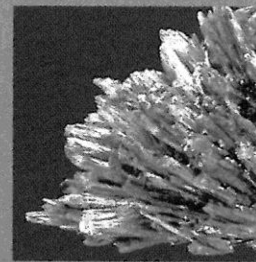
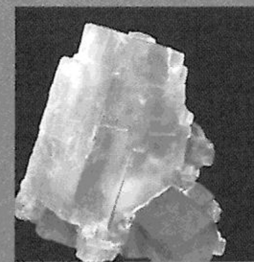
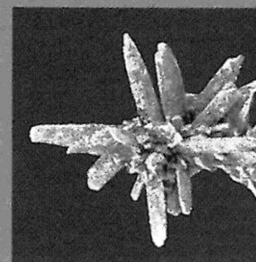
ANNUAL NEW MEXICO MINERAL SYMPOSIUM

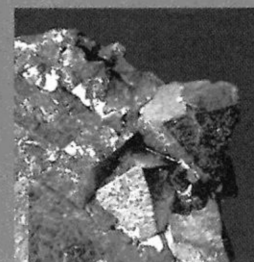
25th Annual New Mexico Mineral Symposium

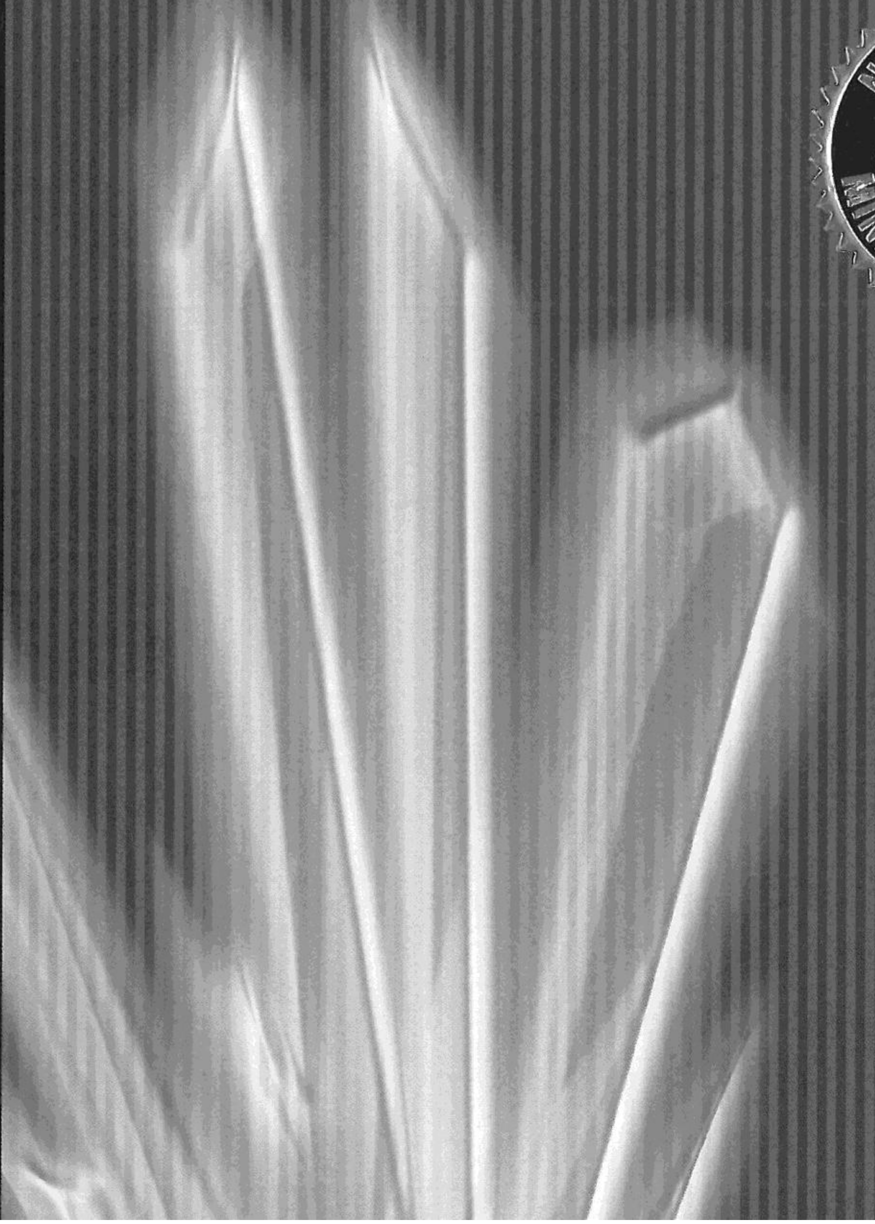
November 13 & 14, 2004











PROGRAM & ABSTRACTS

25th Annual New Mexico Mineral Symposium

November 13 & 14, 2004

New Mexico Bureau of Geology and Mineral Resources

A Division of New Mexico Institute of Mining and Technology

Socorro 2004

Welcome to

THE TWENTY—FIFTH ANNUAL

NEW MEXICO MINERAL SYMPOSIUM

November 13 and 14, 2003

Macey Center Auditorium

New Mexico Institute of Mining and Technology

Socorro, New Mexico

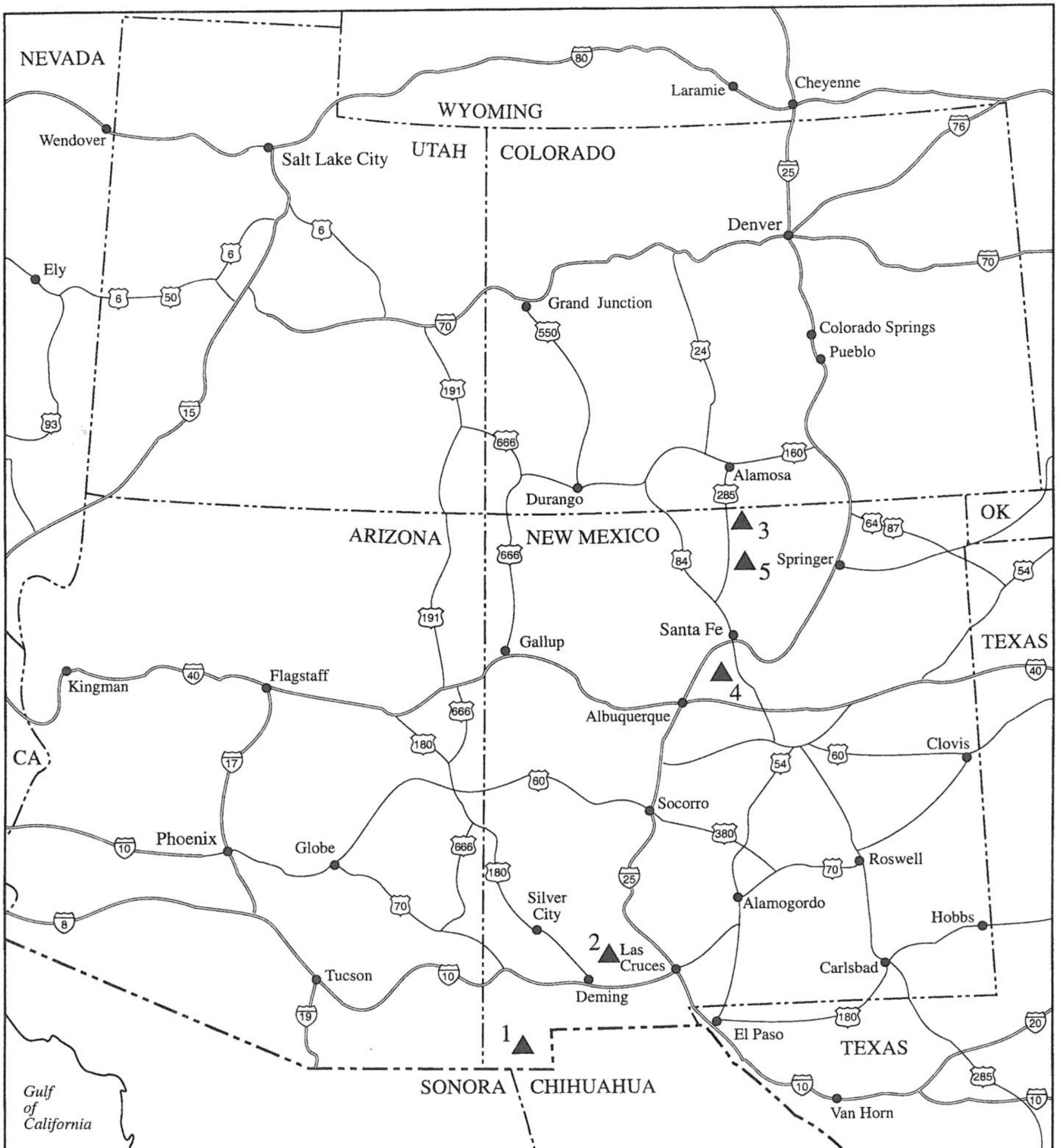
The Mineral Symposium is organized each year by the Mineral Museum at the New Mexico Bureau of Geology and Mineral Resources.

Sponsors this year include:

Albuquerque Gem and Mineral Club
Chaparral Rockhounds
Los Alamos Geological Society
New Mexico Geological Society

The 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 allows for intimate discussions among all interested in mineralogy and associated fields.

New Mexico minerals on the cover: top left — pyrolusite, top right — halite, bottom left — malachite pseudomorph of linarite, and bottom right — magnetite.



Geographic Index Map
25th New Mexico Mineral Symposium

SCHEDULE

Numbers in parentheses refer to geographic location on the index map.

FRIDAY, NOVEMBER 12, 2004

6:00 p.m. Informal tailgating and social hour individual rooms, Super 8 Motel (free)

SATURDAY, NOVEMBER 13, 2004

8:30 a.m. Registration: Macey Center, continental breakfast

9:20 a.m. *Opening remarks*, main auditorium

9:30 a.m. *Early commercial mineral collecting in New Mexico as represented in the Mineral Collector (1894-1909)* — Virgil W. Lueth

10:00 a.m. *(1) New mineral occurrences from New Mexico's bootheel* — Ramon S. DeMark and Paul F. Hlava

10:30 a.m. Coffee break

11:00 a.m. *Gemstones of New Mexico* — Robert M. North and Virgil W. Lueth

11:30 a.m. (2) *Microminerals of the Cooke's Peak and Old Hadley districts, Luna County, New Mexico* — Joan Beyer and Robert E. Walstrom

12:00 p.m. Lunch

1:00 p.m. Museum tours

2:00 p.m. (3) *Minerals of the Questa mine, Taos County, New Mexico* — Virginia T. McLemore, Virgil W. Lueth, Amanda Rowe, and Bruce M. Walker

2:30 p.m. *Rhodochrosite and other manganese minerals in Arizona* — Les Presmyk and Raymond Grant

3:00 p.m. Coffee break

3:30 p.m. *(4) San Pedro mine: A closer look at its ownership and minerals* — Jerry Simmons

4:00 p.m. *Lunar geology and mineralogy*— Harrison H. Schmitt, featured speaker

5:30 p.m. Sarsaparilla and suds: cocktail hour, cash bar

6:30 p.m. Dinner followed by an auction to benefit the New Mexico Mineral Symposium

SUNDAY, NOVEMBER 14, 2004

8:15 a.m. Morning social: coffee and donuts

9:00 a.m. *Welcome to the second day of the symposium and follow-up remarks*

9:10 a.m. *Known minerals unreported from New Mexico districts* — Larry Caviggia

9:40 a.m. *New Mexico gold throughout history* — Robert W. Eveleth and Virgil W. Lueth

10:10 a.m. Coffee break

10:40 a.m. *The wealth of New Spain: Conquistador silver in Mexico* — James McGlasson, Peter K. Megaw, and Virgil W. Lueth

11:10 a.m. *Four Corners mineral news 2004* — Patrick Haynes

11:40 a.m. (5) *Petalite on the Rio Cieneguilla: examining a footnote in Northrop's Minerals of New Mexico* — Jesse M. Kline

12:00 p.m. Lunch

1:15 to 3:00 p.m. Silent auction, upper lobby, Macey Center, sponsored by the Albuquerque Gem and Mineral Club for the benefit of the Mineral Museum (FREE)

Early commercial mineral collecting in New Mexico as represented in the *Mineral Collector* (1894-1909)

Virgil W. Lueth
New Mexico Bureau of Geology and Mineral Resources
New Mexico Institute of Mining and Technology
801 Leroy Place, Socorro, NM 87801

The Mineral Collector, published from March 1894 until February 1909, was America's first popular mineral magazine. The 15-yr run recorded the mineral collecting history of the nation during a period of intense interest in the natural sciences. Articles and advertisements highlight the mineral specimens coming out of New Mexico. The information from this magazine, coupled with correspondence and reports found in the New Mexico Bureau of Geology and Mineral Resources mining archives, provides a record of the collecting history of New Mexico during the period.

The first New Mexico mineral specimen encountered in the magazine is in the fourth issue, and it is the editor himself, Arthur Chamberlain, advertising "Peridotes, N.M., one-half carat 50cts." Later that year Chamberlain advertises "Descloisite, N.M." probably from Lake Valley. George English advertises "Shipments from New Mexico" and follows the ad with a list of material including "Cerussite from New Mexico in elegant groups of twins 5 ¢ to $5.00; large museum specimens, $10.00 to $25.00." "Yellow wulfenites" soon follow and, along with the cerussite, probably came from the Stephenson—Bennett mine in the Organ Mountains. An article by Maynard Bixby mentions silver specimens from Bullard Peak, the Solid Silver and Bremen mines near Silver City, and the Bridal Chamber at Lake Valley. Some dubious localities are also advertised (not unlike today), such as the American Jewel mines offering "Aquamarine that abounds in New Mexico and Arizona!"

First mention of smithsonite, "of a color and and luster which exceeds that of the Grecian specimens" is an advertisement by A. E. Foote in the first issue of 1895. F. G. Hillman offers quartz crystals from New Mexico in addition to an editorial note about their unusual shapes and colors that suggests they are the first offered from the Steeple Rock/Mule Creek area. The unusual pink chalcedony "buttons" from around Socorro also make their appearance in the magazine at this time. "Quartz, small red crystals from New Mexico, very pretty, 10 ¢ each, 3 for 25 ¢. postpaid" are offered in 1895 by Niven & Hopping, marking the first documented sales of Pecos diamonds.

The "glory days" of New Mexico minerals in the popular literature and advertisements spanned the years from 1894 to 1899. Ads offer wulfenite, cerussite, altaite, flos ferri, and quartz from Organ; smithsonites and cerussites from Magdalena; red descloisite and silver vanadinite from the Commercial mine; graphite from Madrid; copper after azurite from the Copper Rose mine; wolframite and helvite (probably from Victorio); and melanotekite and fine yellow endlichite from Hillsboro. New Mexico turquoise is commonly offered for sale. New Mexico almost disappears from the mineralogical scene from 1900 to 1907. Interestingly, aurichalcite from Magdalena does not show up until 1904, but when it does it creates a sensation and rejuvenates interest in the minerals from the state. The last two issues of *The Mineral Collector* teem with New Mexico articles on meershaum and turquoise and ads that not only offer the "New Mexico staples" but also molybdenum, bismutite, and a new find of red vanadinite from Kelly.

More significant, however, might be those items advertised yet never seen today or specimens from what are now famous localities yet unmentioned. Of the latter, native copper and cuprite from Santa Rita are never mentioned although fine malachite specimens are noted! One of the more common mystery specimens is "drusy hematite on lava, NM" offered by George English. Embolite on quartz is also offered for sale, but unfortunately no location information is ever given. Most significant to modern collectors of New Mexico minerals is the complete lack of fluorite specimens in ads or articles. In fact, in an article discussing mineral products of the United States, New Mexico is not even mentioned in fluorspar production for 1908. However, it would soon achieve prominence as the largest producer in the West after 1909, the year *The Mineral Collector* ceased to exist.

New mineral occurrences from New Mexico's bootheel

Ramon S. DeMark[1] *and Paul F. Hlava*[2]
[1]8240 Eddy Avenue, N.E., Albuquerque, NM 87109
[2]4000 Smith, S.E., Albuquerque, NM 87108

(Location 1 on the index map)

The mines of New Mexico's "bootheel" are unfamiliar to many mineral collectors due to the remote location and stifling summer heat. The area does, however, have an extensive mining history and a diverse mineralogy. The Apache mine just south of Hachita and the Red Hill mine on the east slope of the Animas Mountains were visited in April and May of 2004 in search of new and/or interesting mineral occurrences.

The Apache mine has been studied extensively by Strongin (1958) and Peterson (1976), and Lueth (1996) revealed new information on the mineralogy of the mine in a presentation at the Seventeenth Annual New Mexico Mineral Symposium. These sources should be consulted for a thorough description of the mine.

Specimens were collected exclusively from dump material south of the collapsed main stope at the Apache mine. Ten species not previously reported from the mine were identified by a combination of microprobe analysis and physical characteristics. New to the Apache mine are bromargyrite, cuprotungstite, hemimorphite, jixianite, mottramite, rosasite, shattuckite, stolzite, willemite, and wulfenite. Jixianite [Pb $(W, Fe)_2(0,0H)_7$] has been reported from only two locations world wide, Jixian, Hebei, China, and the Clara mine in Germany. The Apache mine is the first North American occurrence of jixianite. It was found in a single 7.5 x 10-cm (3 x 4-inch) specimen associated with scheelite, cuprotungstite, bromargyrite, calcite, and muscovite (sericite). Crystals are bright crimson red octahedra averaging approximately 20 R. Many of the crystals exhibit spinel law twinning. Shattuckite [Cue_5^{2+} $(SiO_3)_4(OH)_2$] was found sparingly in a limited area on one of the dumps. It occurs as robin's egg blue spheres and blebs as much as 5 mm embedded in calcite and in gossan associated with malachite, bismutite, and pyrite altered to goethite.

The Red Hill mine visit was prompted by the receipt of a package containing two wulfenite specimens from Mickey and Elaine Raine of Clifton, New Jersey. The specimens were accompanied by hand-written labels reading "Wulfenite, Red Hill mine, W. of Hachita, NM, 3-23-43." One label included the initials R.R.R. There is no mention of wulfenite from this area in Northrop's (1966) *Minerals of New Mexico;* however, a Red Hill district and Red Hill mine in the Animas Mountains about 30 mi southwest of Hachita were described. Also referenced was the USGS Walnut Wells quadrangle map. This information led to New Mexico Bureau of Mines and Mineral Resources Bulletin 84, 1965, *Geology of the Walnut Wells quadrangle, Hidalgo County, New Mexico,* by R. A. Zeller, Jr., and A. M. Alper. A thorough description of the Red Hill mine is contained in this publication and surprisingly, a mention of wulfenite and pyromorphite! Inspired by this information, arrangements were made to travel to the bootheel on the 18th of April to see what minerals could be found. Mine workings consist of a vertical shaft (partially caved) and "glory hole" trenches following the quartz vein, which contains the ore minerals galena, anglesite, and cerussite. There are several dumps and a long, ramplike structure made up of dump material plus some collapsed mine structures. Small wulfenite crystals are found in the quartz vein along with small, steeply pyramidal white crystals that were determined by microprobe analysis to be vanadinite. Cerussite is common on the dumps along with relict galena and green botryoidal mottramite (var. psittisinite). Micro hemimorphite and rosasite were also found in dump material. Another trip was made on the 23rd of May to search for additional specimens and to take photographs. Wulfenite specimens were found in a limited area on one of the dumps that exactly matched those of the Raine specimens that were apparently collected in 1943. The crystals were caramel-colored, prismatic to tabular, and as much as 5.5 mm. Micro willemite, vanadinite, mimetite, coronadite, and pyromorphite (identified by microprobe analysis) were also found. Species new to the Red Hill mine are coronadite, hemimorphite, mimetite, rosasite, vanadinite, and willemite. A large mass that appeared to be cerussite was found on the "ramp" during this visit. When broken, it was solid galena with a rind of anglesite/cerussite. The mass weighed 8.64 kg (191b)!

References

Lueth, V. W., 1996, Secondary bismuth minerals from the Apache mine, Hidalgo County, New Mexico (abs): New Mexico Bureau of Mines and Mineral Resources, 17th Annual New Mexico Mineral Symposium, p. 4.

Northrop, S. A., and LaBruzza, F. A., 1996, Minerals of New Mexico: University of New Mexico Press, Albuquerque, New Mexico, 356 pp.

Peterson, S. L., 1976, Geology of the Apache No. 2 mining district, Hidalgo County, New Mexico: Unpublished M.S. thesis, University of New Mexico, 86 pp.

Strongin, 0., 1958, Geology and ore deposits of the Apache Hills and northern Sierra Rica, Hidalgo County, New Mexico: Unpublished Ph.D. dissertation, Columbia University, 222 pp.

Zeller, R. A., Jr., and Alper, A. M., 1965, Geology of the Walnut Wells quadrangle, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Bulletin 84, 105 pp.

Red Hill mine, Hidalgo County, New Mexico
Mineral List

Anglesite	+Mimetite
Azurite	+Mottramite
Calcite	Pyromorphite
Cerussite	Quartz
Chlorargyrite	+Rosasite
Chrysocolla	*Siderite
+Coronadite	*Sulphur
Galena	*Turquoise
+Hemimorphite	+Vanadinite
Jarosite	+Willemite
Malachite	Wulfenite

Apache mine, Apache #2 district, Hidalgo County, New Mexico
Mineral List

*Actinolite	Covellite	Malachite
Andradite	+Cuprotungstite	+Mottramite
*Anglesite	Epidote	Muscovite
*Aurichalcite	Fluorite	#*Perite
#*Bismite	Galena	Pyrite
#*Bismoclite	Goethite	*Pyrolusite
*Bismuthinite	*Gold	Quartz
Bismutite	Gypsum	+Rosasite
+Brormargyrite	Hematite	Scheelite
Calcite	*Hedenbergite	+Shattuckite
*Caledonite	+Hemimorphite	*Smithsonite
Cerussite	*Hydrozincite	*Sphalerite
Chalcopyrite	Jarosite	+Stolzite
*Chlorargyrite	+Jixianite	+Willemite
Chrysocolla	*Kettnerite	*Wolframite
	*Magnetite	

+ Not previously reported
* Reported but not observed
# Tentative Identification

Gemstones of New Mexico

Robert M. North[1] *and Virgil W. Lueth*[2]
[1]Chino Mines Company, Hurley, NM 88023
[2]New Mexico Bureau of Geology and Mineral Resources
New Mexico Institute of Mining and Technology
801 Leroy Place, Socorro, NM 87801

A gem is defined as "a precious or semiprecious stone that may be used as a jewel or ornament when cut and polished." A gemstone is defined as "a mineral or petrified material that when cut and polished can be used in jewelry." Although probably best known for its turquoise deposits, New Mexico has a number of minerals and rocks that fit this definition. Two general types of true gem material occur in the state: single mineral grains that can be faceted or polished and mineral aggregates that can be cut, polished, and worn as ornaments. Additionally, some mineral specimens have historically been used as ornaments with little modification from their natural state.

Crystals of feldspar, olivine, fluorite, and quartz from New Mexico have been faceted into gems. Pale-- to golden-yellow feldspar from Pueblo Park in Catron County and near Hatch in Dona Ana County, described as bytownite but more likely labradorite, has been faceted into some very attractive gems. Peridot, the gem variety of olivine, occurs at Kilbourne Hole, a volcanic maar in Dofia Ana County and in the Navajo Nation associated with ultramafic intrusions. Fluorite is a common mineral in New Mexico that commonly occurs as large, transparent to translucent crystals. Although too soft to be used in jewelry, fluorite has been faceted into large stones for display. Grant County is known for the production of the moonstone variety of sanidine from a pegmatite in Rabb Canyon. This locality has produced both facet-grade material and samples that can be polished into small chatoyant cabs. Facet-grade amethyst is found in lithophysal cavities in rhyolite southwest of Mule Creek in Grant County (west of Brushy Mountain) and in recently rediscovered vein deposits in the Ladron Mountains in Socorro County. Non facet-grade material is also found in a number of ore deposits around the state. Beryl deposits in the pegmatite deposits of Rio Arriba, Taos, and San Miguel Counties have produced a disappointingly small number of goshenite, morganite, and aquamarine gemstones. Yellow apatite of sufficient size and clarity for faceting has been produced from the Organ Mountains. Green titanite crystals from northern New Mexico have also been faceted into small stones.

Mineral aggregates are here defined as masses of relatively fine grained minerals but typically are masses of a single mineral with minor impurities. Smithsonite from the mines of the Kelly district in Socorro County is an example. Crystalline masses of opaque to translucent blue or yellow smithsonite can be polished into cabochons or cut and polished, for example, into an emerald-cut stone. Luna County has produced some interesting polishing materials including dumortierite $A1_7(B0_3)(SiO_4)_30_3$ and spurrite $Ca_5(SiO_4)_2(CO_3)$ from zinc skarns in the Tres Hermanas district and agate from several localities. Turquoise has been produced from the Tyrone, Santa Rita, Hachita, and Hanover—Fierro districts of Grant County since pre-Columbian times in addition to the famous Cerrillos deposits of Santa Fe County. Ricolite, a commercial name for a mixture of serpentine and talc from Ash Canyon in Grant County, has been cut, polished, and carved into many interesting and beautiful shapes.

Some minerals have served as ornaments without any enhancement from their original form, other than cleaning. Native copper has been found in several districts, most notably Santa Rita, and served as ornaments for the earliest discoverers of the deposit. More commonly, the native copper was pounded around small rocks and fashioned into bells by, for example, the Mogollon culture ca 900 A.D. Azurite crystals and crystal aggregates (rosettes) have been collected from a clay-filled shear zone along the Barringer fault at Hanover Mountain in the Hanover—Fierro district. Small crystals have been matched and set in silver earrings.

Collecting in some of the named areas is restricted, whereas other areas are open. Information can be obtained from the New Mexico Bureau of Geology and Mineral Resources (http://geoinfo.nmt.edu) or from local mineral clubs.

Microminerals of the Cooke's Peak and Old Hadley districts,
Luna County, New Mexico

Joan Beyer[1] and Robert E. Walstrom[2]
[1]5030 Beyer Rd, Las Cruces, NM 88011
[2]P.O. Box 1978 Silver City, NM 88062
walstromminerals@gilanet.com

(Location 2 on the index map)

COOKE'S PEAK DISTRICT—Cooke's Peak is the highest point in Cooke's Range, approximately 24 mi northeast of Deming. It is reached by taking US-180 north from Deming, then turning east on NM-26 to the Florida Siding where a dirt road leads north to Cooke's Peak. Access is via a locked gate with permission from the rancher. The last few miles require four-wheel drive.

The greatest activity at Cooke's Peak took place from 1880 to about 1905 in the San Jose district on the west side, the Cooke's Peak district on the east side, and the Old Hadley near the southeast base. During that time the three districts annually produced about 1.5 million lb of lead and 6,000 oz of silver (Jicha 1954). The most productive claims, the Desdemona, Othello, and Summit Groups, were located in the Cooke's Peak district and accounted for $2,350,000 of the total production up to 1910 (Lindgren et al. 1910). The mining camp on the east slope grew into a flourishing town named Cooks (note the different spelling), which boasted a post office, school, mercantile, and saloon (Couchman 1990). By 1910 the richest oxidized ores were depleted, although mining continued on a smaller scale for lead, zinc, silver, and copper until 1953 (Jicha 1954). By then Cooks had dwindled to a ghost town and has since disappeared.

Cooke's Peak consists of faulted sedimentary rocks intruded by a Late Cretaceous or early Tertiary granodiorite stock. Some Tertiary volcanics crop out near the base. Orebodies occur as fissure fillings and modified mantos in Silurian limestone. Primary minerals galena and sphalerite are deeply oxidized to form the principal ore minerals cerussite and smithsonite (Lindgren et al. 1910; Jicha 1954). Lesser amounts of copper and a good deal of fluorite are also present.

Most of the collectable microcrystals are secondary lead and zinc minerals but also include copper secondaries and fluorite. The appeal of these common species lies in their variety of colors and crystal habits:

- Copper minerals are sparse, aurichalcite and malachite being somewhat more abundant than azurite and rosasite.
- Cerussite occurs as milky or clear elongate crystals, v-twins, reticulated groups, and most desirably as peach-pink twinned crystals.
- Fluorite microcrystals are common as colorless cubes, frequently modified by octahedron or dodecahedron faces, and sometimes zoned with purple. Pale to deep purple cubes or octahedrons line some pockets.

Cooke's Peak is the type locality for plumbojarosite, found as aggregates of yellow, brownish, or greenish platy crystals. A sample of identical crystals grading from golden yellow to dark brown thought to be jarosite was identified as corkite. Tiny opaque-white hexagonal prisms associated with similar crystal aggregates proved to be pyromorphite. These are the only phosphates found to date. Pyromorphite can be sight identified, but corkite and plumbojarosite can only be distinguished by analysis.

The principal mineral of interest is wulfenite. It occurs in a great variety of habits including prismatic, tabular, pyramidal, and blocky and ranges in color from almost colorless grayish to yellow, orange, many shades of brown, and even green. Brown wulfenites are usually associated with or perched on clear or color-zoned fluorite.

OLD HADLEY DISTRICT—The Old Hadley (Graphic) district is located a short distance southeast and on the southern approach to the Cooke's Peak district. The district is a small one, covering 1 mi east to west and 2.5 mi north to south. The area, at 5,600 ft elevation, contains perhaps 15 mines and prospects of which three probably had significant production. Predominate rock types include Tertiary pyroxene andesite of the Macho series and quartz latite. An intrusive granodiorite stock, from which the district's mineralized fluids were derived, is located 2,000 ft west of the main vein systems. Fissure veins, made up of barite and quartz gangue strike generally north-northeast and dip steeply to the east throughout the district. These veins contain value in the form of argentiferous galena, sphalerite, and copper minerals. References indicate a total production of $1.2 million for all mines combined. Most of the mining properties in the district were patented in 1899 and are now under the control of Hyatt Ranches.

The Graphic mine, located in the geographic center of the district, was by far the most productive property in terms of value. Large prominent white dumps consisting of processed vein material can be seen from the main dirt road passing through the area. A few sphalerite crystals along with massive galena can be picked up on the dump. The main 650-ft shaft is caved to the surface. The Copper mine is located at the extreme northern end of the district. The property consists of several shafts, one reported to be 70 ft deep, and small pits. The mine has produced the following minerals of interest to collectors: wulfenite, vanadinite, mimetite, fornacite, mottramite, willemite, dioptase, murdochite, plancheite, creaseyite, bromargyrite, chlorargyrite, barite, quartz, and many chrysocolla pseudomorphs. The Rock Island mine property is located adjacent to the Copper mine on the south. The small dumps associated with several shallow shafts and pits have produced vanadinate and barite crystals. The Hub mine is located just north of the Graphic mine, and the dump around a caved shaft has produced descloizite and vanadinite crystals. The Keystone mine is located just south of the Graphic property and consists of a shaft with the remains of an old hand winze. The small amount of dump material available produced wulfenite, barite, mimetite, vanadinite, descloizite, mottramite, and galena crystals. At the far southern end of the district is located the Section 4 prospect. Here, the dump material from a pit consists of small vugs formed from vacated feldspar crystals in silicified andesite. The vugs contain small lustrous microcrystals of sphalerite, galena, quartz, barite, jarosite, and gypsum. The last property of consequence is the Jumbo mine located a short distance west of the Section 4 prospect. The property consists of one large open shaft and large white dump. Several small pits nearby produced dark-blue lathlike azurite crystals, barite blades, and cubic galena crystals.

Acknowledgments

Special thanks to Ron Gibbs for mineral specimen photography and for computerizing the presentation, to Bob Eveleth and staff at the New Mexico Bureau of Geology and Mineral Resources for access to the archives, to the volunteers at the Deming-Luna County Museum and staff at the Museum of New Mexico for helping to locate historical photographs, and to Leedrue Hyatt for permission to cross his ranchland.

References

Couchman, D. H., 1990, Cooke's Peak—pasaron por aqui—a focus on United States history in southwestern New Mexico (cultural resources): Bureau of Land Management, Las Cruces District, Mimbres Resource Area, 268 pp.

Jicha, H. L., Jr., 1954, Geology and mineral deposits of Lake Valley quadrangle, Grant, Luna, and Sierra Counties, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Bulletin 37, reprinted 1980, 93 pp.

Lindgren, W., Graton, L. C., and Gordon, C. H., 1910, The ore deposits of New Mexico: U.S. Geological Survey, Professional Paper 68, 361 pp.

Minerals of the Questa mine, Taos County, New Mexico

Virginia T. McLemore[1], Virgil W. Lueth[1], Amanda Rowe[2], Bruce M. Walker[3], Ramon S. DeMark[4] and Paul F. Hlava[5]

[1]New Mexico Bureau of Geology and Mineral Resources
New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801
[2]Department of Earth and Environmental Science
New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801
[3]Molycorp, Inc., P.O. Box 469, Questa, NM 87556
[4]8240 Eddy Avenue, N.E., Albuquerque, NM 87109
[5]4000 Smith, S.E., Albuquerque, NM 87108

(Location 3 on the index map)

The Questa Mine, Taos County, New Mexico, is a porphyry molybdenum deposit. Porphyry molybdenum deposits are large, low-grade deposits that contain disseminated and stockwork veinlets of molybdenum sulfides and are associated with porphyritic intrusions. Climax and Henderson are examples of other large porphyry molybdenum deposits that have yielded numerous mineral specimens. Recent development of the underground Questa orebody and ongoing studies of the mine rock piles, open pit, and nearby alteration scars have lead to the recognition of minerals not previously associated with the deposit. This presentation will describe these new discoveries.

The deposit was first famous for collectable specimens of molybdenite and ferrimolybdite that were produced from old underground workings and the open pit. Questa's molybdenite occurs in three associations: "dotty" molybdenite, vein molybdenite, and thin fracture fillings of "paint" molybdenite, each of which reflect different stages of mineralization. Clotty molybdenite occurs as a component of a coarse breccia matrix and is crosscut by later vein molybdenite. Paint molybdenite cuts both vein and dotty moly. Minerals typically associated with the Questa molybdenite mineralization include: fluorite, calcite, rhodochrosite (generally pale), anhydrite, galena, and dolomite. As is common with stockwork molybdenum deposits, these minerals were typically found in veins with limited amounts of open space and highly collectable minerals specimens were the exception. Galena is found intergrown with the molybdenite. The presence of fluorite as disseminations in feldspar at Questa is consistent with the pegmatitic high-fluorine nature of the deposit, which suggests the Questa deposit is similar to the Henderson, Colorado molybdenite deposit.

New minerals identified in the recent phase of mining breccia and vein type deposits in the operational underground workings include: beryl (aquamarine and emerald), celestine, and topaz. The greater abundance of open space in these deposits has lead to the discovery of a number of collectable specimens. In addition, exploration drilling has revealed some tungsten minerals, especially wolframite.

Together these data suggest that the Questa molybdenite deposit was formed by highly-fractionated, complex magmatic fluids similar to those that formed the Henderson and Climax deposits.

Rhodochrosite and other manganese minerals in Arizona

Les Presmyle[1] and Raymond Grant[2]
[1]P.O. Box 1273, Gilbert, AZ 85233
[2]3262 Monterey St., Chandler, AZ 85226

Manganese minerals are widespread throughout Arizona. During the world wars a large amount of manganese was mined in Arizona, and the Artillery Peak area of west-central Arizona contains manganese deposits rated as among the four or five largest low-grade manganese mineral deposits in the United States (Chapman 1962).

There are more than 70 minerals that contain manganese found in Arizona (Anthony et al. 1995). Several of the Arizona manganese minerals are found in pegmatites, including the 7U7 Ranch locality. The 7U7 Ranch is the type locality for two manganese minerals, bermanite and paulkerrite. Manganese minerals are also commonly found associated with copper, silver, lead, and zinc deposits in Arizona. The type locality for coronadite is the west end of the Coronado vein near Morenci. In many of these veins the manganese is present as oxides included in black calcite veins. So, why is there manganese oxide and calcite in these veins instead of rhodochrosite?

Mineral collectors probably do not think of Arizona as a state that has produced fine specimens of rhodochrosite, and they are right. Although the rhodochrosite from Arizona does not compare with specimens from Colorado, there are a number of interesting localities. The *Mineralogy of Arizona* (Anthony et al. 1995) 13 rhodochrosite localities for the state.

The earliest described rhodochrosite from Arizona was found in Bisbee at the Junction mine, 1500 level, 78 stope and the Briggs mine, 1500 level, 104 stope by Bateman et al. (1914). It was found at the Trench mine in Santa Cruz County with alabandite, the manganese sulfide, by Schrader and Hill (1915). Similar occurrences of rhodochrosite with alabandite are reported from the Lucky Cuss mine in Tombstone, Higgins mine in Bisbee, and the Humbolt mine in the Chiricahua Mountains—all in Cochise County, Arizona, and described by Hewett and Rove (1930).

The best rhodochrosite in Arizona comes from the 2300 level of the Junction mine in Bisbee. The following is a description of this occurrence by Richard Graeme, unpublished manuscript, *Mineralogy of Bisbee* (2004).

> "This was the most prolific locality for rhodochrosite in the district. Here it was usually found as massive material in alabandite and associated with sphalerite. It also rarely occurred as small, pale pink tabular crystals in massive alabandite and as 2 mm highly modified scalenohedrons in small voids in alabandite. These voids were usually at the limestone contact with the sulfides."

Other localities of interest include the Magma mine in Superior, Arizona, with rare small pale pink to red crystals in the south vein described by Barnes and Hay (1983) and collected by one of the authors. Nodules of iron oxide and rhodochrosite are reported from the Chinle Formation in Antelope Valley near St. Johns, Apache County. Finally, a 4-ft-wide rhodochrosite vein is reported at a depth of 120 ft in the shaft of the London Range mine in the Banner district, Gila County (Ross 1925). Unfortunately, the exact location of this mine and the rhodochrosite vein are not known.

References

Anthony, J. W., Williams, S. A., Bideaux, R. A., and Grant, R. W., 1995, Mineralogy of Arizona: University of Arizona Press, Tucson, Arizona, 508 pp.

Barnes, R., and Hay, M., 1983, Famous mineral localities—the Magma mine: Mineralogical Record, v. 14, pp. 72-82.

Bateman, M. N., and Murdoch, J., 1914, Secondary enrichment investigations; notes on Bisbee, Arizona: Unpublished notes, Harvard University, Mineralogical Museum files, 240 pp.

Chapman, T. G., editor, 1962, The mineral industries of Arizona: Arizona Bureau of Mines, Bulletin 169, 20 pp.
Hewett, D. F., and Rove, 0. N., 1930, Occurrence and relations of alabandite: Economic Geology, v. 25, pp. 36-56.
Ross, C. P., 1925, Geology of the Saddle Mountain and Banner mining districts: U.S. Geolgical Survey, Bulletin 771, 72 pp.
Schrader, F. C., and Hill, J. M., 1915, Mineral deposits of the Santa Rita and Patagonia Mountains, Arizona: U.S. Geological Survey, Bulletin 624, 412 pp.

San Pedro mine: A closer look at its ownership and minerals

Jerry Simmons
Southwestern Indian Polytechnic Institute
9169 Coors Rd. NW
Albuquerque, NM 87184

(Location 4 on the index map)

The San Pedro mine, near the town of Golden, New Mexico, is located in one of the oldest placer gold fields in North America. Along with its 200-250 yrs of existence are tales and stories that rival the best of treasures of gold/wealth as well as boom/bust. As with most such locations, facts, dates, and names tend to get lost or obscured with the passing of time. One of the main objectives of current work is to uncover, sort, and as accurately as possible assemble the details of ownership of the San Pedro mine. Subsequent goals are to gain a better understanding of the bigger picture as it relates to the individuals who controlled the mine as well as continue the search and reporting of new minerals and/or confirm reports of some specimens at the location.

The "modus operandi" for this whole project, now in its seventh year, is the publishing of a book and other documents (including a CD) that will give a reasonably accurate picture of the mine's owners, tales and stories of discovery, chronology of events, geology, and mineralogy. Plans are to also include color pictures of all the minerals found on site. Involved in this ambitious project have been *many* hours of walking both above and underground, photographing, collecting and cataloging, analysis of specimens, talking to key individuals, searching the literature for information, leading tours, presenting, and writing.

This past year's work has resulted in some significant information and discoveries that add further to the lore of the San Pedro mine. Most significantly has been the connection of the San Pedro to copper mines in Butte, Montana; Copper Basin in Tennessee; and the Globe mines in Arizona via its ownership. Mineralogically the discovery of smoky and amethyst quartz scepters, ankerite, anatase, brookite, brochantite, common opal, scheelite, and powellite (a molybdenum bearing variety of scheelite) have either expanded and/or confirmed reported minerals found at the location.

In summary, recent work has shown that connections to other big name copper mining locations is a very important component in the history of the San Pedro mine, and there are still minerals species, new to the location, to be found in this contact metamorphic, metasomatic setting.

Sources

Butte-Silver Bow Public Archives, 2003, research work on Lewisohn brothers in Butte, Montana.
Glasscock, C. B., 1935, The war of the copper kings; builders of Butte and wolves of Wall Street: Grosset and Dunlap, New York, 314 pp.
Gobla, M., 2004, pers. comm., the Butte, Montana, mines.
Engineering and Mining Journal, 1891, Prominent men in the mining industry.
Lee, C. G., and Atkinson, W. W., Jr., 1985, Geochemistry of zoned garnets from the San Pedro mine, Santa Fe County, New Mexico: New Mexico Geology, v. 7, no. 4, pp. 69-74.
Santa Fe New Mexican, 1900-1912, The San Pedro mine and mill.
Williams, C., in progress, The San Pedro mine: Sacramento, California.

A Trip to the Moon and Beyond

Harrison H. Schmitt
P.O. Box 90730
Albuquerque, NM 87199
505 823 2616

The last Apollo mission to the moon, Apollo 17, left Earth on December 7, 1972, at 12:40 a.m., to land near the southeastern edge of Mare Serenitatis in the Valley of Taurus-Littrow. For 75 hrs, Gene Cernan and the author lived and worked in that valley. We performed extensive geological studies of the volcanic rocks that partially fill the valley, the boulders that rolled into the valley from the surrounding mountains, and the meteor impact generated soils that cover the valley floor and sloping walls. Successful exploration of Taurus-Littrow capped a six mission investigation of the materials and history of the Moon. The determination of optical properties of the lunar surface was one of the fundamental objectives of lunar exploration from the early days of the lunar mapping program, the Ranger and Surveyor unmanned programs, and Apollo exploration. At the conclusion of all these studies, science had gained a first order understanding of the evolution of the Moon as a planet. Humankind also had gained knowledge of new resources in the soils of the Moon that may help solve many energy and environmental problems on Earth and help initiate the exploration and settlement of Mars.

Known minerals unreported from New Mexico districts

Larry Caviggia
P.O. Box 1376
Gallup, NM 87305

There are minerals from mining districts of New Mexico that were unreported in *Minerals of New Mexico* by Stuart A. Northrop. This is also the case in the third editiGn by Florence A. LaBruzza. This paper is an attempt to report some of them and also to show a few minerals from places not mentioned at all.

Aragonite—Cibola County at the Mirbal mine in Diner Canyon. Found in granite and associated with barite, fluorite, and native silver.

Augite--Catron County west of Pueblo Park. The location is 8 mi west of Pueblo Park and on the sides of Forest Road 232 below Saddle Mountain. Found as small and medium crystals in basalt on the side of road. The only other reference to augite for Catron County, in Northrop, is in the Mogollon district.

Aurichalcite—Grant County about 2 mi west of the junction on NM-152 from Hanover. A gravel road goes north to a gravel-pit operation. The location is close to the highway on the north side of the road where some prospect pits are west of the gravel operation road and its junction with NM-152. Aurichalcite occurs with grossular garnets and barite in the rock on the slag piles of the prospect pits.

Beryl (Aquamarine)—Cibola County at East Grants Ridge. Found in the form of small rounded masses in rhyolite and associated with red garnets (spessartine) and topaz.

Calcite—Pecos mine at Willow Creek, San Miguel district. Found as crystals covered with a dusting of malachite and associated with pyrite, actinolite, and tourmaline variety schorl. Northrop mentions calcite at the Rociada and Tecolote districts.

Calcite (variety travertine)—a short distance west of Twin Buttes at the west end of Gallup.

Chlorite—Zuni Mountains district at the west end of the range. Associated with epidote and milky quartz.

Epidote—McKinley County, Zuni Mountains in the western end of the district. Found in both crystal and massive forms and associated with chlorite and quartz.

Halotrichite--Becenti mine located on the Sundance Coal mine road 6 mi southeast of Gallup. Associated with carnotite.

Hematite—Cibola County around Bluewater Lake. Found on the southeast side of the lake. Pseudomorphs after pyrite and magnetite.

Hematite (variety specularite)—around Red Lake north of Navajo. Associated with pyrope and olivine.

Manganocalcite—Grant County on the dumps north of Fierro. Associated with andradite and magnetite.

Marcasite—San Juan County along US-666 north of Little Water. Associated with dogtooth calcite in weathered basalt. Also found in ball-like formation in a mine on the east side of the Hogsback formation near Gallup. (see halotrichite). Also associated with coal in McKinley County.

Molybdenite—Grant County, Pinos Altos district. Found in both crystal and massive forms and associated with pyrite. Molybdenite at this locality is not cited in Northrop.

Olivine (Peridot)—Catron County north of Luna in the S. A. Creek area at Black Gap. Associated with pumice. (Black Gap and Forest Road 6 and Kurrath road). Also found in the basalt at the Twin Buttes formation near Gallup and in basalt on the Zuni River (junction of NM-53 and ETA 4).

Pyrite—Georgetown district on the dumps. Associated with vanadinite and descloizite. Pyrite is not cited in Northrop for Georgetown district.

Quartz–McKinley County west end of the Zuni Mountains. Milky quartz associated with epidote and chlorite.

Rhodonite—Bear Mountain area north of Silver City. Massive form. The rhodonite is in an unidentified black mineral. Rhodonite is mentioned in Northrop as found in the Fleming district.

Stibnite—Grant County, Pinos Altos district north of Silver City. Found in a boulder along the highway north of the village, just near where the split pavement from the village comes back together.

Turquoise–Hanover Mountain above Fierro. Found on a dump on the northeast side. The turquoise is always weathered white, but some large samples sometimes have a blue center. It is usually too soft to use for anything. When an oil is put on specimens, they turn blue but are still too soft to work. Associated with malachite and azurite.

New Mexico gold throughout history

Robert W. Eveleth and Virgil W. Lueth
New Mexico Bureau of Geology and Mineral Resources
New Mexico Institute of Mining and Technology
801 Leroy Place, Socorro, NM 87801

Gold, it can be argued', was a major driving force behind the early day exploration and development of southwestern North America. The Spaniards came here seeking it and stole it from the Aztecs in quantities they wrongly assumed to be inexhaustible. When the Aztecs could no longer continue to fill the specified storeroom full of gold, they met their fate at the business end of a sword or musket. Moving northward into present day New Mexico the conquerors voraciously continued their quest for the yellow metal. But the Native Americans were wise to their schemes by this time and kept the Spaniards forever on the march seeking the elusive, treasure-laden "Seven Cities of Cibola" always just beyond the next range of mountains.

The Spanish eventually did manage to find a small quantity of gold in the Land of Enchantment, but most of the major discoveries were made much later by their Mexican and American successors. What they did not fully appreciate at the time is that New Mexico, in truth, is not an area heavily blessed with the precious metal in the native state, and the territory possessed few productive gold placers. Most of New Mexico's gold, with but few exceptions, has been won from the by-product processing of other metals such as copper, lead, zinc, and silver.

Those few exceptions did produce some remarkable gold nuggets. Notable examples include the Old (Ortiz) and New (San Pedro) Placers districts of Santa Fe County, the Nogal—Bonito areas of Lincoln County, and the Elizabethtown—Baldy area of Colfax County. Many others, such as the Hillsboro—Las Animas area, Magdalena Mountains, Pinos Altos, White Oaks, and Hopewell, have produced smaller but collectible specimens, all of which will be discussed in detail.

The wealth of New Spain: Conquistador silver in Mexico

James McGlasson[1], Peter K. Megaw[2], and Virgil W. Lueth[3]
[1]Consulting Geologist, Tucson, AZ (jimmcglasson@comcast.net)
[2]IMDEX, Inc., Tucson, AZ
[3]New Mexico Bureau of Geology and Mineral Resources
New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801

In 1517 when Francisco Hernandez de Cordoba landed on the Yucatan Peninsula, he encountered the vestiges of the once-vast Mayan civilization. The Maya used substantial precious metals in decorative items as well as sacred ceremonial effigies. There was considerably more gold than silver in these objects, because the native gold could be worked without further refining, and the silver in this region is generally confined to complex minerals and not readily available in its native state. Cordoba returned to Cuba telling of the great wealth of gold in the region as demonstrated by the objects that he had seen in the Yucatan. Two years later, on March 13, 1519, Hernando Cortez landed at what is now Vera Cruz on the eastern gulf shore. Along with him, he brought 10 stallions, five mares, and at least one case of smallpox. This date signifies the beginning of the end of the Aztec, Inca, and other Native American civilizations in Latin America. In the vicinity of Vera Cruz, Cortez encountered the thriving Aztec civilization ruled by Montezuma II. The Aztec at first thought that Cortez and his followers were the reincarnation of their God—Quetzalcoatl, but soon determined that these "gueros" (light skinned people) were really there to conquer and plunder their people. By November 1519, Montezuma was a captive of the Spanish, and was then killed by his own people June 30, 1520 while trying to "calm" a crowd of Aztecs, lead by his son Cuauhternoc, as they drove Cortez and the invaders from the city. Cortez returned to capture the city on August 13, 1521, and, with a relatively small force, defeated a civilization of approximately 25 million. On October 15, 1522, Hernando Cortez was appointed governor of Mexico and thus began the reign of the Spanish Empire in the Americas.

Explorers, prospectors, and conquerors were sent out from Mexico City to find the sources of the "Aztec Gold." What they discovered instead was a vast wealth of silver. During the next few years many of the "world class" silver districts of Mexico were "discovered." At least the conquistadores took credit for their discovery, because there is evidence in many districts that the indigenous people had known of these areas for years. The discovery of this vast wealth in silver financed the Spanish Empire for a long period of time, and to this day, the mines of Mexico and Peru are the world's leading producers of silver. Silver production in Mexico has been affected by political events as well as technology.

TAXCO (Guerrero)-1522

The conquistadores Juan de La Cabra, Juan Salcedo, and Muriel and Hernan Cortez began mining silver from the Socavon de Rey (Mina del Pedregal) in 1534. Sporadic mining continued **until** 1747. In 1802 there were several "bonanza" discoveries in the district, but metallurgical problems curtailed major production. In 1920 American Smelting and Refining Company (ASARCO) constructed a floatation plant to treat sulfide ores followed by amalgamation. The property is currently controlled by Industrial Minera Mexico, S.A. (IIVIMSA), and in the late 1980s was producing 3,000 tons per day. It has recently been put back into production after being idle for several years due to depressed metals prices.

PACHUCA (Hidalgo)-1524

This area is located about 60 mi north of Mexico City and includes three areas (Pachuca, Real del Monte, and Moran). This is one of the most famous and productive areas in Mexico. The area represents a confluence of the effects of technology as well as politics on the mining industry in Mexico. The mines were worked continuously from 1524 to 1733, when they were abandoned because of high water flow. Drainage tunnels were constructed, and the mines reopened continuing production for an additional 140 yrs.

GUANAJUATO (Guanajuato)-1529

This district was known as early as 1529, but Juan Rayas, a muleskinner, filed the first recorded claim in 1548. On April 15, 1558, work began on the Mellado shaft resulting in the discovery of the Veta Madre. This vein system underlies the eastern half of the city, and mining continues to the present (555 yrs). By the early 1600s the mines were well developed and many mines had been discovered and developed (Cata, Mellano, Rayas, and Sirena). In 1726 Don Jose de Sardaneta y Legaspi substantially increased production with the introduction of gunpowder to break rock. In 1766 the Valenciana shaft was developed to 230 m. By 1770 production had commenced in the Peregrina, El Monte, San Nicolas, Santa Rosa, and El Cubo areas. Mining activity continued at a high level until 1821 when insurrectionists burned all mine operations, including the headframe of the Tiro Valenciana. The area became a harbor for thieves and criminals until 1868 when the Valenciana was reopened and pumped using a Cornish steam hoist and leather buckets.

FRESNILLO (Zacatecas)-1553

The Fresnillo deposits were discovered shortly after the mineralization at Zacatecas by Francisco de Ibarra by miners traveling from Zacatecas to Sombrerete along the "Camino Real." They noticed a prominent hill on the western skyline and found rich silver ores in outcrop on the flanks of the hill. The hill became known as Cerro Proatio, after Diego Fernandez de Proario, who discovered some of the first small veins in the area. Mining activities in the area continued unti11757 when they were suspended because of water problems in the mines. The mines became property of the government in 1830 and reopened with prison labor in 1833, until production was halted because of cholera and lack of capital. An English company, Compania Zacatecano-Mexicana, took over operations in 1835 and installed two Cornish pumps. The Fresnillo Company was founded in 1910 in New York and leased the mine to the English–Mexican corporation for operation. The two companies eventually merged as the Fresnillo Company of New York. This company began changing its structure in 1961, because the government required all foreign operations to reduce their ownership to 49% by 1975. Indust-has Penoles acquired the 51% majority ownership and ultimately bought the remaining 49% in 1996. However, the mine is still operated as Compania Fresnillo today.

CHARCAS (San Luis Potosi)-1570

There were small mine workings being operated as early as 1570, but the main area of production was not discovered until 1583. Open cut operations in the area of the San Bartolo shaft yielded as much as 1.5 kg / ton silver.

SANTA EULALIA (Chihuahua)-1593

Santa Eulalia has been in continuous production for nearly 300 yrs from 1703 to the present, and ranks as one of Mexico's chief silver and base metal producers with over a half billion ounces of silver recovered. The city of Chihuahua was built by Spanish pioneers on the riches emanating from Santa Eulalia over the first 100 yrs of mining, and, although modern industry now dominates Chihuahua's economy, the grand cathedral and palatial mansions of the old part of the city bear mute testimony to the wealth Santa Eulalia produced for those lucky enough to own the mines and not have to work *in* them.

Significant production from the district did not begin until the early 1700s, but the initial discovery of mineralization is shrouded in myth, romance, and speculation. Several authors have suggested that, long before the Spanish conquest of Mexico, indigenous peoples may have accidentally discovered that silver and lead could be obtained from mineralized outcrops in the district. The mineralogy of the oxide ores would permit this, but no hard archaeological evidence for it exists. It is very likely that the indigenes found small pods of gaudy copper oxide mineralization along the southern San Antonio graben and mined it, with attendant ochre, for ornamentation.

From 1709 to 1737, the district yielded a quarter of the silver produced in all of Mexico and remained the country's largest single silver producer until 1790. By 1790 over 4 million tons of ore had been produced with grades that averaged 700 grams per mega ton of silver. Ores from some mines were extremely high grade.

MAPIMI [Ojuela] (Durango)-1598

The mineralization at the Ojuela mine was first discovered in 1598 by Spanish explorers who noticed the iron-stained outcrops on the canyon walls. There are three possible derivations of the name "Ojuela":

1) The mine may have been named for a missionary, Don Pedro de Ojuela.
2) The name is possibly for a hole resembling the eye of a needle *(ojuela,* "little eye") visible on the north canyon wall at the mouth of the mine.
3) The third possible derivation of the name is from *hojuela,* an old Spanish mining term for argentiferous galena of a leafy texture. The local miners consider this to be the source for the name.

The Ojuela mine and others in the district operated until the beginning of the Mexican Revolution in 1810 and produced at very low levels under the new government from 1821 to 1867. It was closed from 1867 to 1884. Commercial mining at the Ojuela mine continued, somewhat sporadically, until the 1940s. Currently the Ojuela mine is operated solely for mineral specimens.

In 1899, the district had 216 miners and produced $4 million (1899 dollars) of ore. The German investors received $100,000 per month during the 1890s and 1900s. During this period 6% of the total mine production in Mexico came from the Mapimi district.

There are 126 known mineral species from the Ojuela mine, and the mine is the type locality for five of them (lotharmeyerite, mapimite, metakottigite, ojuelaite, paradamite) and the cotype locality for one (scrutinyite). The mine has nearly 450 km of workings.

BATOPILAS (Chihuahua)-1632

High-grade native silver outcrops in the Batopilas district were discovered around 1630, and production records begin in 1632. The district contains more than 65 mines, and it experienced three major periods of activity during which approximately 300,000,000 oz of silver were produced from 1632-1732, 1790-1819, and 1862-1914. A.R. Sheperd, former governor of Washington DC, ran the last of these, which was the most sophisticated and organized. Sheperd was a good friend of Porfirio Diaz, president of Mexico from 1880 to 1910, who gave him carte blanche for the area. Sheperd opened the mines on a systematic basis and used the proceeds to establish a fiefdom in the area. He was very successful but used a large percentage of the profits to build himself a palatial residence and support a lavish lifestyle. Sheperd died in 1902, and his sons took over until their world came to an end in about 1911 when Pancho Villa and company arrived in the area in search of silver and gold to support the revolution. The Sheperds refused to co-operate, and Pancho devastated the area, including the hydroelectric plant that drove the pumps that kept dry the deep workings where the mining was focused. Pancho and company did work the nearby Cerro Colorado deposit for gold, which made it difficult for more than minor clandestine work to continue at Batopilas. An attempt was made to put the mines back into production after the revolution, but the destruction of the power plant made it impossible to pump out the deep workings. It is believed that these efforts were directed to pillar and offshoots in the parts of the veins above the water table. Sheperd's son attempted to revive interest in the district in 1935 but was unsuccessful. There are almost no production records from 1920 to 1975, so it is reasonable to infer that whatever work was undertaken during this period consisted of minor high-grading. From the late 1970s to the early 1980s, miners reopened the New Nevada mine and hit a high-grade breccia pipe that yielded a significant amount of native silver. This work ended when the bottom dropped out of the silver market in 1983, leaving the lower extension of this body untouched. An under-funded, but well-directed program in the early 1980s drove into the hanging wall of the Roncesvalles fault vein and hit a vein carrying native silver ore. This was the first discovery of mineralization in the hanging wall of this structure, but it was not systematically followed up. No mining activity of note has occurred since 1983.

NAICA (Chihuahua)-1794
This district was discovered in 1794, and small-scale mining occurred in 1828, but operations on the early oxide ores were limited to the "rainy seasons" because there was no water available. In 1892 Compania Minera de Naica began commercial operations but suspended operations in 1911 as the mine reached the ground water level. In 1954 the Fresnillo Company acquired the mine, and they erected a 400-ton per day sulfide processing plant to process sulfide ores discovered beneath the historic oxide zones. By 1985 the mine was serviced by a 3,000-ton per day plant, which has been expanded to produce approximately 100,000 tons per month by cut-and-fill mining techniques recovering gold, silver, copper, lead, zinc, and small amounts of tungsten and cadmium.

BOLEO (Baja California South)-1868
The Boleo was first exploited by the French El Boleo Company and produced 13.6 million metric tonnes of mineral containing 500,000 metric tonnes of copper. Most of the production occurred from 1886 to 1947; the underground workings total nearly 600 km.

Four Corners mineral news 2004

Patrick Haynes
6468 Jackrabbit Run Ave.
Las Vegas, NV 89122

Squawcreekite, from the Squaw Creek tin mine, in Catron County, New Mexico, has been discredited. In 1897 a new mineral from Brazil, tripuhyite, was described by today's standards inadequately. The mineralogy of tripuhyite was revisited, and during that process the mineral squawcreekite was determined to be stannian tripuhyite.

Some mines in Colorado's San Juan Mountains have produced sparse colorful sulfate minerals. Eckhard Stuart and I found linarite in waste rock from a mine (name undetermined) south of the Aspen mine, between Blair Gulch and Arrastra Creek, east of Silverton, Colorado. It occurs with anglesite, cerussite, chalcopyrite, covellite, cuprite, jarosite, galena, malachite, and quartz. Local collectors go there to collect coarse lumps of green fluorite.

The Mogul mine, at the head of Cement Creek and north of Silverton, had a sphalerite-rich boulder with crusts of tiny blue ktenasite crystals.

Near the entrance of the closed-up Mountain Springs mine at Rico a boulder was found containing various blue and green crusts, which were tentatively identified as langite, posnjakite, and wroewolfeite. Unfortunately I was never informed about which crust was which, so the crusts remain unlabeled. The boulder also had some tiny crystals of linarite. Pyrite, commonly occurring as octahedrons, is found in boulders on the mine's extensive dumps.

There has been some confusion regarding the species "calciovolborthite." The name has now been discredited, and most of this material is now called tangeite. Some was collected at the Tippecanoe mine in La Plata Canyon, Colorado. It was poor material, found in boulders from a shallow trench outside the mine. At a dump to the northeast, excellent micro crystals of azurite were found.

Eckhard Stuart and I searched for the Arrowhead claim in the Slick Rock district of Colorado. It is the type locality for rossite and metarossite, which were described by Foshag and Hess in 1927. The minerals were reported as being on the left side of the claim entrance. We found coarse rossite and metarossite on the right side of one adit and assumed that the type locality was somewhere nearby. On a return trip I was taking a picture of Eckhard standing in the adit entrance when I noticed that an arrowhead was carved into the sandstone above his head. In 1927 Foshag and Hess got their lefts and rights mixed up. Also occurring there are metatyuyamunite, pascoite, brochantite, volborthite, gypsum, and metahewettite.

In 1988 a trip was made with Arnold Hampson to the Temple Mountain district in Utah. A silicified log was found in the North Mesa 5 mine that had some pyrite, montroseite, and sparse sphalerite replacement, which was oxidized to form sulfur and numerous sulfate minerals. Identified were ferricopiapite, rozenite, kornelite, szomolnokite, a halotrichite-group mineral, minasragrite (monoclinic), and its new polymorphs: orthominasragrite (orthorhombic) and anorthominasragrite (triclinic). A three-watered monoclinic vanadium sulfate named bobjonesite was also found.

Adjacent and interconnected to the North Mesa mine group is the Lopez incline. It had some bright pink crusts of cobaltomenite and some tiny spots of a blue mineral (clinochalcomenite?). There were also tiny scaly olive-green crystals of alunogen and olive-green acicular crystals of a halotrichite-group mineral.

At the 2002 Denver show Dmitriy Belakovskiy asked me if I could collect specimens of a new mineral for him. He needed to determine the water content of a mineral he was working on, but he was running low on material. So the following month I went out to Searle Canyon, in Utah's Thomas Range. I collected a few flats of material, along with bixbyite, topaz, and sparse red beryl. I also filled three small bags with pit fines. I panned out a bag of pit fines, about 250 crystals, which did not cover the bottom of a micromount box. It was enough for the water content test.

The panned crystals and a bag of pit fines were mailed to Dmitriy. He did his testing and submitted the research to the International Mineralogy Association (IMA). It was approved, named holfertite, and has the number IMA2003 -009. This mineral is a calcium uranium titanium silicate.

Several years ago a similar potential new mineral from Topaz Valley was partially described, but with titanium being dominant over uranium. If the Topaz Valley material's description is correct then it probably forms a series with holfertite.

Petalite on the Rio Cieneguilla: examining a footnote in *Northrop's Minerals of New Mexico*

Jesse M. Kline
5094 NDCBU
Taos, NM 87571

(Location 5 is on the index map)

"This reported occurrence needs verification."—Stuart A. Northrop, 1944

1904 is a heady year of the territory of New Mexico: growing population, proven reserves of mineral commodities, and lumber for exploitation—the drive for statehood is in full swing. F. A. Jones publishes his "New Mexico Mines and Minerals, World's Fair Edition" to coincide with the Louisiana Exposition. He squarely places the mineral petalite along with spodumene and amblygonite in the mining district he called Cieneguilla, south of Taos. These minerals are all sources of lithium—needed to fuel a strong ceramics and glass industry on the eastern seaboard of the United States. In the 100 yrs since, no worker has confirmed, or denied, its existence at this locality. Is it just a case of calculated speculation with Jones as a well-placed shill or fact?

Rito Cieneguilla (little swamp in Spanish)—located 13 mi southwest of the town of Taos, in Taos County. Over 3 mi in length, it is an arroyo-creek that headwaters in a canyon of the same name, in the northwest Picuris Mountains. It has a confluence with the Rio Grande at Pilar, New Mexico. Its course straddles a major geological unconformity—Santa Fe Group sedimentary deposits to the west and uplifted Precambrian terrane to theeast. Its existence is due, in part, to a widespread fault zone, with the southwest-northeast trending Embudo fault joining with the northwest-southeast Picuris–Pecos fault midway down its length. Three mi due south is Copper Ridge, home to the Champion mine and Copper Hill. The Harding mine is 2 mi farther south. The Apodaca, an old Spanish road and one of the extensions of the Camino Real, connected all at the turn of the century. Glenwoody Bridge, site of another infamous mine speculation, lies 2 mi southwest on the Rio Grande, below the Pilar Cliffs. The entire length of the Rito Cieneguilla is designated Bureau of Land Management property. Some private property exists within the area.