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The Milpillas Mine

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Cuitaca, Sonora, Mexico

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The Milpillas mine, opened in 2006, is an underground copper mine in Sonora, Mexico operated by Industrias Peñoles until closing in 2020. It exploited a deeply oxidized and enriched Porphyry Copper Deposit, which proved to contain multiple bonanzas of world-class copper minerals, especially azurite and malachite, but also the world's finest specimens of brochantite, olivenite, tenorite, vésigniéite and volborthite.

EDITOR'S NOTE

This is our second report on the famous Milpillas mine. After fine specimens of azurite and malachite first began causing such great excitement on the international mineral market, we dispatched editor Thomas Moore to visit the mine in early 2008, take a tour underground with the miners, and prepare an article (Moore and Origlieri, 2008). Seven azurites and two malachites from the first surge of specimens are pictured there. Since that time, important discoveries have continued semi-regularly, including vast numbers of fine azurite specimens from numerous pockets and veins, and some surprisingly fine specimens of other, much rarer minerals. Now, 13 years later, the mine has finally closed permanently, and the time is right to record a comprehensive overview of all that has transpired during its operating life. Our thanks to the authors, who have been intensively involved in the study and marketing of Milpillas specimens during that time, for sharing their knowledge, and especially to Jeff Scovil for providing access to many hundreds of (individually dated!) specimen photos.

INTRODUCTION

The Milpillas mine is an underground copper mine in Sonora, Mexico operated by the Mexican mining company Industrias Peñoles. It was opened in 2006 to exploit a recently discovered, deeply oxidized and enriched Porphyry Copper Deposit (the term is traditionally capitalized in geological literature). Within a year, itinerant Mexican mineral dealers were crossing the border into Arizona, offering mediocre to good quality azurite crystals and malachite pseudomorphs after azurite for sale. They kept the source to themselves, but the specimens were distinct from those of any known locality in Mexico or Arizona; the quality of the specimens and the mystery of their origin engendered much early speculation about the source. Soon the secret came out: the material came from the then newly opened Milpillas mine.

The overall quality of the early specimens was fairly good; a 4-inch single azurite crystal acquired by Jimmy Vacek in 2007 raised some eyebrows! Gene Schlepp was also marketing fine early examples of Milpillas material. But this was only a hint of what

Figure 99. **Azurite specimen nicknamed "the Cannonball," 11.5 cm, recovered in 2011 from the Rosette Pocket on the 1100 level of the Milpillas mine. Evan Jones (*Unique Minerals*) and Bryan Lees (*Collector's Edge Minerals*) specimen; Jeff Scovil photo.**

Figure 100. **Azurite, 10 cm, recovered in 2011 from the Rosette Pocket on the 1100 level of the Milpillas mine. Evan Jones (*Unique Minerals*) specimen and photo.**

Figure 101. **Azurite, 12.7 cm, recovered in 2011 from the Rosette Pocket on the 1100 level of the Milpillas mine. Dylan Stolowitz (*Green Mountain Minerals*) specimen; Joe Budd photo.**

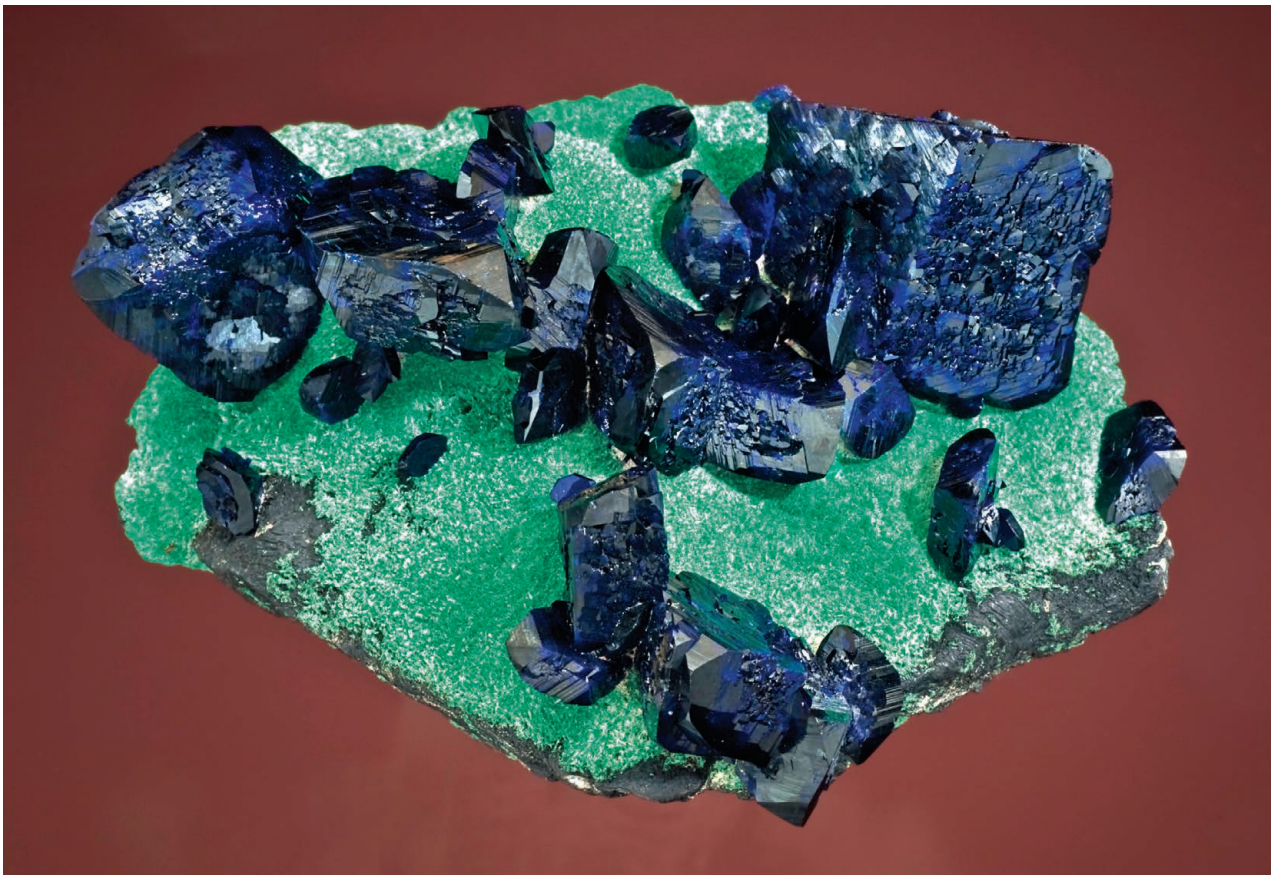

***Figure 72*. Azurite on malachite, 7.5 cm, recovered in 2010 from the Tolvas Duales Pocket, 1100 level of the Milpillas mine. Steve Neely collection; Jeff Scovil photo.**

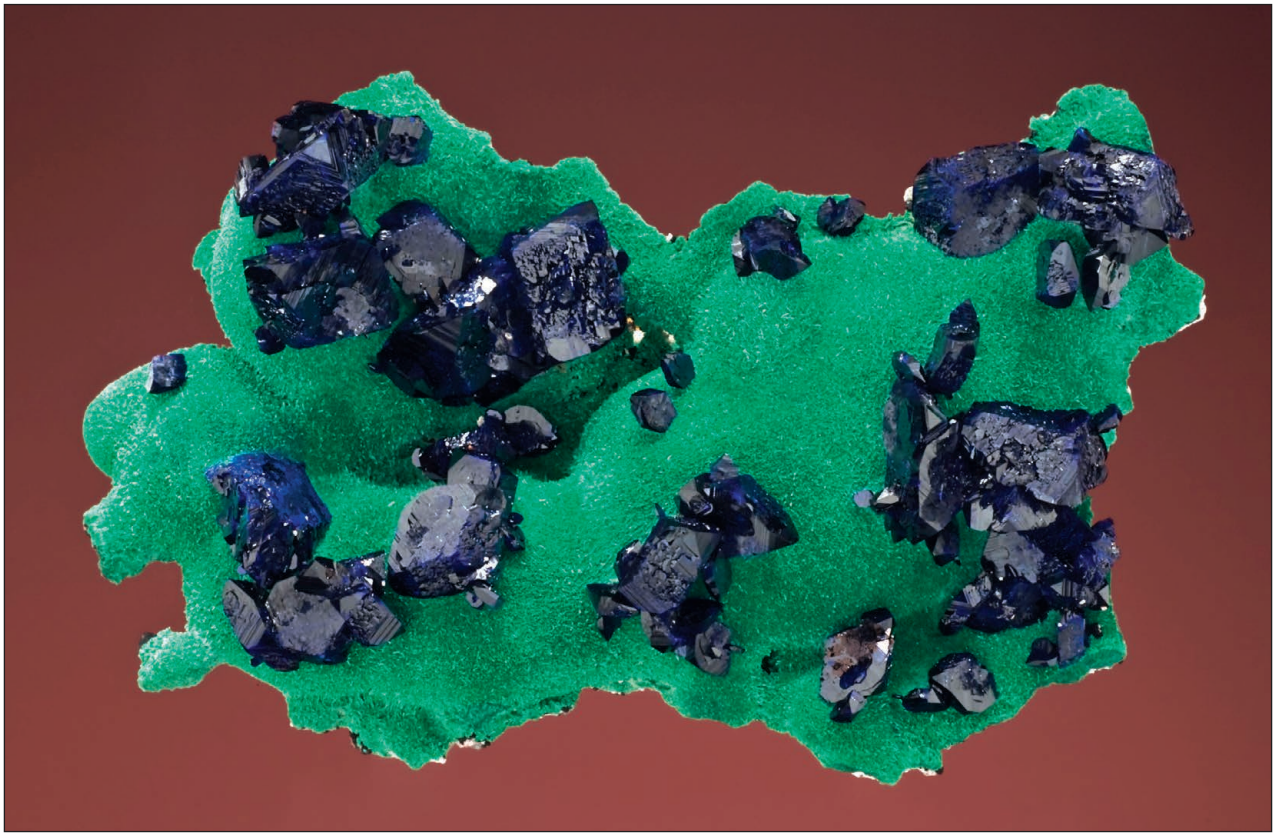

***Figure 73*. Azurite on malachite, 13.3 cm, recovered in 2010 from the Tolvas Duales Pocket, 1100 level of the Milpillas mine. Peter Megaw collection; Jeff Scovil photo.**

Figure 114 (above). **Azurite, 11 cm, recovered in 2013–2014 from the Watercourse Pocket on the 1280 level of the Milpillas mine. Daniel Trinchillo *(Fine Minerals International)* specimen; James Elliott photo.**

Figure 115 (above right). **Azurite, 5 cm, recovered in 2013–2014 from the Watercourse Pocket on the 1280 level of the Milpillas mine. Thomas Weiland collection and photo.**

Figure 116 (right). **Azurite, 4.2 cm, recovered in 2013–2014 from the Watercourse Pocket on the 1280 level of the Milpillas mine. Marshall Sussman specimen; Jeff Scovil photo.**

Figure 167. **Brochantite, 13.1 cm, from the Milpillas mine. Gail and Jim Spann collection; Tom Spann photo.**

Figure 168. **Brochantite, 9 cm, from the Milpillas mine. Scott Werschky (*Miner's Lunchbox*) specimen; Jeff Scovil photo.**

Figure 190 (left). **Copper, 14 cm, from the Milpillas mine. Brent Lockhart collection; Jeff Scovil photo.**

Figure 191 (below left). **Copper, 8 cm, from the Milpillas mine. Gail and Jim Spann collection; Joe Budd photo.**

Figure 192 (below). **Copper, 6.8 cm, from the Milpillas mine. Kerith Graeber collection; Jeff Scovil photo.**

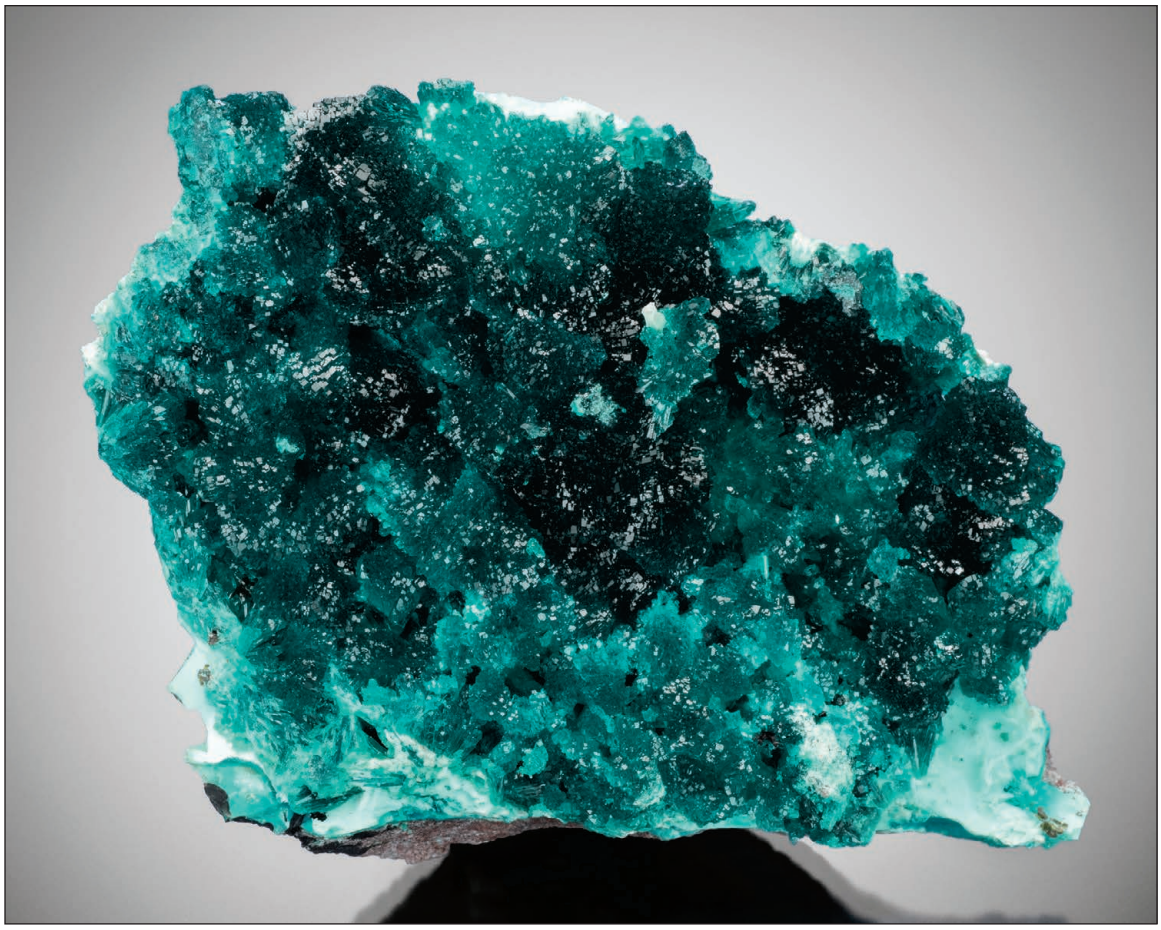

***Figure 209*. Dioptase crystals with chrysocolla and darker malachite, 6.2 cm, from the 992 level of the Milpillas mine, collected in 2019. Jim and Imelda Klein collection; Jeff Scovil photo.**

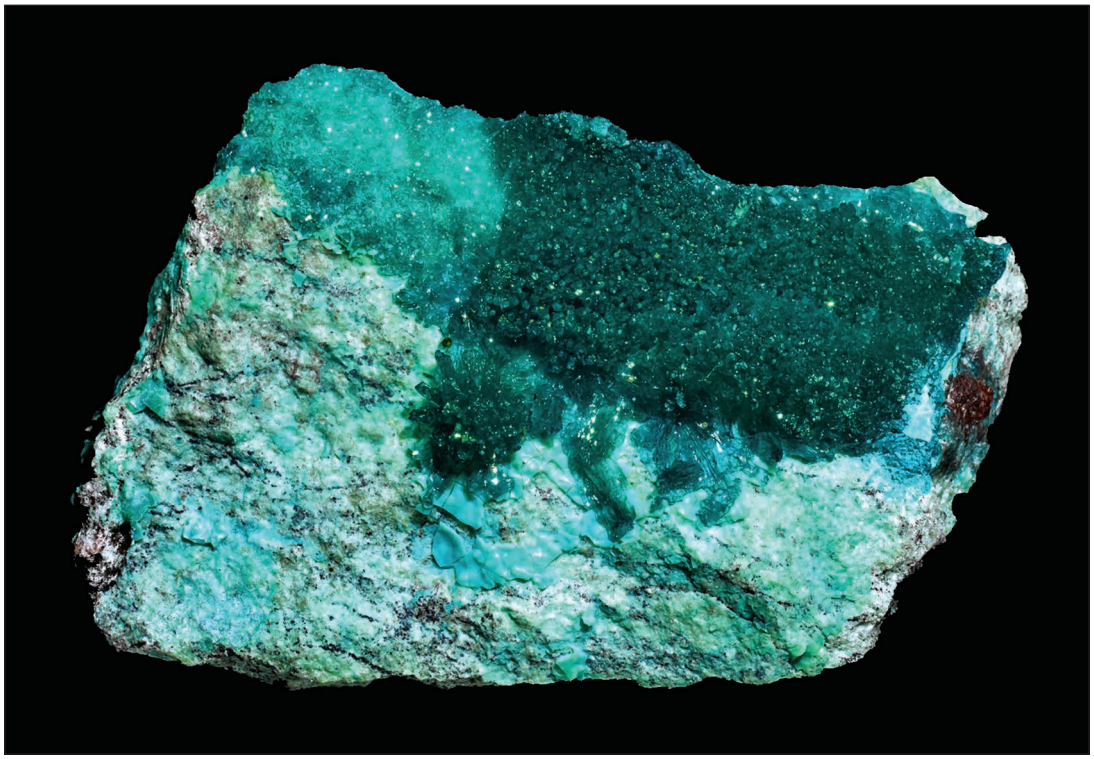

***Figure 210*. Dioptase crystals with pale blue shattuckite, 6.1 cm, from the 992 level of the Milpillas mine. Jordi Fabre specimen and photo.**

Figure 196. **Cuprite, 1.5 cm, from the Milpillas mine. Alejandro Valenzuela specimen; Jeff Scovil photo.**

Figure 197. **Cuprite, 2.7 cm, from the Milpillas mine. Marshall Sussman specimen; Jeff Scovil photo.**

Figure 198. **Cuprite, 2.6 cm, from the Milpillas mine. Kiyoshi Kiikuni (*Key's Minerals*) specimen and photo.**

Figure 199. **Cuprite, 3 cm, from the Milpillas mine. Brendan O'Connor collection and photo.**

Figure 295. **Volborthite, 3 cm, from the Milpillas mine. Daniel Trinchillo (*Fine Minerals International*) specimen, now in the collection of the Mim Mineralogical Museum, Beirut; James Elliott photo.**

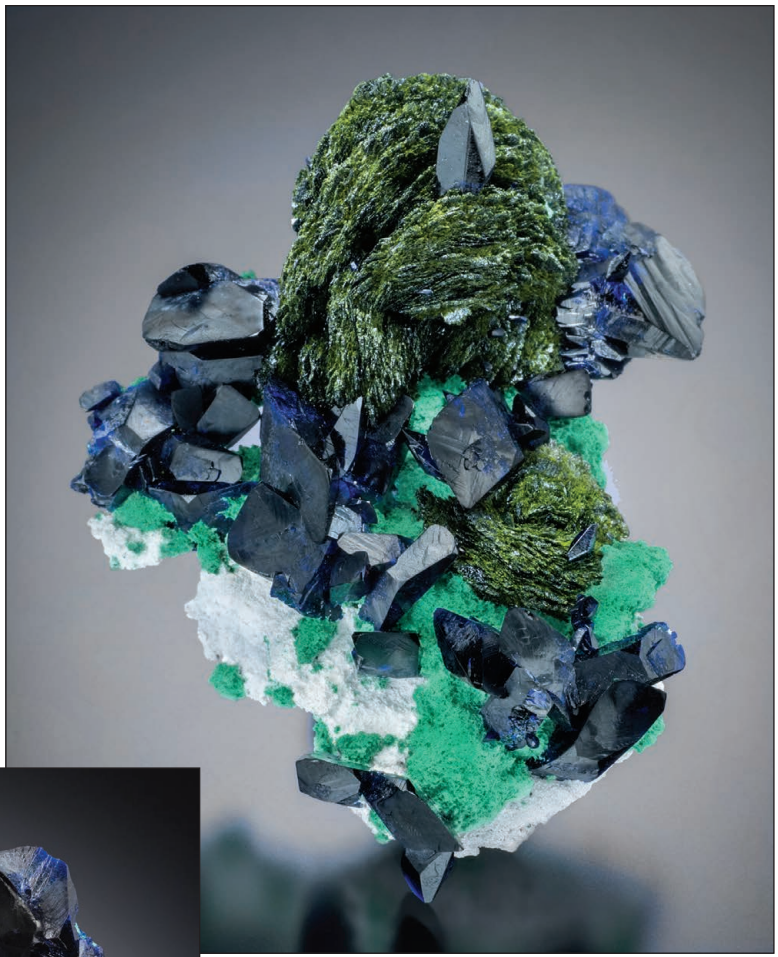

Figure 296. **Volborthite with malachite and azurite on white matrix, 5.8 cm, recovered in 2015 from the 890 level of the Milpillas mine. Peter Megaw collection; Jeff Scovil photo.**

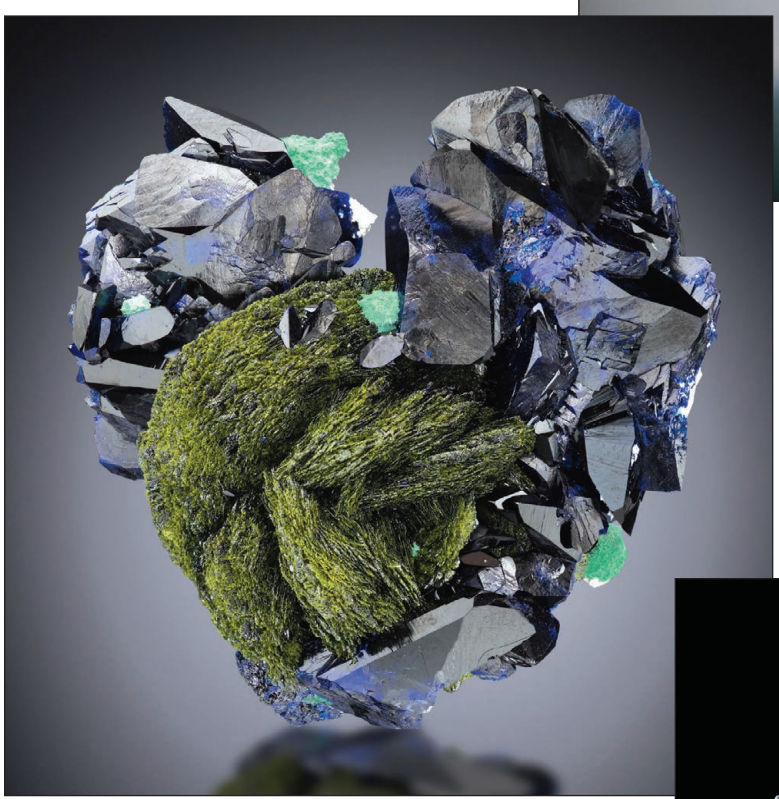

Figure 297. **Volborthite with malachite and azurite on white matrix, 4 cm, recovered in 2015 from the 890 level of the Milpillas mine. Irv Brown specimen; Jeff Scovil photo.**

Figure 298. **Volborthite on matrix, 4.5 cm, from the Milpillas mine. Daniel Trinchillo (*Fine Minerals International*) specimen, now in the collection of the Mim Mineralogical Museum, Beirut; James Elliott photo.**

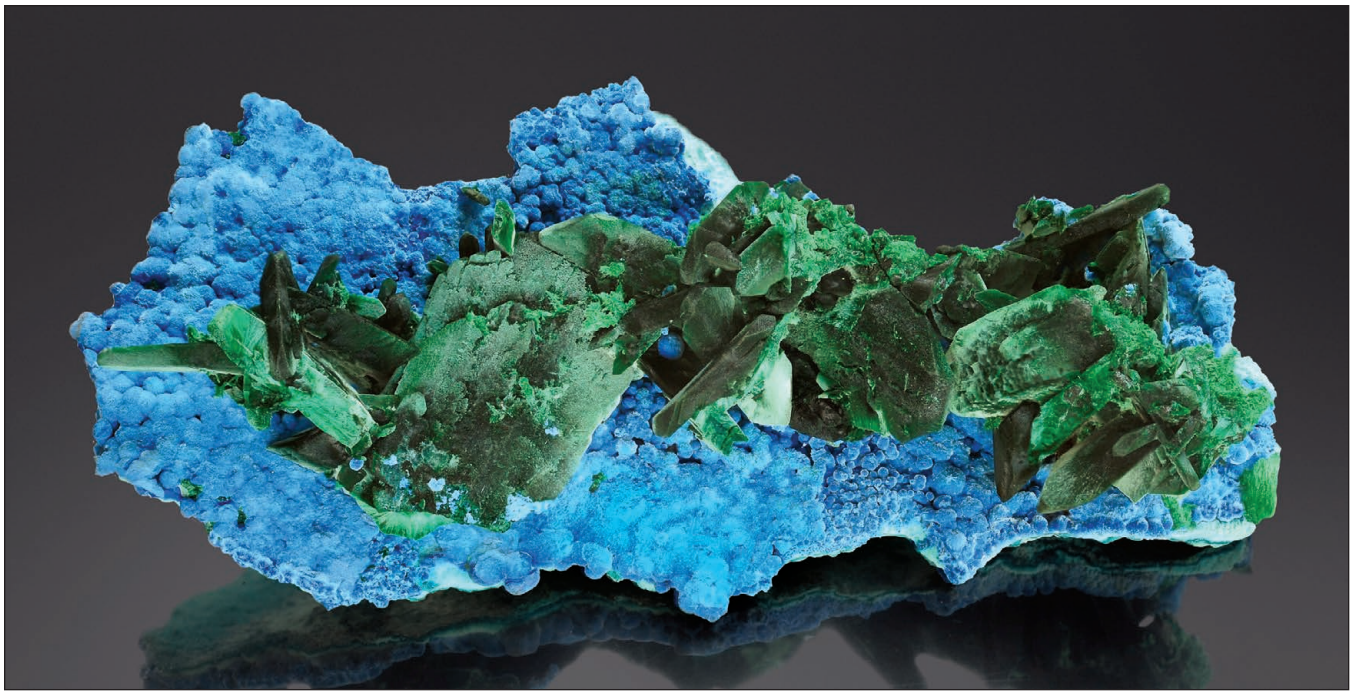

Figure 264. **Malachite pseudomorphs after azurite on velvet plancheite, 9 cm, recovered in 2008 from the 1160 level in the Milpillas mine. Thomas Weiland collection and photo.**

Figure 265. **Malachite pseudomorph after azurite on velvet plancheite, 4 cm, recovered in 2008 from the 1160 level in the Milpillas mine. Saafa Yu Jackson specimen; Jeff Scovil photo.**

Figure 266. **Pyrite crystal with minor chalcocite coating (two views), 2 cm, from the Milpillas mine. John Betts specimen and photo, identified by Ben Grguric.**

Figure 267 (left). **Pyrite crystal, 5.7 cm, from the Milpillas mine. Brendan O'Connor collection; Jeff Scovil photo.**

Figure 268 (below left). **Pyrite crystal, 1.9 cm, from the Milpillas mine. John Betts specimen and photo.**

Figure 269 (below). **Pyrite crystal on matrix, 3.7 cm, recovered in 2016 from the Milpillas mine. Jordi Fabre specimen and photo.**

Quartz SiO_2

Surprisingly, quartz crystals are uncommon at Milpillas. The most abundant examples form the unprepossessing matrix supporting rare antlerite, but thin layers of drusy quartz sometimes coat dioptase and plancheite as well. A few examples of small milky quartz crystals to 5 mm have been found with cuprite and malachite. A notable exception to these ordinary examples is a frosted 6-mm scepter growing off a bed of sharp cuprite crystals. The head of the scepter is a composite of three separate crystals with an aggregate width of 4 mm. Another isolated example is a doubly terminated gemmy 5-mm quartz crystal on azurite. In 2019, small clusters and aggregates of needle-like quartz were found on the 992 level coated with apple-green conichalcite, associated with chenevixite and natrojarosite. Later in 2019, drusy coatings and sunburst-like clusters of well-terminated and lustrous water-clear quartz crystals to 1 cm in size over shattuckite and dioptase emerged in moderate quantity, also from the 992 level. These formed very attractive specimens, generally in thumbnail to miniature sizes.

Shortly thereafter, a large find of somewhat similar material hit the specimen market, purportedly having come from the Milpillas mine. Although similar in some respects to specimens from Milpillas, it was soon determined that this material was being mined from a small copper property near Rancho Jacalito, several kilometers west of Cuitaca and many kilometers southwest of the Milpillas mine. It can be distinguished by abundant shattuckite and thicker quartz crystal encrustations with fibrous ajoite (the latter largely pseudomorphed by chrysocolla) and a lack of dioptase.

Rutile TiO_2

A single example of a rutile microcrystal was found in host rock from Milpillas (Hexiong Yang identification; Marshall Sussman, personal communication).

Figure 270. **Quartz crystal cluster on dioptase, 3.8 cm, collected in 2019 on the 992 level of the Milpillas mine. *Valenzuela's Minerals* specimen; Jeff Scovil photo.**

Figure 271. **Quartz crystal scepter with dioptase, 2.2 cm, collected in 2019 on the 992 level of the Milpillas mine. *Valenzuela's Minerals* specimen; Jeff Scovil photo.**

Figure 272. **Quartz crystal druse on dioptase and shattuckite, 8.5 cm, collected in 2019 on the 992 level of the Milpillas mine. Brendan O'Connor specimen and photo.**

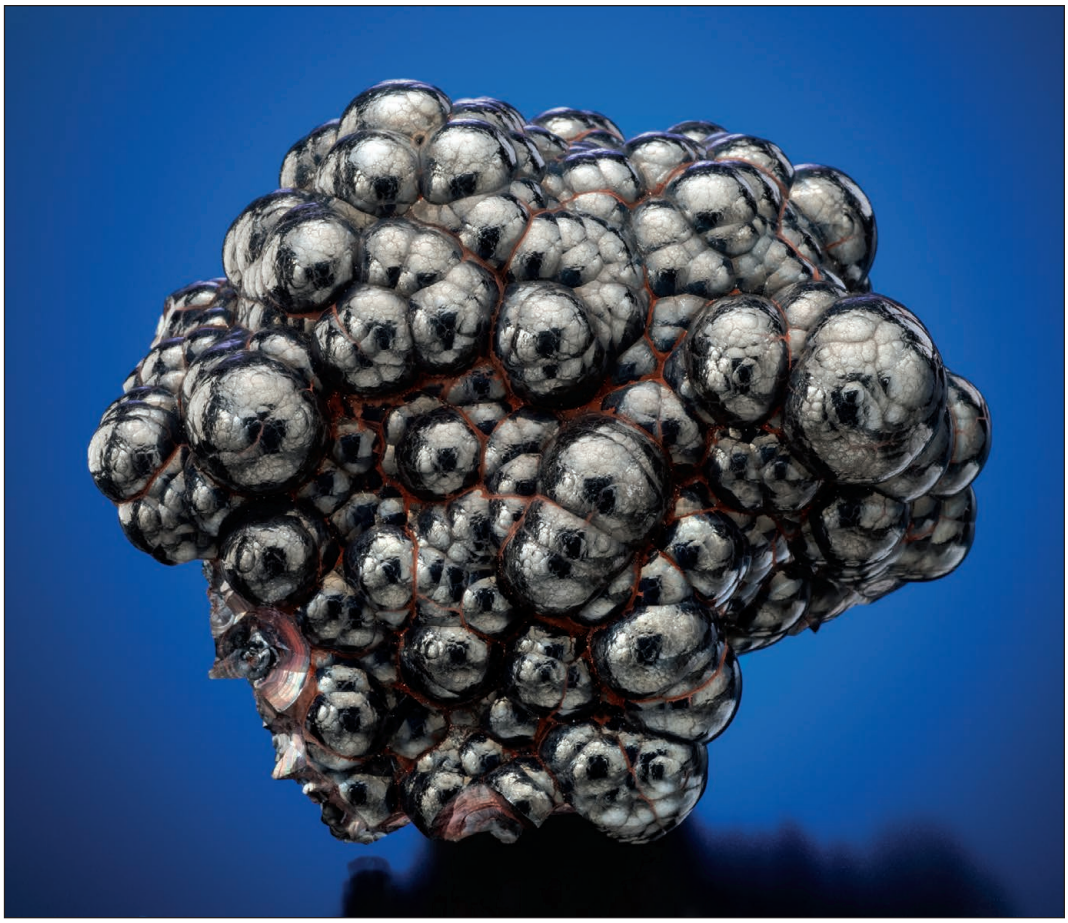

Figure 217. **Botryoidal hematite, 7.4 cm, from the Milpillas mine. Brendan O'Connor collection; Jeff Scovil photo.**

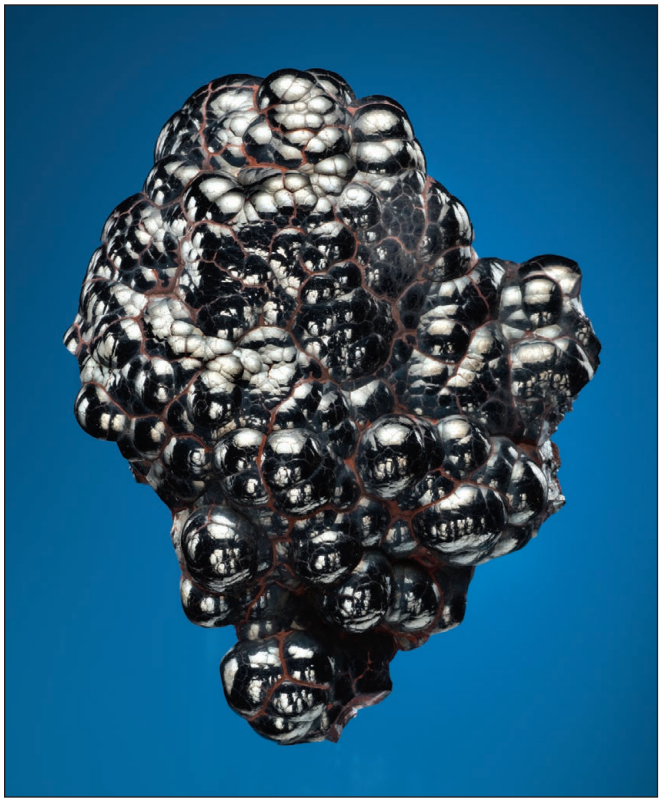

Figure 218. **Botryoidal hematite, 6.8 cm, from the Milpillas mine. Jim and Imelda Klein collection; Jeff Scovil photo.**

Figure 219. **Halotrichite (probably post-mining), 8 cm, from the Milpillas mine. Jim and Imelda Klein collection; Jeff Scovil photo.**

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