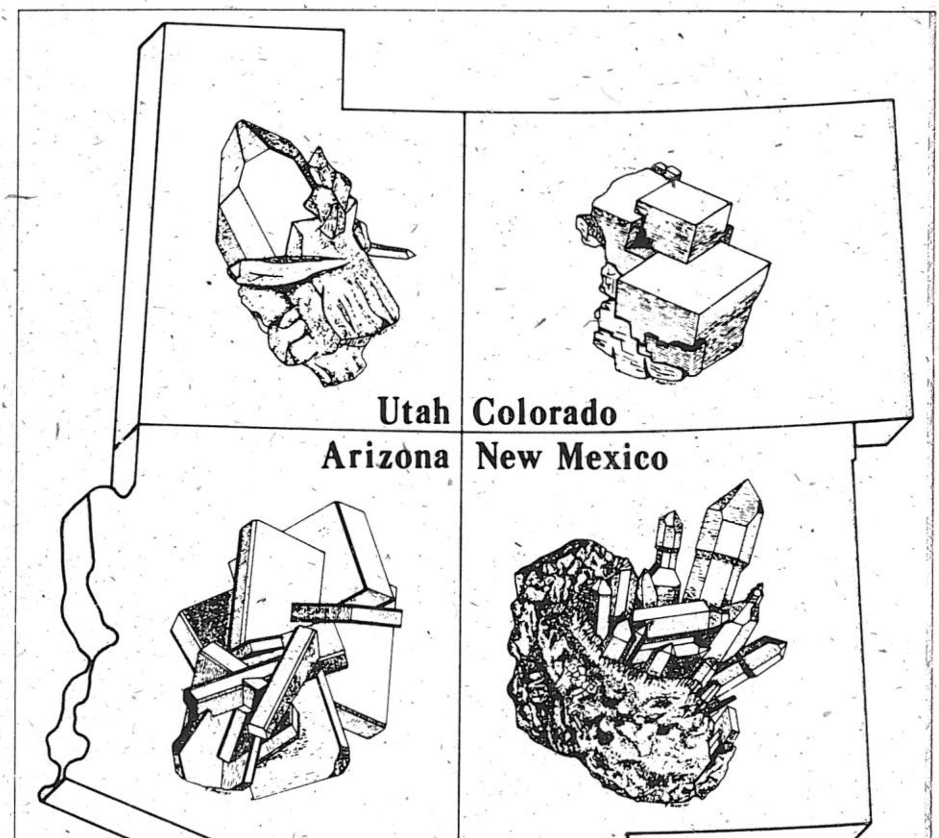
14th
annual

NEW MEXICO
MINERAL SYMPOSIUM

November 13 & 14, 1993



NMIMT Campus, Socorro, New Mexico

Welcome to

THE FOURTEENTH ANNUAL

NEW MEXICO MINERAL SYMPOSIUM

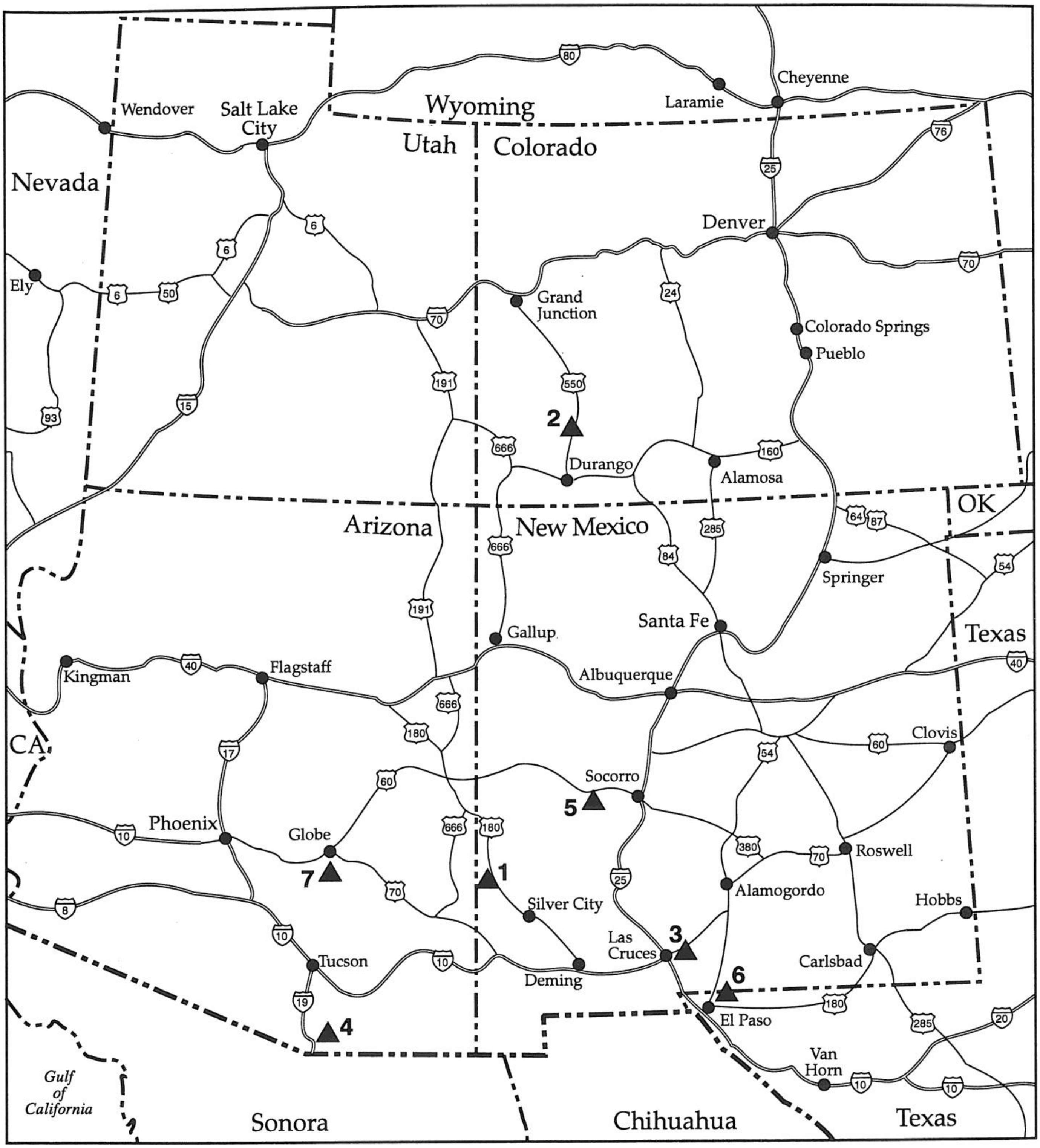
November 13 and 14, 1993

Macey Center Auditorium
New Mexico Institute of Mining and Technology
Socorro, New Mexico

sponsored by
New Mexico Bureau of Mines and Mineral Resources
Albuquerque Gem and Mineral Club
Los Alamos Geological Society
New Mexico Geological Society
Chaparral Rockhounds

The purpose of the New Mexico Mineral Symposium is to bring together for an exchange of ideas both professionals and amateurs interested in mineralogy. The sponsors hope that the Thirteenth New Mexico Mineral Symposium will give both groups a forum to present their cumulative knowledge of mineral occurrences in the state. In addition to the formal papers, informal discussions among mineralogists, geologists, and hobbyists should benefit all.

Cover—MINERALS OF THE FOUR-CORNERS STATES. Scepter quartz from Kingston, New Mexico; rhodochrosite from Silverton, Colorado; topaz from the Thomas Mountains, Utah; and barite from Superior, Arizona represent the four-corners states in the cover design by Teresa Mueller.



Geographic Index Map
14th New Mexico Mineral Symposium

SCHEDULE

Numbers in parentheses refer to geographic location on map.

Friday, November 12

6:00 pm Informal tailgating and social hour, individual rooms, Super 8 Motel

Saturday, November 13

8:30 am Registration; coffee and donuts

9:30 *Opening remarks,* main auditorium

9:40 (1) *Minerals of the Steeple Rock mining district, Grant County, New Mexico and Greenlee County, Arizona—Virginia* McLemore

10:10 *Silver and silver-bearing minerals—Terry* Wallace

10:40 Coffee break

11:10 (2) *New mineral finds in the San Juan Mountains, southwestern Colorado*— Tom Rosemeyer

11:40 (3) *Notable miarolitics of the Organ Mountains—Chris* Cowan

12:00 pm Lunch, Museum tours

2:00 (4) *Mines and minerals of the Patagonia Mountains, Santa Cruz County, Arizona—Anna* Domitrovic

2:30 (5) *New developments and mineral occurrences at the Linchburg mine, Socorro County—Ramon* DeMark

3:00 Coffee break

3:30 *What's new in* Colorado Minerals—Jack Murphy

4:00 *Franklin—its mines and minerals*—Bernard T. Kozykowski, featured speaker

5:30 Sarsaparilla and suds: cocktail hour (with cash bar)

6:30 Dinner at Garcia Opera House with an auction to benefit the New Mexico Mineral Symposium followed by a brief presentation by Bernard Kozykowski, *The Sterling mine—a precious hillside preserve*

Sunday, November 14

9:00 am Welcome to second day of symposium and follow-up remarks

9:10 (6) *The collections at the University of Texas at El Paso—Mark* A. Ouimette

9:40 *Minerals of Broken Hill, Australia—John* Sobolewski

10:10 Coffee break

10:40 (7) *History and minerals of the Pioneer mining district, Pinal County, Arizona—Les* Presmyk

11:10 *What's in a name; a discourse on the pronunciation and origins of some mineral names—Paul* Hlava

12:00 pm Lunch

1:15-3:00 Silent auction, upper lobby, Macey Center, sponsored by the Albuquerque Gem and Mineral Club

MINERALS OF STEEPLE ROCK MINING DISTRICT, GRANT COUNTY, NEW MEXICO AND GREENLEE COUNTY, ARIZONA

(Location 1 on index map)

Virginia T. McLemore
New Mexico Bureau of Mines and Mineral Resources
Socorro, NM 87801

Steeple Rock mining district is in the Summit Mountains in southwest New Mexico and southeast Arizona. An estimated $10 million worth of gold, silver, copper, lead, and zinc have been produced from the district since 1880. In addition, minor quantities of fluorite, manganese, and decorative stone were produced. Five distinct types of epithermal fissure-vein deposits are identified in the district on the basis of mineralogy and chemistry: 1) base with precious metals, 2) precious metals, 3) copper-silver, 4) fluorite, and 5) manganese. These veins are structurally controlled, hosted by Miocene to Oligocene volcanic, volcaniclastic, and intrusive rocks, and appear to be spatially related to two types of alteration: alkali-chloride (propylitic to argillic to sericitic) and acid-sulfate (advanced argillic). However, field relationships and age determinations indicate that the alteration is older than the epithermal fissure veins.

The mineral assemblages, along with field relationships, textures, fluid-inclusion data, and sulfur-isotope data, provide clues to the origin and genesis of the alteration and the epithermal fissure veins. Alunite and kaolinite in acid-sulfate altered rocks indicate precipitation from acidic fluids. Pyrophyllite indicates temperatures of formation >250°C. Chlorite, adularia, and quartz in alkalichloride-altered rocks indicate precipitation from slightly acidic to neutral pH fluids. Epidote indicates temperatures of formation > 250°C. Mineralogic and chemical zonations, textures, stratigraphic relationships, and limited sulfur-isotope data are consistent with both types of alteration being formed by magmatic-hydrothermal fluids in a nearsurface environment, similar to modern hot springs systems.

The epithermal fissure veins have mineral assemblages consistent with precipitation from slightly acidic to neutral pH fluids. Fluid-inclusion data indicate these fluids had low salinity (<5 eq. wt. % NaCl) and were at low to moderate temperatures (240-320°C) at relatively shallow depths (360-1,300 m). Lattice textures of bladed quartz (pseudomorphed after calcite) and bladed calcite indicate boiling was a mechanism forming these fissure veins. These data are consistent with an epithermal origin.

The alteration and mineralization in Steeple Rock district occurred in response to cyclic volcanic activity that subsequently resulted in development of local hydrothermal systems. Exact timing and duration of these events is unknown. There is no evidence to suggest that these events were continuous, rather the alteration and mineralization were probably episodic, waning and migrating from one locality to another.

Steeple Rock district is known for the occurrence of sceptered amethyst in vugs of andesite, but these specimens actually are found north of the district. Steeple Rock district does contain amethyst quartz intergrown with quartz and sulfides. Other collectable minerals from the district are listed below. In addition, areas of acid-sulfate-altered rocks typically contain Liesegang-banded rock that can be cut and polished as decorative stone.

Minerals in epithermal fissure veins:
gold, Au
silver minerals, Ag sphalerite, (Zn,Fe)S chalcopyrite, $CuFeS_2$
galena, PbS
fluorite, CaF_2
anglesite, $PbSO_4$
azurite, Cu3(OH)2(CO3)2
bornite, Cu_5FeS_4 cerussite, $PbCO_3$ chalcanthite, $CaSO_4 \bullet 5H_20$
chalcocite, Cu_2S
chrysocolla, $(Cu,Al)_2H_2S_20_5(OH)_4 * nH_2O$
covellite, CuS cuprite, Cu_2O
malachite, $Cu_2(OH)_2(CO_3)$
mimetite, $Pb_5(As0_4,PO_4)_3Cl$
mottramite, $(Cu,Zn)Pb(VO_4)(OH)$
nantokite, CuCl
pseudomalachite, $Cu_5(PO_4)_2(OH)_4\ H_20$
quartz, SiO_2
calcite, $CaCO_3$ pyrite, FeS2
adularia, $KAlSi_30_8$ aragonite, $CaCO_3$ dolomite, $CaMg(CO_3)_2$
jarosite, $KFe_3OH)_6(SO_4)_2$
marcasite, FeS_2

Selected alteration minerals: quartz, SiO_2
pyrite, FeS_2
chlorite, $Mg_3(Si_40_{10})(OH)_2 \bullet Mg_3(OH)_6$
adularia, $KAlSi_30_8$
titanite, $CaTiSiO_5$
epidote, Ca-Mg-Mn $(Al,Fe)_3(OH)(SiO_4)_3$
mordenite, $(Ca,Na_2,K_2)Al_2Si_{10}0_{24} \bullet 7H_20$
gismondine, $Ca_2Al_4Si_40_{16} \bullet 9H_20$
thomsonite, $NaCa_2Al_5Si_50_{20} \bullet 6H_20$
wairakite, $CaAl_2Si_40_{12} \bullet 2H_20$ alunite, $KAl_3(OH)_6(SO_4)_2$
natroalunite, $NaAl_3(SO_4)_{2(}OH^{)}_6$ pyrophyllite, $Al_2(Si_4O_{10})(OH^{)}_2$
diaspore, $HAl0_2$

Acid-sulfate alt → banded qtz/clay (i.e.: Organ Te fault)
Bladed calcite = "lattice texture"
↳ qtz pseudomorphs after calcite.

kaolinite, $Al_4(Si_4O_{10})(OH)_8$

SILVER AND SILVER-BEARING MINERALS

Terry Wallace and Mark Barton
Bldg. #77, University of Arizona
Tucson, AZ 85721

Silver and silver-bearing minerals hold a particular fascination for the mineral collector. Superb specimens are known from hundreds of localities worldwide, and unlike gold, silver is quite a reactive element, forming more than a hundred different silver-bearing minerals. Further, silver mining has played a very important role in development of the New World, so mineral specimens are often associated with a rich historical lore. Today the annual worldwide production of silver is approximately 14,000 metric tons, more than at any time in history. Most of this silver is recovered as a byproduct of low-grade copper and lead mining. This fact, coupled with the historically low price of silver (— $5 US/troy ounce) and the continued mechanization of even high-grade mines, has greatly reduced the availability of "new" silver mineral specimens on the market. Only Mexico, Peru, and, to a lesser extent, Kazakhstan have produced significant volumes of specimen material in the last decade. Nevertheless, silver is an extremely important industrial metal, and the future is bright for more spectacular specimens.

The name *silver* is an old English word related to the German *Silber.* This name apparently has no descriptive value, but the Latin name *argentum* means "white and shining". Silver is widespread in the Earth's crust, with literally thousands of ore deposits exploited in the last few hundred years. Ordinary rocks contain roughly 100 parts per billion silver, whereas typical ore deposits contain 10-1,000 grams of silver per ton. There are a variety of ways that silver enrichment can take place, but most commonly it is by hydrothermal activity. It is possible to divide silver mineral localities into two broad categories: deposits where silver is the dominant metal and deposits where silver is produced as a byproduct. Fine specimens are found in both types of deposits, but the best are usually from silver-rich deposits. Silver-dominant ore deposits generally form veins that contain the most varied and spectacular specimens.

Silver has an atomic number of 47 and has two stable isotopes (Ag$^{1'}$ and Ag^{i}n that occur in nature in approximately equal amounts. Another 25 radioactive isotopes have been created in the laboratory. When not in its native form, silver is generally monovalent and is present as a cation in approximately 130 different minerals. The relatively large number of known silver minerals can be attributed to several factors, including crystal radius. Ordinarily, when cations and anions bind together, each gathers as many ions of opposite sign as size permits, the number corresponding to the *coordination number.* However, silver has an unusual electronic structure that leads to a preference for low coordination numbers (typically 2, 3, and 4). There are four basic groups of silver minerals that share general properties. These are the *silver sulfides*, *silver sulfosalts*, *silver halides*, and *amalgams.* There are a few unusual silver minerals that include an oxide (stetefeldtite) and oxysalts (bellite, an apatite group mineral, and argentojarosite, a silver-iron sulfate). Most silver minerals are stable only at low temperatures (<250°C), and at higher temperatures they convert to solid solutions, commonly with large amounts of base metals. The elemental composition of deposits is important for determining which silver minerals will be present.

V.P. Min. Record c̄ Board of Directors
UA museum Curator

"Pushing wires out of acanthite"
↳ multiple Ag sites in structure

NEW MINERAL FINDS IN THE SAN JUAN MOUNTAINS, SOUTHWESTERN COLORADO

(Location 2 on index map)

Tom Rosemeyer
1632 Camp Bird Mine Road
P.O. Box 586
Ouray, CO 81427

The past three collecting seasons in the San Juan Mountains have produced interesting mineral finds, mainly microcrystals. The crystals occur in hydrothermal veins, contact metamorphic deposits, bedded replacement deposits, and gossan deposits.

The Silver Link mine, 3.5 mi south of Ouray, Colorado, is situated on sheer cliffs 1,000 ft above the Uncompahgre River and was worked in the 1880s for silver and copper. The quartztetrahedrite-bornite-chalcopyrite vein has produced superbly crystallized specimens of anatase, brookite, bornite, chalcopyrite, tetrahedrite, and clear quartz crystals with bornite and tetrahedrite inclusions. Rutile and zircon are also present but are too small to be photographed. Secondary minerals collected so far include brochantite, azurite, and malachite.

Another mine in the Ouray area that has produced a variety of silver-bearing and gangue minerals is the Eldorado mine in Yankee Boy Basin 8 mi southwest of Ouray. The mine was first worked during the silver rush of the 1870s and turned out to be not much more than a prospect with a few short drifts on the vein. In 1986 an exploration drift was driven on the Eldorado vein, and one small silver orebody was mined that produced a number of fine, crystallized microcrystals. The silver-bearing minerals of the hydrothermal vein include native silver, polybasite, pyrargyrite, freibergite, and acanthite. Other ore minerals that occur as microcrystals are galena, sphalerite, and chalcopyrite. The gangue minerals present in the vein are pyrite, marcasite, arsenopyrite, quartz, barite, dolomite, rhodochrosite, kutnohorite, siderite, and calcite. Of special interest are clear barite and quartz crystals containing globular inclusions of pyrargyrite and polybasite.

Just a few miles north of Ouray is the Senorita mine, which is primarily a lead-silver bedded replacement deposit in shales and siltstones. The ore minerals, galena and tetrahedrite, occur in a quartz-barite gangue and are not well crystallized. Secondary alteration of the upper part of the orebody has formed an interesting suite of minerals including malachite, azurite, cerussite, mimetite, and aurichalcite. Other exotic minerals are present but await positive identification.

Near Red Mountain Pass, between Ouray and Silverton, Colorado is a small contact metamorphic deposit that was mined for gold and silver in the 1880s. The limestones near the intrusive contact have been highly altered into a small skarn zone. Vugs in this zone contain well-crystallized grossular, tremolite, magnetite, and epidote. The most amazing find though is well-crystallized prehnite on grossular. These may be the finest microcrystals of prehnite found to date in Colorado.

And last but not least is a small lead-zinc-copper gossan deposit near Silverton, Colorado that was worked until the early fall snows hit. The deposit has produced an array of colorful and exotic minerals including anglesite, cerussite, malachite, azurite, posnjakite, chalcoalumite, linarite, brochantite, serpierite, and possibly osarizawaite.

Micromineral Column - "Through the Scope"
↳ Rocks & Minerals

Don Benke - Illinois (microphotos)

AgAs-Sulfosalts (Polybasite) -> Eldorado Mine
Ag-tet Pyrargyrite-Polybasite

Ti-mobilization?
↳anatase, brookite, rutile in qtz vein

NOTABLE MIAROLITICS OF THE ORGAN MOUNTAINS

(Location 3 on index map)

Chris Cowan
2000 Camino de Pueblo #6
Bernalillo, NM 87004

Rock Springs Canyon on the east side of the Organ Mountains contains some of the larger miarolitic cavities in North America. These deposits were first found and mined by a German named Hoffer in the early 1940s. The gentleman was an entrepreneur and found the deposits while on a hunting excursion. Hoffer mined the deposits for its exceptionally large, clear quartz crystals when the demand for radio quartz made it an economic opportunity. Because of lack of documentation and the obscurity of this locality, the location of the deposit was lost to the mineral-collecting community for over 40 years. It was Hoffer's friends who were responsible for my finding the deposits in the mid 1980s.

The miarolitic cavities occur in the Sugar Loaf Peak quartz monzonite porphyry phase of the Organ Mountain batholith. The largest and most diverse miarolitic, in terms of mineral species, has been named "The Pit." All the major quartz specimens were mined out during the original mining; consequently, the specimens retrieved in recent years were left in the dumps, and many are damaged or weathered. The mineralogy was not documented during the original mining; all of the following information is either verbal communication or information I collected first hand.

Albite—Crystals of extremely good quality are common. Single crystals larger than 1 cm and radiating groups of twinning crystals in parallel growth forming pinacoids to 5 cm have been found.

Apatite—Hydroapatite is found in small crystals in abundance whereas larger ones up to 5 x 3.5 x 4.5 cm are very rare. A few of the larger ones contain inclusions of small dodecahedral pyrite crystals. The apatites vary greatly in morphology and clarity. Faceting-grade material is quite rare although some gems have been cut. All of these, to my knowledge, are smaller than 10 carats.

Orthoclase—The most abundant mineral in the cavities, large baveno and some manebach twins are common. The largest known crystal is 18.2 x 8.3 x 8.6 cm and like most, has some magnetite growing on it. In general, the crystals have a secondary overgrowth of perthite, and some contain cores of chatoyant sanidine.

Quartz—I was told that the core of "The Pit" contained in excess of 40 crystals, 2 to 4 ft long. To my knowledge, none of these survived. The Smithsonian has in its possession a group of five smokey crystals with secondary twinning on three of the faces. The largest crystal is over 12 inches long.
This specimen came from one of the smaller miarolitics. Some of the crystals have inclusions of pyrite, some are bent, some are floaters with no real morphology, and many are double terminated.

Titanite—Large root beer-colored sphenes up to 5 x 5.5 x 1.5 cm have been collected. The larger sphenes are twinned and very rare; smaller ones are much more common.

The deposit also has epidote, magnetite, biotite, molybdenite, pyrite, and perthite as part of its mineralogy. The finest specimens contained several of these above minerals on the same specimen.

In conclusion, I would say that the tailings have been extensively searched, and the prospect for more specimens is slim.

15x25' Lens
rmd w/ massive qtz

Core 42 clear qtz xtals

qtz morphology alst like
Quickstrike !

↳ py incl.
↳ mnt incl.

MINES AND MINERALS OF THE PATAGONIA MOUNTAINS, SANTA CRUZ COUNTY, ARIZONA

(Location 4 on index map)

Anna Domitrovic, Mineralogist
Arizona-Sonora Desert Museum (since 1977)
2021 N. Kinney Rd.
Tucson, AZ 85743

Mineral prospecting in what would become southern Arizona began about the mid-1800s, after the Gadsden Purchase of 1853. Silver mining goes back much further. Some of the earliest silver mining was done by the Spaniards about 1687, and those were deposits that had been worked much earlier by the Indians.

After the Jusuits were expelled from the New World and the Spaniards migrated back into Mexico, the mines laid dormant until 1855. This is the date of some of the earliest settlements. In 1857, mining began in earnest with the formation of the Sonora Mining and Exploration Co. and the Arizona Mining Co. In 1858, the Santa Rita Mining Co. was organized to operate older workings as well as the new ones that were being discovered every day.

In areas where mining was exceptionally active, towns sprang up—Patagonia, Harshaw, Mowry, Washington, and Dusquesne. But many mines had their own temporary camps that kept the miners close to their work—Trench, Hardshell, World's Fair, and Four Metals. There may be an adobe wall or two, a foundation, or even a fairly complete building left in the more prosperous or easily dismantled buildings. When it was time to move to the next mineral discovery, it was a relatively easy task to tear down one camp and set up another elsewhere. Outside of a vague mark on a tattered old map, these temporary mining camps have returned to the earth from which they arose.

The heyday of life and mining activity in the Harshaw and Patagonia Districts in the Patagonia Mountains lasted for a good half century from the 1870s to the 1930s. Outside of the towns of Patagonia, Harshaw, Mowry, Washington Camp, and Dusquesne that experienced fluctuating populations from 500 to 2000 inhabitants, there were at least a dozen smaller camps scattered throughout the mountains to handle the gold, silver, copper, and lead ore where the discoveries were made. A wealth of information lies within the crumbling adobe walls, the scattered artifacts of everyday life, and the rusting mining equipment left behind in these ghost towns.

Other important information lies within the mineral specimens saved from the jaws of the crushers and the fires of the smelters. These remnants provide glimpses of the kinds of minerals uncovered nearly 150 years ago. The Arizona-Sonora Desert Museum has in its permanent mineral collection some of the finer examples of copper, lead, silver, and zinc minerals from this area preserved for posterity.

NEW DEVELOPMENTS AND MINERAL OCCURRENCES AT THE LINCHBURG MINE, SOCORRO COUNTY, NEW MEXICO

(Location 5 on index map)

Ramon S. DeMark
530 E. Arch St.
Marquette, MI 49855

&

Christopher B. DeWitt (formerly Continental Mine)
1055 Quincy St. SE
Albuquerque, NM 87108

History—The Linchburg mine is in Socorro County, New Mexico, approximately 9 km south of the village of Magdalena. It was first operated by the American Zinc, Lead, and Smelting Co. in 1910. Early development consisted of driving a 500-m-long adit to explore the sulfide ore deposits adjacent to the Linchburg fault. In 1912, C. T. Brown purchased the property and then sold it to the Empire Zinc Co. that same year. Empire developed the deposit by stoping off the main adit, primarily to the north, in 1915 and 1916. Minor production continued to the mid-1920s. The mine was then idle until purchased by the New Jersey Zinc Co. in 1942 when the high demand for strategic metals during World War II resulted in renewed activity. New Jersey Zinc leased the property to various operators after the war. Operations ceased during the mid-1960s, primarily because of the distance required to ship concentrates. Cobb Resources, Inc. leased the property in 1972 and performed additional development work until 1982. Hydro Nuclear Corp. purchased the property from New Jersey Zinc in 1989, but there has been no production in recent years.

In 1990, the property was leased by the U.S. Army Corps of Engineers to conduct experiments as part of an underground munitions storage facility research project. This project is a joint venture between the United States and the Republic of Korea designed to optimize safety for underground munitions storage facilities. Two drifts will extend from the existing adit to provide access to seven chambers that are 1/3-scale models of the final design. Each chamber incorporates different features designed to attenuate gas and blast pressures resulting from the detonation of the explosives contained inside. A series of instruments located throughout the project and adit will measure the effects of the blasts.

Geology—The Linchburg mine is on the north end of Magdalena uplift, a horst block homocline feature in the Rio Grande rift. Sedimentary rocks in the homocline generally strike north-northwestward and dip W20°-40°SW. Most mine workings are in the Mississippian Kelly Limestone where large replacement bodies of zinc, lead, and minor copper sulfide ore have developed adjacent to major faults. In addition to the Kelly Limestone, there are exposures of Pennsylvanian shale and limestone of the Madera and Sandia Formations, Precambrian greenstone and granite, Tertiary monzonite porphyry, and Tertiary andesite and rhyolite. The munitions project is in an interval of the upper Kelly Limestone exposed in the adit between 215 and 275 m from the portal. The intent was to locate the project in a homogeneous body of relatively hard and dense material barren of ore.

Mineralogy—Two mineral species not previously reported/confirmed from New Mexico were found by the authors during Spring 1993. Both minerals, ktenasite $(Cu^{+2},Zn)_5(SO_4)_2(OH)_6 \bullet 6H_20$ and serpierite $Ca(Cu^{+2},Zn)_4(SO_4)_2(OH)_6 \bullet 3H_20$, were found on fault/fracture surfaces and in gouge and breccia associated with the Linchburg fault where the hanging-wall replacement ore contains zinc and copper. Observations and production records indicate that significant copper-bearing ore was

Photomicro - Arnold Hanson
SEM - Modreski, Hlava, McKay

located only to the north of the main adit, which is also where the ktenasite and serpierite were found. Ktenasite was confirmed by microprobe analysis (Hlava, personal communication) and by x-ray diffraction (McKee, personal communication). Serpierite identification was established by microprobe analysis (Hlava, personal communication). Ktenasite is found as crusts and druzes of transparent, very thin, tabular crystals usually 0.1 mm or less. Some crystals are more equant. The color ranges from emerald green to blue-green with a vitreous luster. Ktenasite is often found overgrown on serpierite, which makes it appear blue. Serpierite is found as spherical aggregates of robin's egg blue crystals with a pearly luster.The individual sword-shaped crystals are considerably less than 0.1 mm in length. Much of the serpierite is covered by ktenasite. An unknown zinc carbonate-sulfate was also found in association with the ktenasite and serpierite. It occurs as crusts of thin, hexagonal platelets that are transparent and colorless with a vitreous luster. Crystals are 0.1 mm or smaller. Identification is pending based on further study (Modreski and Hlava, personal communication).

To our knowledge, ktenasite has been reported in the United States only from the Commodore mine in Colorado and the 79 mine in Arizona. The type location is at Laurium, Greece, and the only other known world occurrence is in Modum, Norway. The Blanchard mine is the only previously reported serpierite location in New Mexico, but analyses have failed to confirm these earlier reports.

Minerals from the Linchburg mine

Sulfides	Oxides	Halides	Carbonates
Chalcopyrite	Chalcophanite	Fluorite	*Calcite –w/ goethite inclusions
Galena –spinnel tunnel	Goethite		Cerussite - dump
Pyrite	Hematite – Rosettes		
Sphalerite	Ilvaite - dumponly		
	Quartz- needle		

Sulfates	Silicates	Molybdates/Tungstates
Barite	Chrysocolla	† Scheelite
Gypsum	Grossular	Wulfenite
Jarosite(?)	Hemimorphite -dump	
††Ktenasite		
††Serpierite		

†† New to New Mexico
†Reported but not observed
* Many collectors have specimens from the Linchburg mine that are labelled siderite. Numerous analyses of the tan to dark-brown siderite-looking mineral have all indicated that it is ferruginous calcite. In addition, ankerite has not been observed, indicating that siderite is not likely to occur.

Paragenesis Serp —— : acicular, light blue
Ktan —— : bladed to blocky
t →
↳ in Linchburg Fault zone

Unknown Mineral:
thin, hex. platlets - drusy
hydrated $ZnSO_4$ (?)
[Gypsum/Anydrite analog??]

COLORADO MINERALS—AN UPDATE

Jack A. Murphy
Curator of Geology
Department of Earth Sciences
Denver Museum of Natural History
2001 Colorado Blvd.
Denver, CO 80205

In 1961, 445 Colorado mineral species were described by Edwin Eckel in U.S. Geological Survey Bulletin 1114. Today, nearly 750 species are known from the state. An update and revision of *Colorado Minerals* is in the final stages of development. The long-awaited publication, sponsored by the Denver Museum of Natural History and the Colorado Chapter of Friends of Mineralogy, will be undergoing a final review during 1994 with publication expected in 1995. The publication contains important historical information on the state's minerals as well as up-to-date mineralogy on a large number of rare and unique species.

FRANKLIN—OF ITS MINE AND MINERALS

Bernard T. Kozykowski, R.A.
Vice President
Sterling Hill Mining Museum
30 Plant St.
Ogdensburg, NJ 07439

The Franklin mine stands out worldwide in unique characterization. By today's standards the mine was relatively small in size. However, in every other respect, it was truly a giant.

It was the richest zinc deposit ever encountered by man, having produced over 22,000,000 tons of ore averaging 19.6% zinc. During peak periods of production it employed nearly 1,000 men and fostered a mining town that was a model community for the rest of the industry. Even during the Great Depression of the 1930s it remained in operation. Its ores played host to the most complex diversification of minerals on Earth.

Its origin is interpreted as exhalative belches rich in zinc, iron and manganese that emanated from deep inside the planet's mantle. The protore fluids oozed out of an ancient sea-floor rift well over a billion years ago. The epoch events experienced across the next eon, age after age, during cataclysmic periods of geophysical change and geochemical alteration, provided unique opportunity for the development of one of nature's greatest mineralogical treasures.

Even in its most fundamental sense, Franklin demonstrates its unique nature. Here, unlike other zinc mines worldwide, the ore consists of silicates (willemite) and oxides (zincite and franklinite). The presence of iron and manganese is not at all insignificant.

To date, this deposit, along with its twin at nearby Sterling Hill, boasts of over 350 mineral species. This is more than 10% of those known to man, more than anywhere else on Earth. Of the 350, nearly seventy were first described from here, and nearly half of those are found nowhere else. Over half of the minerals found here exhibit fluorescence under ultraviolet irradiation. This uncommon phenomenon has earned Franklin the indisputable title of The Fluorescent Mineral Capital of the World."

THE COLLECTIONS AT THE UNIVERSITY OF TEXAS AT EL PASO

Mark A. Ouimette
Department of Geological Sciences
The University of Texas at El Paso
El Paso, TX 79968

The University of Texas at El Paso has two separate mineral, exotic rock, and fossil collections. The Centennial Museum and the Department of Geological Sciences house these collections that include a wide variety of specimens primarily from west Texas, New Mexico, Mexico, and other parts of the world. The collections are curated separately and provide the public with samples from instructional to splendid.

The collections, located throughout the new Geological Sciences building, include microminerals, hand-sized, and large specimens of calcite, gypsum, celestite, halite, fluorite, and quartz. The economic mineral and rock collections include many specimens of azurite, malachite, Mississippi Valley-type lead and zinc minerals, Carlsbad area potash minerals, Mexican sulfide mineral assemblages, and west Texas talc, sulfur, barite, and fluorite. The fossil displays include specimens of ammonite, trilobite, fern, and glyptodon.

The Centennial Museum, across the street from the department building, presents a larger display of fossils that include specimens of glyptodon, ammonite, and fossils from the Cretaceous sediments around Sierra de Cristo Rey and from the Paleozoic rocks of the Franklin Mountains. Mineral specimens featured here include a large desert rose of barite, many wulfenite crystals, quartz, gypsum, calcite, native copper and other copper minerals, tetrahedrite, galena, native sulfur, and pegmatitic feldspar.

These facilities are open to the general public during the academic year. Group tours led by UTEP students are available with prior notice.

MINERALS OF BROKEN HILL, AUSTRALIA

John S. Sobolewski
University of New Mexico
Albuquerque, NM 87131

Broken Hill, in the state of New South Wales, Australia, is not merely one of the world's largest deposits of silver, lead, and zinc. It is also one of the greatest sources of mineral specimens ever known. Over 100 years of continuous mining operations have produced a suite of mineral specimens ranging from the unique to the spectacular. Unfortunately, the great majority of these went to the smelters and only a relatively small percentage has found its way into collections.

The mines of Broken Hill have contributed significantly to mining and ore treatment technologies and have helped make Australia one of the world's leading producers of silver, lead, and zinc for decades. They led to the formation of companies that played a leading role in developing Australia's industry and economy. One of these was BHP (Broken Hill Proprietary), which is now an industrial giant with interests in steel, manufacturing, coal, oil, gas and minerals both in Australia nd overseas. It is very unlikely that any single mining district of the future will exert as much influence on Australian life as Broken Hill.

Until recently, there has been much controversy over the formation of the Broken hill orebody. It is now accepted that it is a metamorphosed stratiform volcanic exhalation deposit originally formed about 1.8 billion years ago. Since that time there have been several events of heavy deformation and metamorphosis as well as a series of granitic and doleritic intrusions. In the past 20 million years, the orebody was uplifted to form the Barrier Range, and erosion and oxidation began. The current lode is shaped like an inverted boomerang and is about 5 mi long, 3,000 ft deep, and about 1,500 ft wide. It has been oxidized to a depth from 300 to 600 ft. The episodes of metamorphosis, the oxidation, together with the fact that the primary ore was rich in copper, calcium, manganese, bismuth, cobalt, nickel, phosphorus, fluorine, chlorine, bromine, and iodine (besides silver, lead, and zinc), have led to the formation of unique and spectacular suites of minerals in the main lode and surrounding area. Reports from the early days show that miners were amazed by the discovery of hundreds of vugs, some the size of rooms, covered with magnificent crystals and stalactites of anglesite, cerussite, smithsonite, azurite, malachite, coronadite, silver halides, pyromorphite, native silver and copper, as well as many other rare secondary minerals. Unfortunately, most were not preserved and went to the smelters. The relatively small number that were preserved are eagerly sought by collectors and museums alike, and several are among the world's best for the species. To date, over 250 distinct species have been identified from the main lode alone, and over 430 from the mines in a 30-mi radius of the main lode. Broken Hill is the type locality for 10 species; this list is likely to increase with recent systematic collecting and studies of specimens from the backfill of the old stopes and with recent mining of the remnants of the oxidized zone in the Kintore and Block 14 opencuts near the center of the lode. In the last few years, these studies have uncovered over 50 rare species previously unrecorded from Broken Hill including several rare phosphates, arsenates, and sulphates that appear to be new to science. These studies should shed additional light on the origins and paragenesis of this complex deposit.

HISTORY AND MINERALS OF THE PIONEER MINING DISTRICT, PINAL COUNTY, ARIZONA

(Location 7 on index map)

Les Presmyk
Salt River Project
P.O. Box 52025
Phoenix, AZ 85072-2025

The Pioneer mining district is in the northeast corner of Pinal County, approximately 65 mi east of Phoenix. It encompasses an area from Silver King to the Belmont mine, from Superior to Gonzales Pass. It is also referred to as the Superior mining district. The Silver King mine was the first one developed in the area, and when the silver ran out, copper became king at the Magma mine (originally located as the Silver Queen). Although not the earliest producer, the longest lived mine in the district is the Magma mine at Superior.

In 1873, while constructing a road over the limestone mountains between Globe and Florence, a soldier (Sullivan) discovered a few lumps of heavy black rock. After leaving the Army, he mentioned his discovery to residents in the Florence area. Soon thereafter he moved on, and the farmers put together two prospecting expeditions over the next two years. The first discovery, in 1874, was the Silver Queen followed by finally relocating Sullivan's discovery as the Silver King on March 22, 1875.

Mining commenced at the Silver King following the discovery, and profitable operations continued through 1887. Additional, intermittent work continued until 1920 without any real success. The mill for processing the ore was located at Hastings near Picket Post Mountain to be closer to water. Some work was done on the Silver Queen claims, but the silver ore quickly turned to uneconomic black copper mineralization (predominantly chalcocite, which contains 78% copper). Only the most valuable of ores could be mined because all materials and supplies were brought in by mule team from the river port at Yuma, Arizona.

By the turn of the century, the railroad had gotten as far as Florence. As a result, copper economics began to change and more interest was shown in the Silver Queen. William Boyce Thompson (of Newmont Mining Corporation fame) took an option on the property and organized the Magma Copper Company in 1910.

Development of the Magma mine has included the sinking of nine shafts, miles of drifts, the construction of 35 mi of railroad, a concentrator, a smelter, and a townsite. During the last expansion in the early seventies, #9 shaft was sunk a total length of 5,000 ft with a finished diameter of 22 ft. In addition, a haulage adit was driven a total of 7,500 ft with a 12-ft-diameter tunnel-boring machine. Today that is fairly routine but the project was truly innovative in 1969.

The first fifty years of mining extracted ore from the Magma vein and several parallel vein structures. These were generally east-west striking, almost vertical veins. In the 1950s, mining began in manto replacement beds within the Naco, Escabrosa, and Martin limestone units. The replacement

Az Mineral Symposium - March

Stromeyerite

bed orebodies were exploited until the mine closed in 1982 because of the poor copper market and high costs experienced at the mine. The Magma mine reopened in 1989 and has continued in production. There have been over 2.5 billion pounds of copper produced from the Magma mine, along with lesser amounts of gold, silver, lead, and zinc.

Other producers in the area include the Lake Superior and Arizona and the Belmont for copper, the Ramsey for gold, the Arizona Hancock for lead and vanadium, and the most famous lapidary locale, "The Apache Tears" pit.

Specimen production from mines of the Pioneer district is confined almost exclusively to the Silver King, the Magma, and to a much lesser extent, the Arizona Hancock. The Silver King has produced some of the best native silver from Arizona. The Magma mine has produced world-class examples of barite, pyrite, and calcite. Lesser known minerals include chalcocite, chalcopyrite, groutite, rhodochrosite, and gypsum. For the richness of the orebodies, the copper sulfide minerals are generally poorly crystallized. The Arizona Hancock has produced some fairly nice red vanadinite crystals up to 4.0 mm.

MINERAL NAMES: PRONUNCIATIONS AND ORIGINS

Paul F. Hlava
Department 1822
Sandia National Laboratories
Albuquerque, NM 87185

I have noticed, when talking minerals with friends/colleagues/dealers, that they are often unsure about the pronunciation of some mineral names. This doubt is usually manifested when they give two (or more) pronunciations for the mineral every time they use the name. This was recently brought home to me in regard to uranocircite. ("Hey, Paul. Have you seen the new *you-ran-oh-sir-sites/you-ran-oh-sir-kites* coming out of Brazil?") Note that many of these people are highly regarded scientists and professionals who are otherwise quite sophisticated about minerals. They can tell you all about the chemistry, mineral associations, and phase relationships but they are unsure about the pronunciation of the very thing they are talking about. This problem may be partly related to the lack of pronunciation guides in mineral texts, guidebooks, glossaries, and the like. And I have seldom seen pronunciations given in the primary and secondary articles that describe new mineral species!

What is needed to rectify this situation is for someone to search out correct pronunciations and take it upon himself to inform everyone else. And this is just what I have attempted to do in this paper (at considerable risk to my health and any good graces that I might have with friends and colleagues). In some small way I hope that many of you will pick up the right pronunciations of some beleaguered minerals and pass them on to others. Then you too can be regarded as know-it-alls.

The only major work that I know of which attempts to list and discuss the proper pronunciation(s) of most mineral names if the "Chemical Index of Minerals" (and supplements) by Max Hey of the British Museum. For more than a few years, I have been looking up problematical mineral pronunciations in these references so I could at least be correct myself. I have also tried to pass some of this information on to some of my more receptive comrades. Now it is perhaps time for me to expand on my mission of education and speak to wider audiences. In preparation for this mission, I have gone through various mineral lists picking out those names which seem to be forever giving people problems, e.g. tyuyumunite, goethite, fuchsite, and phenacite. In the process I found some names that people didn't realize they had problems with, e.g. parisite, escloizite, coesite, and cuprite. I also found a number of interesting homonymous names, e.g. allanite-alunite and beyerite-byerite or beyerite-bayerite. Some minerals are (almost) never pronounced correctly, e.g. biotite, gadolinite, and descloisite. And the plethora of relatively new names from around the globe continues to plague my efforts because they are not yet in my main reference, e.g. cechite, ktenasite, and dzhezkazganite. As I close this paper, I should mention that neither of the uranocircite pronunciations listed above is correct.

References

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