The Twenty-fifth Annual New Mexico Mineral Symposium was held November 13 and 14, 2004, at New Mexico Institute of Mining and Technology, Socorro. Following are abstracts from all talks given at the symposium.

EARLY COMMERCIAL MINERAL COLLECTING IN NEW MEXICO AS REPRESENTED IN THE MINERAL COLLECTOR (1894-1909), by 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 “Descloiite, 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 luster which exceeds that of the Grecian specimens” is an advertisement by A. E. Foote in the first issue of 1895. F. G. Hillaire 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 Steep 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 diamonads.

The “glory days” of New Mexico minerals in the popular literature and advertisements spanned the years from 1894 to 1899. Ads offer wulfenite, cerussite, alunite, flos ferris, and quartz from Organ; smithsonites and cerussites from Magdalena; red descloiite and silver vanadinite from New Mexico in addition to an editorial note about their unusual shapes and colors that suggests they are the first offered from the American Jewel mines offering “Aquamarine that abounds in New Mexico and Arizona!”

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 fluorite 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, by Ramon S. DeMark, 8240 Eddy Avenue NE, Albuquerque, NM 87109; and Paul F. Hlava, 4000 Smith, SE, Albuquerque, NM 87108.

The mines of New Mexico’s “boothel” 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 Hatchita 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. The mine 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, cuproutongstite, hemimorphite, jixianite, mottramite, rosasite, shattuckite, stolzite, willemite, and wulfenite. Jixianite [Pb(W,Fe⁺)₂(Si₃O₇)(OH)₂] has been reported from only two locations worldwide, Xián, Hebei, China, and the Chalkpit quarry at 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, cuproutongstite, bromargyrite, calcite, and muscovite (sericite). Crystals are bright crimson red octahedra averaging approximately 20 µ. Many of the crystals exhibit spinel law twinning. Shattuckite [Cu₄Cl₂(Si₃O₇)] 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, Hidalgo County, NM.” A gemstone is defined as “a precious or semiprecious mineral that has been cut, polished, and carved into many interesting and beautiful shapes.” A gem is defined as “a precious or semiprecious mineral that has been cut, polished, and carved into many interesting and beautiful shapes.” Rocks and stones that are suitable for polishing 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 Doña Ana County, described as bytownite but more likely labradorite, has been faceted into some very attractive gems. Peridot, the gem variety of olivine, is cleanly fractured from the volcanic maor in Doña Ana County and in the Navajo Nation associated with ultradeep 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 chalcopyrite cabs. Face-grade amethyst is found in lathlike crystals in rhyolite southwest of Mule Creek in Grant County (west of Brushy Mountain) and in recently rediscovered vein deposits in the Ladrón Mountains in Socorro County. Nonfacet-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 tanzanite 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 a classic 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 Al₂(BO₃)(Si₂O₇) and spurrite Ca₄(SiO₃)(CO₃) 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 Cerillos deposits of Santa Fe County. Beryl, 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. Some minerals that have been used as ornaments include native copper. 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. A.D. 900. Azurite crystals from the El Dorado district of Grant County have been collected from a clay-filled shear zone along the Barringer fault at Hanover Mountain in the

References

Red Hill mine, Hidalgo County, New Mexico, mineral list
Anglesite + +Mimetite
Azurite + Mottramite
Calcite Pyromorphite
Cerussite Quartz
Chlorargyrite +Rosasite
Chrysocolla +Sideite
+Cordongite +Sulphur
Galena Turquoise
+Hemimorphite +Vanadinite
Jarosite +Willemite
Malachite +Wulfenite

Apache mine, Apache #2 district, Hidalgo County, New Mexico, mineral list
*Actinolite Covellite Malachite
*Andradite +Cuprumite +Mottramite
+Anglesite Epidote Muscovite
#Aurichalcite Fluorite +Perite
+Bismite Galena Pyrite
#Bismocite Goethite +Pyrolusite
+Banumite Quartz
Bismutite Gypsum +Rosasite
+Bromargyrite Hematite Scheelite
Calcite Hedenbergite +Shattuckite
+Caledonite +Hemimorphite +Smithsonite +Sphalerite
*Cerussite Hydrozincite +Steinheilite
+Chalcopyrite Jarosite +Stolzite
+Chlorargyrite +Jixianite Willemite
Chrysocolla +Kettnerite Wolframate
+Magnetite
+Not previously reported
* Reported but not observed
# Tentative identification

GEMSTONES OF NEW MEXICO, by Robert M. North, Chino Mines Company, Hurley, NM 88023; 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.

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 minerals that contain or are associated with precious 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 Doña Ana County, described as bytownite but more likely labradorite, has been faceted into some very attractive gems. Peridot, the gem variety of olivine, is cleanly fractured from the volcanic maor in Doña Ana County and in the Navajo Nation associated with ultradeep 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 chalcopyrite cabs. Face-grade amethyst is found in lathlike crystals in rhyolite southwest of Mule Creek in Grant County (west of Brushy Mountain) and in recently rediscovered vein deposits in the Ladrón Mountains in Socorro County. Nonfacet-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 tanzanite crystals from northern New Mexico have also been faceted into small stones.

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Some minerals have served as ornaments without any enhancement from their original form. Some minerals that have been used as ornaments include native copper. 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. A.D. 900. Azurite crystals from the El Dorado district of Grant County 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. Other economic areas are 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, by Joan Beyer, 5030 Beyer Rd., Las Cruces, NM 88011; and Robert E. Walstrom, walstromminerals@iglanet.com, P.O. Box 1978, Silver City, NM 88062

(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 (Lindgren et al. 1910). The mining company in the area was restricted, whereas other areas are open. Permission can be obtained from the Department of Earth and Environmental Science, New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801; Amanda Rowe, Department of Earth and Environmental Science, New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801; Bruce M. Walker, Moly-corp, Inc., P.O. Box 469, Questa, NM 87556; Ramon S. Demark, 8200 Alvarado NE, Albuquerque, NM 87109; and Paul F. Hlava, 4000 Smith SE, Albuquerque, NM 87108

MINERALS OF THE QUESTA MINE, TAOS COUNTY, NEW MEXICO, Virginia T. McLemore, Virgil W. Lueth, New Mexico Bureau of Geology and Mineral Resources, New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801; Amanda Rowe, Department of Earth and Environmental Science, New Mexico Institute of Mining and Technology, 801 Leroy Place, Socorro, NM 87801; Bruce M. Walker, Moly-corp, Inc., P.O. Box 469, Questa, NM 87556; Ramon S. DeMark, 8200 Alvarado NE, Albuquerque, NM 87109; and Paul F. Hlava, 4000 Smith SE, Albuquerque, NM 87108

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Note: 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 orebody alteration studies 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 ferrimolybdate that were produced from old underground workings and the open pit. Questa’s molybdenite occurs in three associations: “clotty” 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 that is crosscut by a vein of molybdenite. Paint molybdenite cuts both vein...
and clotty 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 detrital inclusions 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, by Les Presnykh, P.O. Box 1273, Gilbert, AZ 85233; and Raymond Grant, 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 near Bisbee and 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 Moreno. 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) lists 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 Chimie 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.

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**References**


**SAN PEDRO MINE—A CLOSER LOOK AT ITS OWNERSHIP AND MINERALS, by Jerry Simmons, Southwestern Indian Polytechnic Institute, 19169 Coors Rd. NW, Albuquerque, NM 87114**

(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 r rival the best of treasures of gold/wealth as well 200–250 yrs of existence are tales and stories that as boom/bust. As with most such locations, facts, dates, and names tend to get lost or r rival the best of treasures of gold/wealth as well 200–250 yrs of existence are tales and stories that as boom/bust. As with most such locations, facts, dates, and names tend to get lost or

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 mission that was part of the materials and history of the Moon. The determination of optical properties of the lunar surface was one of the fundamental

**A TRIP TO THE MOON AND BEYOND, by Harrison H. Schmitt, P.O. Box 90730, Albuquerque, NM 87199**

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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**, by Larry Carvajal, P.O. Box 13549, 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 edition 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 Mirbil 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 east side of the 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 gossular 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 (spessartite) 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 schist. Northrop mentions calcite at the Rociaida 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**—Benteni mine located on the Sandames Coal mine road 6 mi southeast of Gallup. Associated with carnitite.

**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 epidote and quartz. Found in the basalt at the Twin Buttes formation near Gallup and in basalt on the Zuni River (junction of NM–53 and BIA–1).

**Pyrite**—Georgetown district on the dumps. Associated with vanadinite and descoelite. 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 pieces sometimes remain. 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**, by Robert W. Eceloth 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 indigenous people because there is evidence in many districts that the native people had known of these areas for a period of time, and to this day, the mines of New Mexico financed the Spanish Empire for a long period of time, and to this day, the mines of New Mexico and Peru are the world’s leading producers of silver. Silver production in Mexico has

Those few exceptions did produce some remarkable gold nuggets. Notable examples include the Old (Ortiz) and New (San Pedro) Placer districts of Socorro County and the Chama–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**, by James McGlasson, jimmcglasson@comcast.net, Consulting Geologist, Tucson, AZ; Peter K. Megan, IMDEX, Inc., Tucson, AZ; 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

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 Empire in the Americas.

Cortez encountered the thriving Aztec civilization ruled by Montezuma II. The Aztecs at first thought that Cortez and his followers were the reincarnation of their God—Quetzalcoatl, but soon determined that these “guereros” (light skinned people) were really there to conquer and plunder their people. By November 1319, 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, led by his son Cuauhtémoc, 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.
be affected by political events as well as technology.

**TAXCO** (Guerrero)—1522

The conquistadores Juan de la Cabra, Juan Salcedo, and Hernán Cortez began mining silver from the Socavón 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 Industrias Minera Mexico, S.A. (IMMSA), 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 1737, 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, Melano, Rayas, and Sirena). In 1726 Don Jose de Sardenata 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 Peregirina, 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 halted 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 iron-stained walls on the eastern skyline and found rich silver ores in outcrop on the flanks of the hill. The hill became known as Cerro Proaño, after Diego Fernandez de Proaño, who discovered some of the first small veins in the area. Mining activities in the area continued until 1737 when they were suspended because of weakness of 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, Companía Zacatecana-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 company for operation. The two companies eventually merged into Fresnillo Mining 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. Industrias 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. The mining industry nearly dominated 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.” The mine may have been named for a missionary, Don Pedro de Ojuela. 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. The third possible derivation of the name is from hoyuela, 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 1910 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 1999 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 ore deposits are a mixture of five of them (lotharmeyerite, mapimite, metakotáttige, ojuelaité, paradamite) and the cotype locality for one (scopinite). 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: 1632–1732, 1790–1819, and 1862–1914. A.R. Shepard, former governor of Washington DC, ran the last of these, which was the most sophisticated and organized. Shepard was a good friend of Porfirio Diaz, president of Mexico from 1880 to 1910, who gave him carte blanche for the area. Shepard opened the mines on a systematic basis and used the proceeds to establish a fielddom in the area. He was very successful but used a large percentage of the profits to build himself a palace and support a lavish lifestyle. Shepard 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 Shepards refused to cooperate, and Pancho and company entered 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. Shepard’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 highgrading. 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 Ronesvalles 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 Compañia 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 zone. 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**, by 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, triphuhyite, was described by today’s standards inadequately. The mineralogy of triphuhyite was revisited, and during that process the mineral squawcreekite was determined to be stannian triphuhyite.

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 Arrasta Creek, east of Silverton, Colorado. It occurs with anglesite, cerussite, calcopryrite, covellite, cuprite, jasrosite, galena, malachite, and quartz. Local collectors go there to collect coarse lumps of green fluorite.

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 wroeovloelite. Unfortunately I was never informed about which crust was which, so the crusts remain unlabeled. The boulder also had some tiny crystals of linitarite. Pyrite, commonly occurring as octahedrons, is found in boulders on the mine’s extensive dumps.

**Petalite on the Rio Cieneguilla—Examining a Footnote in Northrop’s Minerals of New Mexico**, by Jesse M. Kline, 5094 NDCBU, Taos, NM 87571

“**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) is 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 the east. 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 miles 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. Glenwood 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.