anything seen in Arizona because they most resembled Michigan style crystals. Crystals over 2" and masses weighing several hundred pounds were encountered. There was a second style, also very distinctive for Arizona, of parallel growths of herringbone-like crystals. The azurites from this period are also distinctive because they are pseudo-cubic in appearance and of course, the malachite pseudomorphs are just as distinctive.

Cuprite was found as crystals up to 1/2" on rock matrix and in a few pockets on native copper. Some of the most vibrant cuprite in calcite specimens from Arizona came from Ajo. The chalcotrichite form of cuprite was also abundant during a few short periods.

Shattuckite was found in chunks and masses up to three inches thick and over a foot across. Tufts of radiating crystals were discovered in vugs within these masses. Much of this massive material was cut and polished into cabochons.

During this time two new copper silicate minerals were discovered and named. Both have distinctive colors and occurred as vugs of crystals as well as massive enough chunks to be cut and polished. Ajoite is an almost turquoise blue while papagoite is a medium blue and not as dark as shattuckite.

Calcite specimens, besides those included with cuprite, were found occasionally. The most notable specimens were found while digging the underground water shafts.

The next and final period of specimen production occurred in the 1970s when Wayne Thompson and Southwest Mineral Associates acquired the collecting contract and started work at the mine. The first pocket consisted of two rocks, each with one face covered with malachite after azurite crystals and the occasional unaltered azurite crystal. The two faces were sawn off the larger rocks and then trimmed into smaller specimens. These have become classic Ajo specimens, both for the association and the generally 1/2" to 5/8" thick matrix obviously sawn back. Additional pockets of azurite and malachite after azurite specimens were recovered at this time. Since the late 1970s no additional specimen recovery has occurred at the mine.



**Malachite after Azurite, Ajo**