2ND

New Mexico Bureau of Mines & Mineral Resources

Socorro, New Mexico 87801

2ND

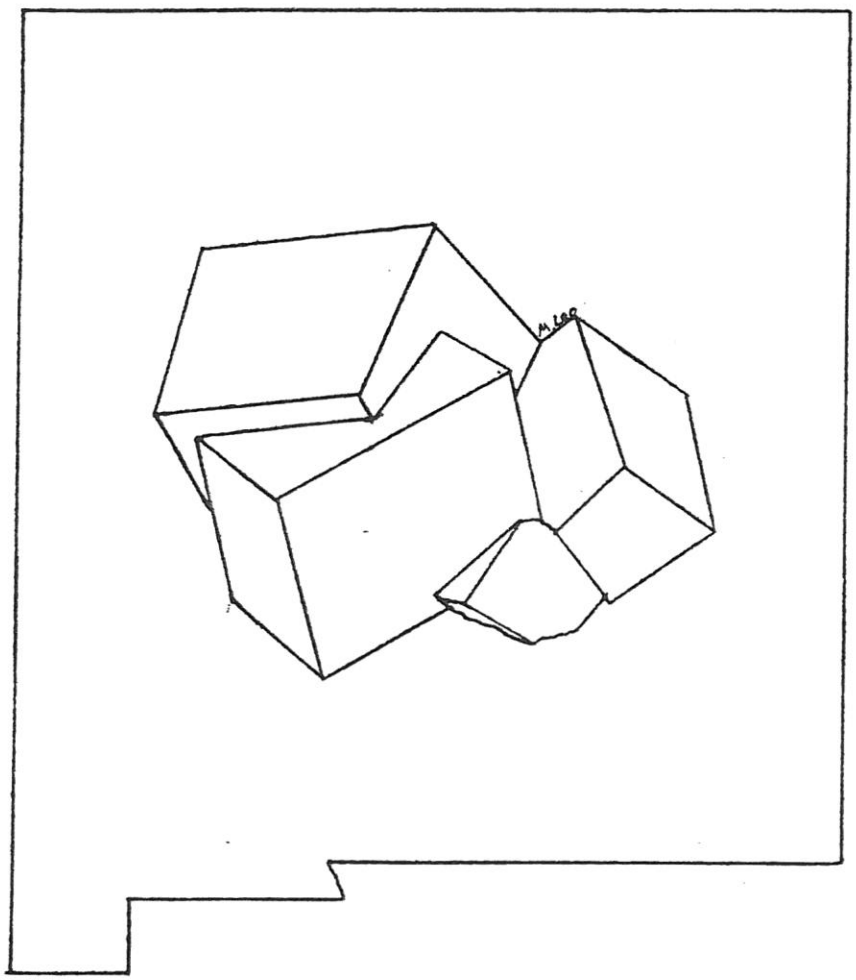
NM Mineral Symposium

OPEN FILE REPORT 1980

This report is preliminary and has not been edited or reviewed for conformity to New Mexico Bureau of Mines standards.

SECOND ANNUAL NEW MEXICO

MINERALS SYMPOSIUM



OCTOBER 25, 1980
WEIR HALL, ROOM 120
NEW MEXICO TECH CAMPUS
SOCORRO, NEW MEXICO

WELCOME TO

THE SECOND ANNUAL

NEW MEXICO MINERALS SYMPOSIUM

October 25-26, 1980
Weir Hall, Room 120
New Mexico Institute of Mining and Technology
Socorro, New Mexico

sponsored by
New Mexico Bureau of Mines and Mineral Resources
Department of Geology, New Mexico Institute of Mining and Technology
Albuquerque Gem and Mineral Society

—SCHEDULE—

Saturday, October 25

8:15 Registration and coffee

8:45 Welcoming remarks

8:50 Opening remarks -- F.E. Kottlowski

9:00 Metamict minerals -- R.C. Ewing

9:30 Cassiterite at Taylor Creek, Sierra County -- R.J. Narsavage

10:00 Coffee break

10:15 Gold in New Mexico -- R.M. North

10:45 Langbeinite in the Carlsbad Potash Basin -- N.T. Rempe

11:15 Zeolite and palagonite mineralogy of volcanic glass -- C.C. Allen

11:45 Lunch (You're on your own!)

1:30 Beryl at Iron Mountain, Sierra County -- R.S. DeMark

2:00 Minerals of the Smuggler, Rex, and Macy mines — F. Kimbler

2:30 Coffee break

2:45 pickeringite efflorescence at the Ortiz mine, Santa Fe County -- P.J. Modreski

3:15 Minerals of the Magdalena district -- M.R. Leo

3:45 Minerals of the Socorro Peak district -- W. P. Moats and L.D. Queen

5:30 Cocktail hour and discussions: Back half El Matador Lounge, El Camino Restaurant and Hotel (#3 on map). Cash bar; New Mexican and American food also available.

7:00 Silent auction

—SILENT AUCTION—A Silent Auction sponsored by the New Mexico Tech

Mineralogical Society will be held on Saturday evening from 7:00 to about 9:00. Anyone wishing to bring specimens for auction is welcome. A small percentage of all sales will go to the club. This will be a good chance to add to your collection at a reasonable cost.

—FIELD TRIP—

Field trip participants are to meet at the Weir Hall parking lot at 7:45 A.M., Sunday, October 26th. Departure will be at 8:00 A.M. The first stop will be the dumps of the Graphic-Waldo mine in the Magdalena mining district. A $2.00 collecting fee is required for this stop. We will leave the Graphic-Waldo at noon. Those wishing to go only to the Lynchburg dumps may join the field trip at the Kelly church. Departure from the Kelly church will be at 12:15 P.M. Parking at the Lynchburg mine dump is limited. Designated vehicles will shuttle participants from a nearby - parking area to the mine. Only designated shuttle vehicles will be allowed on the mine road. Participants should be ready to leave the Lynchburg by 4:00 P.M.

One final note: Be very careful! There are many potential dangers in collecting on mine dumps and Respect mine property. Cobb Nuclear has been generous in letting us collect at their mine. Stay away from their equipment and mine structures.

METAMICT MINERALS

Rodney C. Ewing
Department of Geology, University of New Mexico
Albuquerque, New Mexico 87131
and
Bryan Chakoumakos
Department of Geological Sciences
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Metamict minerals are a special class of amorphous materials which were initially crystalline. Although the mechanism for the transition is not clearly understood, radiation damage caused by alpha particles and recoil nuclei is critical to the process. Metamict minerals are generally optically isotropic, lack cleavage, display a distinct conchoidal fracture and are less dense than their crystalline equivalents. Metamict minerals recrystallize on heating, but the original pre-metamict phase may not form due to compositional changes caused by post-metamict alteration.

The microlite of the Harding petmatite is noteworthy because it occurs in both the crystalline and metamict state. Microlite belongs to the pyrochlore group, a complex croup of cubic Nb-Ta-Ti oxides with the general formula $A_{2-m}B_2O_6(O,OH,F)_{1-n}\cdot pH_2O$ where

A = Na,Mg,R,Ca,Mn,Fe^{2+}, -Sr,Sn,Sb,Ba,Pb,Bi,REE,Th,U^{6+},U^{4+} and B = Ta,Nb,Ti,Fe^{3+}; m = 0 to 1; n = 0 to 1, p = 0 to ?. For the Harding microlite, A-site cations are dominantly Ca, Na and U; the dominant B-site cation is Ta. The Harding pegmatite probably contains the largest deposit of microlite in the world. During a five-year period, 1942-1947, the pegmatite yielded over 10,000 kg of Ta-Nb concentrate. Microlite occurs late in the paragensis of the pegmatite and is a common accessory in three of the eight lithologic units, in replacement masses of the wall zones, and in core units of the eastern extensions of the dike system. Anhedral to euhedral crystals range from 0.1 to 25 mm in size, most commonly 0.5 to 3 mm. Crystals occur dispersed and isolated and display modified octahedral and dodecahedral forms. The degree of metamictness is directly related to the amount of uranium and thorium. The maximum uranium content in metamict microlites approaches five percent of the A-site cations. During annealing experiments in air over the range of 300°C to 1000°C, the metamict microlites recrystallize. Recrystallization begins at 300°C with a decrease in unit cell parameters with increasing temperature.

CASSITERITE AT TAYLOR CREEK, SIERRA COUNTY

Robert J. Narsavage
New Mexico Institute of Mining & Technology
Socorro, New Mexico 87801

With today's technology, tin remains an important commodity, one of which the United States has little. Although we consume in excess of 60,000 long tons per year, we produce less than 100 ton yearly. Therefore, any deposit of tin ore is of interest.

In New Mexico, there are three distinct types of tin deposits: Two in northern New Mexico, and one in the southern half, specifically in the Black Range Mountains.

Located in Catron and Sierra Counties, the cassiterite deposits of the Taylor and Squaw Creek area are the most important in the state. They include both lode and placer deposits, and represent a very unusual type of mineralization.

The cassiterite-hematite-silica type deposition at Squaw Creek and Taylor Creek will be discussed, as well as the collecting status of both cassiterite crystals and placer nuggets.

GOLD IN NEW MEXICO

Robert M. North
New Mexico Bureau of Mines and Mineral Resources
Socorro, New Mexico 87801

Gold mining in New Mexico was reported as early as 1828, but was undoubtedly_ carried on much earlier by the Spanish and possibly by Indians. Total recorded production in New Mexico from 1848-1977 is 2,394,930 troy ounces, ranking New Mexico 12th among the 50 states in gold production. Production peaked in 1915 at 70,681 troy ounces. Most of the gold produced in New Mexico in recent years has been a by-product of copper mining, most notably at the Chino and Continental mines.

The gold deposits of New Mexico are, in general, distributed in a belt 50 to 100 miles wide extending from Hachita, Hidalgo County in the southwest to Elizabethtown, Colfax County in the northeast. The gold deposits are most commonly associated with intrusive rocks of Cretaceous or Tertiary age ranging in composition from quartz monzonite to graodiorite. (Elizabethtown, Central, Pinos Altos, Lordsburg, White Oaks, Nagai, Cochiti, Old Placers, New Placers and Organ districts.) To a lesser extent, the deposits are associated with Tertiary extrusive rocks (Mogollon, Steeple Rock, Hillsboro, and Rosedale districts), and Precambrian rocks (Hopewell, Willow Creek, and Hell Canyon districts). Placer deposits have been important in the Elizabethtown, Pinos Altos, Hopewell, Old Placers, New Placers, and Las Animas districts.

At the present in New Mexico, gold is being produced as a by-product of copper mining in Grant County, by cyanide heap leaching at Mogollon in Catron County and at the Ortiz mine in Santa Fe County, and as lode gold mining in the Steeple Rock district, Grant County and at the Bluebird mine in Santa Fe County. In addition, a number of small operations are also producing minor amounts of gold.

LANGBEINITE:

A Uniquely New Mexican Potash Mineral

Norbert T. Rempe, Sr. Geologist
International Minerals & Chemical Corp.
Carlsbad, New Mexico

Langbeinite, K_1SO_4-$2MgSO_4$, an accessory in many potash deposits, is mined only in New Mexico. Used as specialty fertilizer, its mineralogy is well known, but its genetic position in the depositional and metamorphic sequence of the Carlsbad district is not yet fully understood.

Zeolite and Palagonite Mineralogy of Volcanic Glass Alteration - Isleta and Canjilon Volcanoes, New Mexico

Carlton C. Allen
Department of Geology and Institute of Meteoritics
University of New Mexico
Albuquerque, New Mexico 87131

Palagonite tuff samples from two maar volcanoes in central New Mexico were examined in order to characterize the process of alteration of basaltic glass. This work is part of a larger study of altered glass as a possible analog to the soil of Mars.

Isleta volcano is a 2.8 million year old feature located just west of Isleta Pueblo. The Canjilon Hill complex, dated at 2.6 million years, is north of Bernalillo. In both areas phreatomagmatic explosions produced deposits of glassy basaltic ash mixed with olivine and palagonite crystals.

The glass is orange-brown sideromelane, the characteristic product of rapid quenching of basaltic liquid. Alteration to palagonite occurs exclusively in zones up to 30 microns thick at the surfaces of glass grains and on the walls of vesicles. Palagonitization generally involveS 10-20% hydration of the glass combined with selective leaching of elements and oxidation of iron from Fe^{2+} to Fe^{3+}. Sodium, calcium, managanese and phosphorus are strongly depleted in the palagonite relative to the glass, while silicon, aluminum, iron and potassium remain relatively constant or display apparent enrichment. Titanium and magnesium are concentrated in sections of the palagonite rinds and depleted in other sections.

Material leached from basaltic glass during palagonitization may be lost to the system or may be locally reprecipitated. Zeolites, apparently chabazite and analcite, as well as calcite and amorphous silica, occur along with palagonite in some samples. These minerals are indicative of low temperature (below 80°C) alteration, possibly in a post-eruptive hydrothermal environment.

This research is supported by NASA grant NSG-7579 to Klaus Keil.

BERYL AT IRON MOUNTAIN, SIERRA COUNTY, NEW MEXICO

Ramon S. DeMark
Zuni Minerals
Albuquerque, New Mexico

Iron Mountain is located approximately 28 miles northwest of Truth or Consequences, New Mexico, on the border between Socorro and Sierra Counties. It has been intensely explored and mined on a small scale due to the occurrence of magnetite, fluorite, and beryllium and tungsten-bearing minerals. The beryllium mineral helvite was first noted in November 1941 by L.W. Strock during an examination of ores.

Previous investigations and analyses of the minerals in the area have attributed all of the beryllium present to the minerals helvite and danalite and trace amounts in garnets, idocrase, chlorite and members of the epidote group.

Beryl, however, has now been positively identified from what has been termed the Scheelamite area of the North Peak section of Iron Mountain. In October 1978, numerous small prismatic crystals of an opaque, cerulean blue mineral were recovered from this area. The rock at this location is a coarsely crystalline tactite in which large euhedral crystals of helvite, fluorite and albite occur in vugs, intimately associated with more finely crystalline quartz, chamoisite and hematite. Subsequently, several transparent, aquamarine colored, hexagonal prisms were recovered from the same area. These transparent crystals were found as inclusions in clear and purple fluorite. The opaque crystals are frequently surrounded by an alteration rim of helvite crystals. Maximum dimensions of the opaque beryl crystals have been 3x10 mm.

In light of the relative abundance of beryl in the Scheelamite area of Iron Mountain, further explorations could reasonably expect to reveal additional occurrences.

SOME COLLECTABLE MINERALS FROM THE REX AND SMUGGLER, PETROGLYPH, AND MACY'S MINES, HILLSBORO, NEW MEXICO

Frank S. Kimbler
Geology Department
New Mexico Institute of Mining and Technology
Socorro, New Mexico 87801

The Rex and Smuggler, Petroglyph, and Macy's mines of the Hillsboro district have been fairly well known mineral collecting localities for several years.

Good specimens of Willimite (Zn_2SiO_4), wulfenite ($PbMoO_4$), Vanadinite ($Pb_5(VO_4)_3 CL$), endlichite ($Pb_5[(AS,V)O_4]_3CL$), melanotekite ($Pb_3Fe_4Si_3O_{15}$) and calcite ($CaCO_3$) have been found on the dumps and in the workings of these mines.

At the Macy's mine endlichite and calcite are found scattered throughout the underground workings. Several high quality specimens were obtained here at the turn of the century and are now in the collections of the Smithsonian Institute.

The Rex and Smuggler group of prospects are one of the few places in the United States where willimite occurs. The willimites are found as short prismatic to tabular, colorless crystals and as crusts of unusual needle-like crystals. Melanotekite also occurs at this group of mines as small (=.5 mm) orthorhombic crystals in cavities of brown jasperoid. This is the second known world occurrence of melanotekite.

The Petroglyph or Miners Dream claim is known for its small pockets of wulfenite and vanadinite crystals. The wulfenites are found as rough crystal clusters and as single, thin, square tabular crystals, sometimes coated with chalcedony. The red-orange vanadinites occur as small hexagonal prisms with smooth faces and sharp edges. Occasionally the crystals occur as hollow prisms.

The Petroglyph and Macy's mines are presently under claim. Permission to collect should be obtained from the owners before entry. The Rex and Smuggler group are open for collecting.

MINERALS OF THE MAGDALENA MINING DISTRICT, SOCORRO COUNTY, NEW MEXICO

Mark R. Leo
Geology Department
New Mexico Institute of Mining & Technology Socorro, New Mexico
87801 -

One of the most profitable mining districts in the "Land of Enchantment", both for the miner and the mineral collector, is the Magdalena district. The district is located in the Magdalena Mountains, about 26 miles west of Socorro in central New Mexico. During the 20 years from 1800 to 1900, the district produced approximately $8 million, mostly in lead ores. However, the district did produce large amounts of zinc, mostly from the mineral smithsonite, for which the apple green specimens are known worldwide.

Although the district is "potmarked" with mines and prospect pits, the three most important mines, both for ore production and for mineral specimens, are the Kelly, Juanita, and Waldo-Graphic mines.

The Kelly mine, which located closest to the actual town of Kelly, produced the world famous apple green specimens of smithsonite. Although prize specimens of the green variety are rare today, small white or gray botryoidal masses are not uncommon. Cream to brown colored blades of barite have also recently been collected, as well as good specimens of fluorescent "dogtooth" calcite.

Also near to the town of Kelly, and at one time connected to the Kelly mine, is the Juanita mine. This mine has recently produced many fine brown bladed clusters of barite, as well as specimens, of calcite and aragonite. Some fine metallic goethite specimens, and a rare mineral barytocalcite ($BaCa(CO_3)_2$) have also been collected here.

Finally, the Waldo-Graphic mine, located about 1 km north of the town of Kelly, offers a wide range of mineral species. The so-called "Pyrite Room" of the 9th-level has produced many fine pyrite specimens, especially small (1 to 2 cm) cubic crystal clusters. Between the 5th and 6th levels is a large copper oxidation zone producing such minerals as chalcanthite, aurichalcite, tenorite, malachite•, azurite and rosasite associated with hemimorphite, smithsonite, hematite, and ilmenite. Throughout the mine there are several occurrences of prize calcite specimens, especially the masses of hexagonal plate crystals from the 9th level misnamed "Aragonite Room".

This is only a small list of the more common minerals found in the district; Stuart Northrop's Minerals of New Mexico reports well over 100 specimens from the district.

PICKERINGITE-APJOHNITE FROM THE ORTIZ MINE SANTA FE COUNTY, NEW MEXICO

Peter J. Modreski
U.S. Geological Survey
Denver, Colorado 80225

A sulfate mineral of composition intermediate between pickeringite [$MgAl_2(SO_4)_4.22H_20$] and apjohnite [$MnAl_2(S0_4)_4.22H_20$] occurs as an efflorescence in mines at Cunningham Hill in the Ortiz Mountains. It was found at the old "Dolores Tunnel" adit and in an exploratory incline sunk about 1976 at the present site of the Ortiz open-pit gold nine of Gold Fields Mining Corp. The mine is in a breccia, thought to represent a volcanic vent, of Tertiary latite that intruded the Mesaverde Formation (Upper Cretaceous). Gold, scheelite (some as pale-yellow bipyramidal crystals as large as 0.5 cm), pyrite, hematite, and magnetite are disseminated in the breccia. The pickeringite has formed where ground water seeps into the mine tunnels along fracture zones.

Pickeringite (Mg), apjohnite (Mn), and halotrichite (Fe) are isostructural and have nearly identical lattice dimensions and powder diffraction patterns. Divalent cation compositions of the mineral from the Dolores Tunnel and the Ortiz Mine are, respectively,about $Mg_{.51}Mn_{.44}(Fe,Co,Ca)_{.05}$ and $Mg_{.48}Mn_{.45}(Zn, Co, Cu, Fe, Ca)_{.07}$. These manganoan pickeringites form pink to white crusts of hairlike crystal fibers about 1-2 mm long by 0.01 mm thick and solid masses of parallel fibers as much as 1 cm long. The strongest X-ray diffraction maxima are at d = 4.81 Å (85), and 4.31 Å (55); unit-cell parameters are a = 6.19 Å, b = 24.35 Å, c = 21.26 Å, and B - 100.3°.

This occurrence of manganese-rich sulfates precipitating from waters acidified by the oxidation of pyrite appears to be unusual, but such deposits may be more common than is generally recognized. Similar material has been found at surface outcrops of sulfide veins near Jackass Creek, Lemhi Co., Idaho.

MINERALS OF THE SOCORRO PEAK DISTRICT

W. P. Moats and L. D. Queen
New Mexico Institute of Mining & Technology
Socorro, New Mexico 87801

Socorro Peak (elevation: 7,280 ft) is located approximately 4 miles west of Socorro, Socorro County, New Mexico. The Socorro Peak mining district is centered southeast of the peak, low on the east slope. Smaller mines and prospects extend to the north and south, and toward the crest. Silver was discovered in the district in 1867 by prospectors from nearby Magdalena. Silver production peaked by 1880 and terminated in the mid 1890's, producing $760,000-1,000,000 in silver yalues; however, profits were low.

Socorro Peak is made up of Tertiary volcanic rocks (trachytes, rhyolites, andesites, and tuffs) and interlain sediments. These rocks rest on a thick series of Pennsylvanian rocks (Magdalena group) which overly Precambrian granite. The whole sequence is faulted and dips to the west.

The ore zone on the east face of the mountain is the most complexly faulted. There are two general systems of faults. The most prominent group strike roughly parallel to the elongation of the Socorro Mountains (N20W-N15E). The second group dip steeply and strike N60°E-N70DE. These faults provided channels for subsequent mineralization, thus the veins are all fault controlled, occurring mostly in trachytes, spherulitic rhyolite, and limestone.

The Merrit and Torrance mines were the only commercially productive veins of the Socorro Peak district. These two veins could be faulted segments of the same vein. Inclined shafts were sunk along the veins to recover the ore which consisted of sparsely disseminated silver halides and traces of malachite. The best ore was said to occur associated with fluorite but at best averaged 15-20 oz Ag/ton. Mining terminated in the Torrance and Merrit Mines where the veins were faulted out. The Silver Bar mine is located on the faulted segment of the Merrit vein, which was displaced 50 ft to the west by a fault striking near east-west dipping 75°N.

The primary vein minerals are barite and quartz with lesser amounts of calcite, fluorite and Mn oxides. The most interesting of the minerals are the secondary lead and copper and zinc minerals. Mimetite, wultenite, hemimorphite, willemite, anglesite, and mottramite constitute the suite of known secondary minerals. For the most part these minerals are distributed evenly throughout the mines in the district. The notable exception is mottramite. Mottramite appears to occur along a faulted zone which trends N69°W. The main occurrence does not come from a mine but occurs at a surface exposure of a fault. The lead minerals are oxidation products of the galena which occurs only sparingly in the barite. Wulfenite was found by the authors only at the Silver Bar Mine and an unnamed mine near,the peak. Though thought to occur in the district, no vanadinite was found.