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Volume Twenty-six, Number Five
September–October 1995
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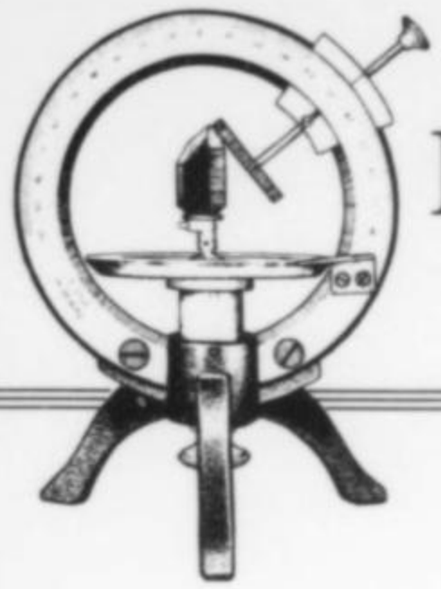

THE MINERALOGICAL RECORD

September–October 1995 Volume Twenty-six, Number Five

Articles

Columns

COVER: ORPIMENT crystals to 4 cm, with calcite, from the arsenic mine near Shimen in Hunan Province, China. Mike Bergmann specimen; photo by Jeff Scovil.

notes from the EDITOR

Changes

NEW CODES!

Readers should be aware that the postal service *and* the telephone company have seen fit to change our numbers as of this past July. The new telephone/FAX area code for both the editorial/advertising office *and* the circulation office is now **520**. And the new postal zip code for the editorial/advertising office is now **85750**. (The zip code for the circulation office's post office box remains 85740.)

NOTICES

Died, Betty Halff Llewellyn, 83, in Dallas, Texas (28 April 1995). Betty Llewellyn was born in Midland, Texas, on June 12, 1911, and graduated from Southern Methodist University with a B.A. in 1934. Over her long lifetime she served as a director for many organizations, and was a philanthropic supporter of activities involving her two great passions: the circus, and mineralogy.

Llewellyn first became seriously interested in minerals in the mid-1950's while living in Santa Barbara, where she was aided by Professor Woodhouse at UCSB. Her collection became worldwide in scope, and included all sizes, with specializations in many single-species suites. She loved to learn about minerals and often bought things solely because she had never heard of them, then returned home to read up on the new acquisitions.

During the 1970's Llewellyn took several courses in gemology from the Gemological Institute of America, and began building a superb collection of cut stones. She made significant donations of fine gemstones to many museums including the Carnegie Museum of Natural History, the Colorado School of Mines Museum, the Denver Museum of Natural History, the Natural History Museum of Los Angeles County, the U.S. National Museum of Natural History (Smithsonian), and one of her favorites, Paris Junior College in Paris, Texas.

Under the company name of Walnut Hill Publishing she published the English edition of Burchard's *Mineral Museums of Europe* (1986) as a service to English-speaking collectors.

Llewellyn was awarded the James Smithson bronze and silver medals by the Smithsonian Institution, and was a member of the James Smithson Society, as well as the Dallas Gem and Mineral Society and many other organizations.

Kind, friendly and good-natured, she was the model of an enthusiastic collector/philanthropist whose work in the mineral and gem communities will endure and be enjoyed by generations to come. Betty Llewellyn is survived by five sons (including mineral show promoter Martin Zinn), two daughters, 17 grandchildren, 18 great-grandchildren and one great-great-grandchild.

W.E.W.

Died, Vincent Morgan, 84. Vincent Morgan was born September 13, 1908, and died February 26, 1995. Vince was "Mr. Boron" to mineral collectors for many years when the great Boron open pit was in its prime as a major specimen producer. He discovered and helped describe two new minerals, gerstleyite and tunellite; and had at least two other new species under investigation when he passed away.

Vince grew up in Los Angeles. He graduated from UCLA in 1937 with a Bachelor of Science degree in chemistry and went to work as a chemist with Pacific Coast Borax Company at the then underground borax and kernite mines.

That started his life-long involvement with boron mineralogy, chemistry, and the town of Boron, California.

Vince's interest in minerals was almost immediate. He quickly recognized that more than chemistry was needed to study borate minerals, so he became a self-taught expert in optical mineralogy. He could quickly identify any sample brought to him, if not by sight, then with his old Zeiss microscope.

His professional career extended over 34 years with Pacific Coast Borax Company and its successor U.S. Borax. He rose quickly to Chief Chemist. During this period, he developed several new analytical techniques and procedures for analyzing boron compounds and associated elements found in the Boron orebody. His final years were served as Senior Scientist in Engineering, a "think tank" position where his skills were used to develop new plant processes. After his retirement in 1971, he continued as a frequent consultant on technical affairs for U.S. Borax, and wrote papers for technical publication.

Vince met his life-long partner, Mignonette ("Midge") when she was on a camping trip to the desert in the late 1930's, and they were married in 1941. She shared his enthusiasm for mineral collecting, and the two were nearly always seen together at mineral functions. They raised three sons who all became highly respected in their fields; but alas, none of them collected minerals.

Vince's contributions to modern mineral collecting were significant. He was a founder of the Mojave Mineralogical Society in 1941. He served as President of the California Federation of Mineralogical Societies in 1955–56, President of the American Federation of Mineralogical Societies in 1957–58, and Chairman of the AFMS Display Rules Committee. Many of the current judging rules, which have been instrumental in raising the overall quality of displays, are the direct result of his input. He was also an unusually competent judge himself, so his thoughts on the judging rules were based on personal experience.

Papers describing two new minerals found at Boron were co-authored by Vince. *Gerstleyite,* a very rare hydrated sodium-antimony-arsenic sulfide, was published with Clifford Frondel in 1956; and *tunellite,* a hydrated strontium borate, was described with Richard C. Erd in 1962. In addition, at least two other antimony sulfides are credited as his discoveries, but are fine-grained and have not yet been described. The best work on Boron mineralogy was published together with Richard C. Erd in the *Mineral Information Service of the California Division of Mines and Geology,* volume 22, numbers 9 and 10 (1969). Most of the photos were taken by Vince. Most of the better crystallized specimens pictured are still preserved together as a group in my own collection.

Field collecting was Vince's great love. Most of his very extensive collection was personally collected, and consisted primarily of Boron and Death Valley borates and associated minerals. Most of his general collection, which contained several superb pieces, was obtained by trading Boron material with museums. Vince did occasionally buy specimens; but his Depression upbringing, and a moral concern about selling "things that properly belonged to the company" kept him above the fray of silver pick collecting. Nevertheless, his collection is an important one, particularly the borate minerals. Many of his specimens are among the finest known for their species . . . Not a bad legacy for a field collector.

Perhaps one of Vince's most satisfying legacies is that he passed on his interest in minerals to others. Collectors knew him for his mineral talks illustrated by his excellent mineral slides; and more than one young student had his curiosity about "rocks" piqued by Vince. Rock Currier worked for Vince in his Boron lab in the early 1960's, and began collecting as a direct result of seeing Vince's specimens in the office. He spent many hours at Vince's home looking at minerals. I myself also gained much from Vince's knowledge and passion. Whenever a case for competitive display was being readied, Vince was called upon to critique it first. Often the criticism was painful, but it was also on the mark.

Vince sold his mineral collection to me in 1991. Moving, cleaning, trimming and general working up of the collection took about a year. The main collection was kept in display cases and metal file drawers in the Morgan's house. However, Vince also had two infamously dusty sheds containing duplicates and stored material. Many boxes contained material wrapped in original collecting paper. Every trip that I made to the shed yielded new treasures. It was like Ali Baba's cave. A large 40-kg boulder of hydroboracite yielded pockets with some of the finest tunellite on hydroboracite known to exist. One shelf was lined with excellent chocolate-brown colemanite crystal groups, all turned so that only their broken, mud-caked backs showed. A dust-covered box produced a lovely Weardale fluorite. Vince just grinned when these pieces turned up.

"Mr. Boron" will be missed by all who knew him. Certainly his contributions will live on, and for that the world is better.

James W. Minette

Died, Blair Gartrell, 44 (1950–1994), of cancer, in Beverley, Western Australia. Gartrell, who advertised and corresponded under the business name of "Westaus Museum," was one of Western Australia's most active and prominent amateur mineralogists and mineral dealers. He collected extensively in the field, was coauthor of several published papers, labored for years on an update of the state's mineralogy (Simpson, 1948), and discovered several new species including *gartrellite,* named for him in 1990. Despite his early death, he made a substantial and lasting contribution to Australian mineralogy.

THANK YOU!

We are indebted to Dr. Miguel Romero of Tehuacan, Puebla, Mexico, for a generous donation toward the production of our special issue on *Mineral Books* (July–August 1995). Dr. Romero, who also contributed to our 25th Anniversary Issue on *The History of Mineral Collecting* (November–December 1994), is the founder of the Romero Mineralogical Museum (see vol. 16, p. 129–136) and a past recipient of the Carnegie Mineralogical Award (see vol. 23, p. 281).

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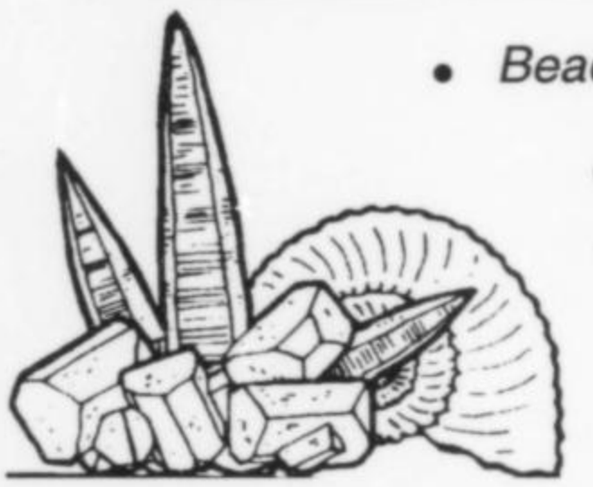

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Definition of a Mineral

Ernest H. Nickel
Division of Exploration & Mining, CSIRO
Wembley, WA 6014, Australia
(Vice-chairman, IMA Commission on New Minerals and Mineral Names)

*In response to suggestions from the mineralogical community that a new definition of a mineral, compatible with recent technological advances, should be promulgated, the IMA Commission on New Minerals and Mineral Names (CNMMN) has taken the initiative in producing the definition embodied in this paper. The paper is the end-product of active discussion of the subject within the CNMMN over a period of several years, and represents a general consensus of the CNMMN membership.**

In general terms, a mineral is *an element or chemical compound that is normally crystalline and which has been formed as a result of geological processes.* This statement suffices to include the vast majority of substances that are generally accepted as minerals, but there are some substances that do not conform entirely to these requirements, and it is therefore necessary to consider where the dividing line between mineral and non-mineral should be drawn, and what exceptions to the general statement should be permitted. The remainder of this document is devoted to an examination of these aspects.

Although the main purpose of this definition is to provide internal guidelines for the work of the CNMMN, it is hoped that it will be also generally accepted by mineralogists and other earth scientists. However, if serious objections are raised with respect to any parts of the definition, the possibility of further revisions will be considered.

CRYSTALLINITY

The term "crystalline," as generally used in mineralogy, means atomic ordering on a scale that can produce an "indexable" (i.e. with Miller indices) diffraction pattern when the substance is traversed by a wave with a suitable wavelength (X-ray, electrons, neutrons, etc.). However, some naturally occurring substances are non-crystalline. Such substances can be divided into two categories: *amorphous* (substances that have never been crystalline and do not diffract X-rays or electrons) and *metamict* (those that were crystalline at one time, but whose crystallinity has been destroyed by ionizing radiation). Some mineralogists are reluctant to accept amorphous substances as minerals because of the difficulty in determining whether the substance is a true chemical compound or a mixture, and the impossibility of characterizing it completely; some prefer to call such substances "*mineraloids.*" However, some amorphous substances (e.g. georgeite, calciouranoite) have been accepted as minerals by the CNMMN.

* Publication approved by the Commission on New Minerals and Mineral Names of the International Mineralogical Association.

With modern techniques it is possible to study amorphous phases more effectively than was possible in the past. Spectroscopic methods associated with a complete chemical analysis can often identify an amorphous phase unequivocally. In fact, appropriate spectroscopies (e.g. IR, NMR, Raman, EXAFS, Mössbauer) can reveal the three-dimensional short-range structural environment of each element (chemical bonds). Of course, without the possibility of obtaining a complete crystal structure analysis, which can give coordinates and the nature of the atoms, the necessity of a complete chemical analysis is more stringent with amorphous material than with a crystalline phase.

The basis for accepting a naturally occurring amorphous phase as a mineral could be:

(1) A series of complete quantitative chemical analyses that are sufficient to reveal the chemical composition of all the grains in the specimen.

(2) Physicochemical (normally spectroscopic) data that prove the uniqueness of the phase.

(3) Evidence that the material cannot produce an "indexable" diffraction pattern, both in the natural state, and after treatment with some physicochemical solid-state process (e.g. heating).

Metamict substances, if formed by geological processes, are accepted as minerals if it can be established with reasonable certainty that the original substance (before metamictization) was a crystalline mineral of the same bulk composition. Evidence for this includes the restoration of crystallinity by appropriate heat treatment and the compatibility of the diffraction pattern of the heat-treated product with the external morphology (if any) of the original crystal (e.g. fergusonite-Y).

A special case of non-crystalline naturally occurring substances are those that are liquid under ambient conditions. Water, in its liquid form, is not considered to be a mineral, but its solid form, ice, is. Mercury, however, is recognized as a mineral even though it does not occur in a crystalline state on Earth. Petroleum and its non-crystalline bituminous manifestations, are not regarded as minerals.

STABILITY UNDER AMBIENT CONDITIONS

Many minerals were formed under conditions of high temperature and/or pressure and are metastable under ambient conditions; others may tend to hydrate or dehydrate when removed from their place of origin. Such minerals may require special procedures to prevent their decomposition before the investigation is complete. The use of special procedures in the investigation does not preclude the acceptance of a metastable or unstable substance as a mineral if it can be adequately characterized and if it meets the other criteria for a mineral.

EXTRATERRESTRIAL SUBSTANCES

Extraterrestrial substances (meteorites, moon rocks, etc.) were apparently produced by processes similar to those on Earth, and therefore such processes are now called geological, even though the term "geology" originally meant the study of rocks on this planet. Consequently, naturally occurring components of extraterrestrial rocks and cosmic dusts are regarded as minerals (e.g. the lunar mineral tranquillityite).

ANTHROPOGENIC SUBSTANCES

Anthropogenic substances are those produced by Man, and are not regarded as minerals. If such substances are identical to minerals, they can be referred to as "synthetic equivalents" of the minerals in question.

GEOLOGICALLY MODIFIED ANTHROPOGENIC SUBSTANCES

Chemical compounds formed by the action of geological processes on anthropogenic substances have, on occasion, been accepted as minerals (e.g. the Laurium minerals formed by the reaction of sea water with ancient metallurgical slags). However, in the modern era, when many exotic materials are produced, the possibility arises that such substances can be placed in a geological environment to produce reaction products that might otherwise qualify as new minerals. The CNMMN has therefore ruled that, *in the future,* chemical compounds formed by the action of geological processes on anthropogenic substances *cannot be considered as minerals.*

Some chemical compounds formed by the action of geological processes on rocks or minerals that have been exposed to such processes by activities of Man (e.g. mine openings, ore dumps, roadcuts, etc.) have been accepted as minerals in the past and, if the exposure was inadvertent, i.e., not done with the express purpose of creating new minerals, then such products can be accepted as minerals. Chemical compounds caused by mine fires are considered to be a special case, as it is not always clear whether there has been human involvement in initiating the fire, and such substances are therefore *not accepted* as minerals.

BIOGENIC SUBSTANCES

Biogenic substances are chemical compounds produced entirely by biological processes without a geological component (e.g. urinary calculi, oxalate crystals in plant tissues, shells of marine molluscs, etc.) and are not regarded as minerals. However, if geological processes were involved in the genesis of the compound, then the product can be accepted as a mineral. Examples of acceptable minerals of this kind are substances crystallized from organic matter in black shale or from bat guano in caves, and the constituents of limestones or phosphorites derived from marine organisms.

The Finch Mine
and Vicinity, Gila County, Arizona

Kyle David Smith
P.O. Box 26616
Tempe, Arizona 85285

The Kullman-McCool group of claims includes one of Arizona's more unusual wulfenite occurrences, the Finch mine, where crystal groups are commonly found covered by a thin layer of drusy quartz. This mine and the various other adjacent properties and workings have yielded many interesting specimens to collectors.

INTRODUCTION

The Kullman-McCool group consists of 21 unpatented claims in the Banner mining district, Gila County, Arizona. The group includes the Brick #1 through #12 and the Lead-Silver #1 through #9. The properties were worked chiefly for vanadium and molybdenum and lesser amounts of lead, zinc and copper. The claims are currently held by the Kullman-McCool Mining Company, Sun City, Arizona.

The group is better known among mineral collectors by several alternate names. The Brick Claims, DH claims, D & H, the Finch mine (Brick #3) and the Barking Spider mine (same claim) are a few of the names which are common (and correctly) used on mineral specimen labels for this locality.

The area is most famous for the unique and beautiful specimens of wulfenite and vanadinite crystals perched on a coating of light blue hemimorphite and later covered with transparent drusy quartz.

The Dripping Springs Mountains, in which these properties are found, are the location for many other well-known mines. Some are rich in silver, others have good gold values, many contain copper, and several have produced lead, zinc and vanadium. Mineral specimens from many of these mines now reside in collections throughout the world. Adjoining the property to the north is the famous 79 mine. Further north and west is the Ray copper mine and the Sulfren-Haley silver mine. Northeast lie the Chileto mine, the Arizona Apex mine, and the Hogwell gold claims. Still a bit further northeast is the Christmas mine, which is rich in copper and is the type locality for several mineral species.

LOCATION

The Kullman-McCool group is located in the Hayden, Arizona, 7.5-minute U.S.G.S. quadrangle; at T4S, R15E, Sec. 28, E$^1/_2$ and Sec. 27, W$^1/_2$. The claims extend approximately from the fork in the road (Sec. 33) on the southwest, up Keystone Canyon to the north, and east through sections 28 and 27 to Schneider Canyon. The claims can be reached by either of two mine roads, both of which lead about 3 miles north to the property from Hayden Junction on Arizona Highway 177.

Elevation at the claims ranges from about 2,600 to 3,225 feet. They are situated in the upper half of the Lower Sonoran Desert Zone. It is a dry, hot area with summer temperatures that can exceed 110° F. Cactuses thrive in these desert mountains. Staghorn and teddy bear chollas, fishhook

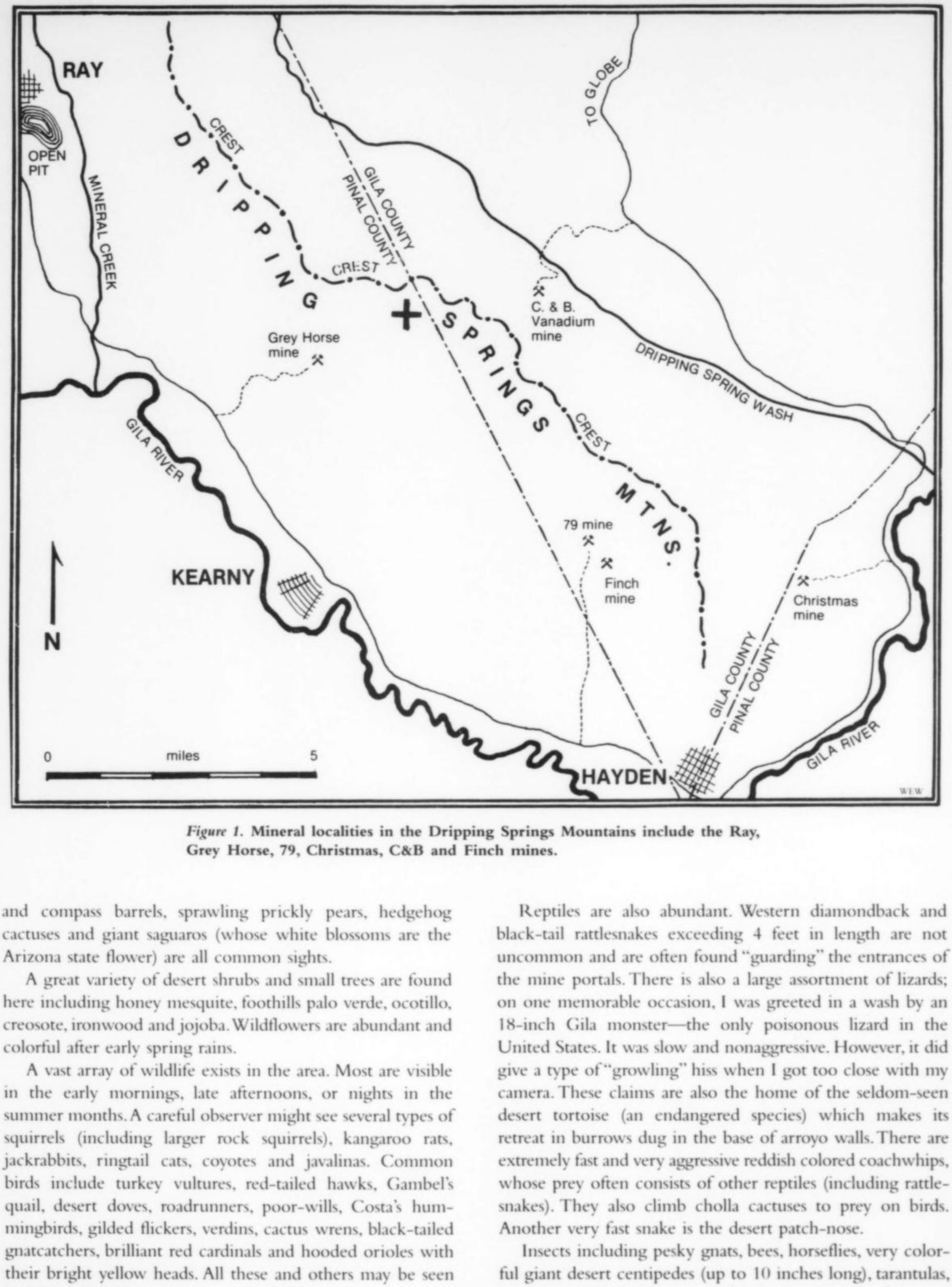


Figure 1. **Mineral localities in the Dripping Springs Mountains include the Ray, Grey Horse, 79, Christmas, C&B and Finch mines.**

and compass barrels, sprawling prickly pears, hedgehog cactuses and giant saguaros (whose white blossoms are the Arizona state flower) are all common sights.

A great variety of desert shrubs and small trees are found here including honey mesquite, foothills palo verde, ocotillo, creosote, ironwood and jojoba. Wildflowers are abundant and colorful after early spring rains.

A vast array of wildlife exists in the area. Most are visible in the early mornings, late afternoons, or nights in the summer months. A careful observer might see several types of squirrels (including larger rock squirrels), kangaroo rats, jackrabbits, ringtail cats, coyotes and javalinas. Common birds include turkey vultures, red-tailed hawks, Gambel's quail, desert doves, roadrunners, poor-wills, Costa's hummingbirds, gilded flickers, verdins, cactus wrens, black-tailed gnatcatchers, brilliant red cardinals and hooded orioles with their bright yellow heads. All these and others may be seen within a 24-hour period.

Reptiles are also abundant. Western diamondback and black-tail rattlesnakes exceeding 4 feet in length are not uncommon and are often found "guarding" the entrances of the mine portals. There is also a large assortment of lizards; on one memorable occasion, I was greeted in a wash by an 18-inch Gila monster—the only poisonous lizard in the United States. It was slow and nonaggressive. However, it did give a type of "growling" hiss when I got too close with my camera. These claims are also the home of the seldom-seen desert tortoise (an endangered species) which makes its retreat in burrows dug in the base of arroyo walls. There are extremely fast and very aggressive reddish colored coachwhips, whose prey often consists of other reptiles (including rattlesnakes). They also climb cholla cactuses to prey on birds. Another very fast snake is the desert patch-nose.

Insects including pesky gnats, bees, horseflies, very colorful giant desert centipedes (up to 10 inches long), tarantulas, scorpions and black ants are all at home on these claims.

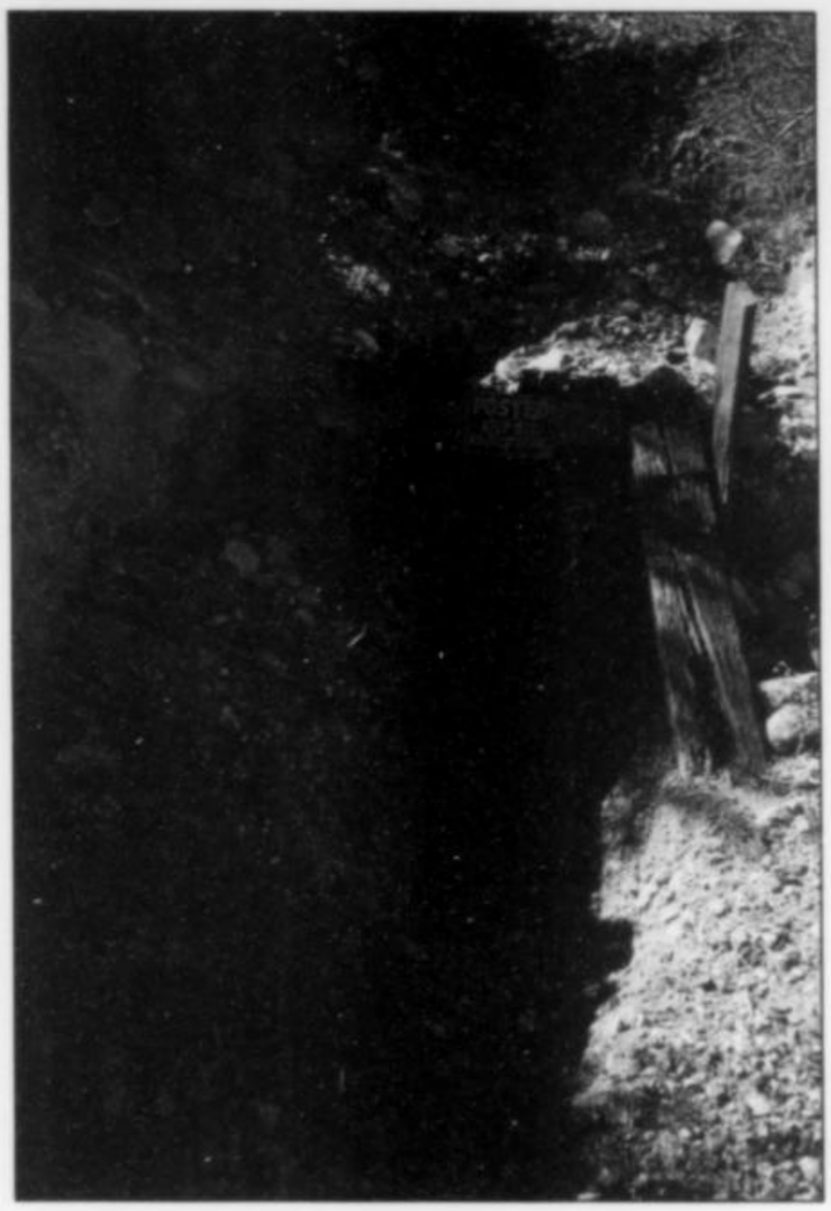


Figure 2. **Western portal of the Finch mine. K. D. Smith photo.**

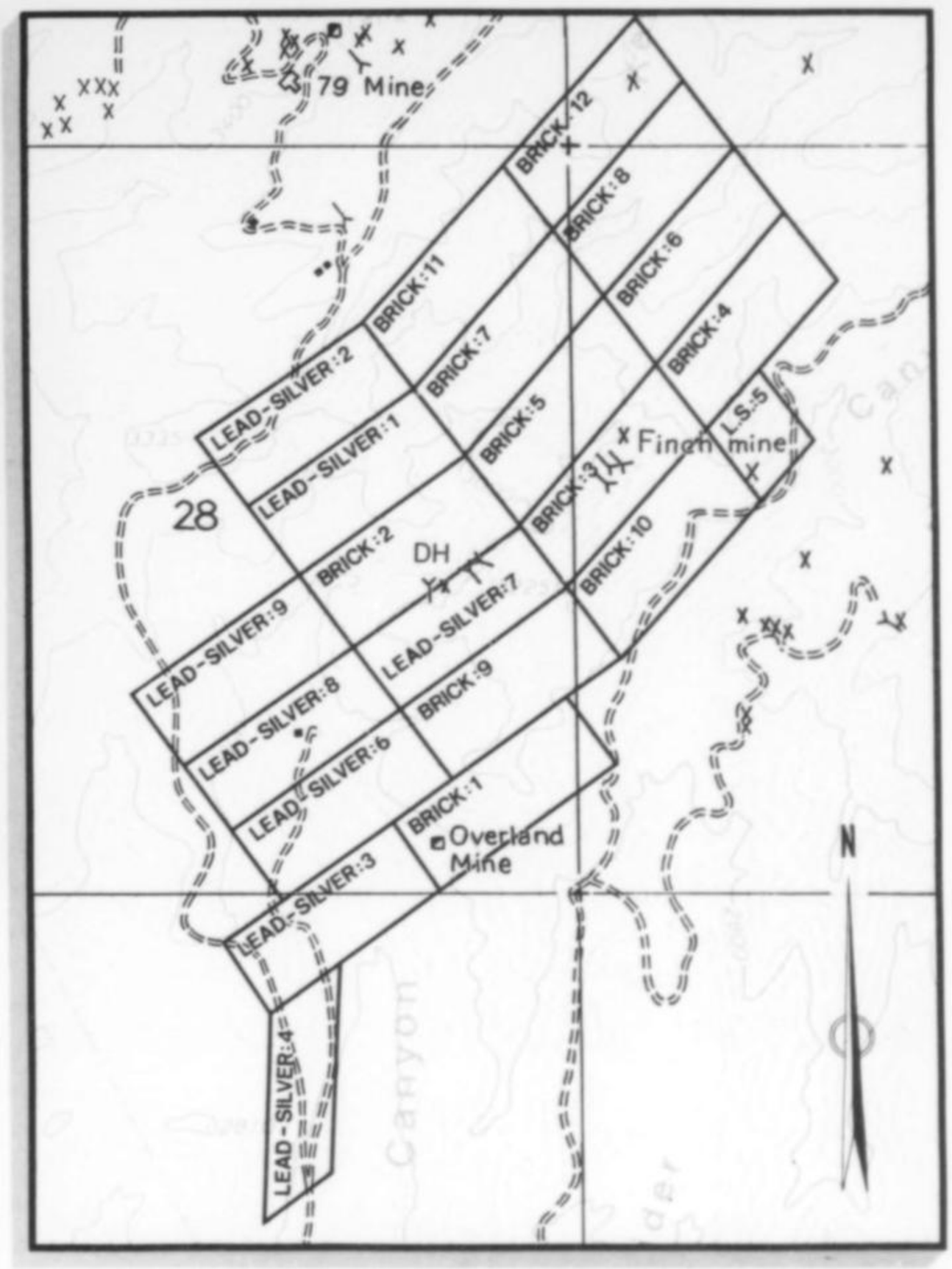


Figure 3. **Claim map showing the 79 mine (top) and the various Kullman-McCool claims, including the DH claims and the Finch mine.**

HISTORY

The history of these claims is vague and somewhat contradictory. Records indicate that the deposits were located around 1880 by a man named Watson. Several claims in the area were later acquired by D. W. O'Carroll and were later sold to the Dripping Springs Mining, Smelting and Copper Company, which was reorganized in 1908 as the London-Arizona Copper Company. In 1913, a merger of the London-Arizona, London-Range, and Ball Copper Companies formed the London-Arizona Consolidated Copper Company. This company had 132 unpatented claims in the vicinity. Work was carried on intermittently until 1920, mostly by lessees, under the supervision of the company's officers. Ore was transported to the nearby smelter in Hayden (Ross, 1925).

In 1923 the original claims of the present day Kullman-McCool group were acquired by Lee Reagan. Production was sparse from the scattered prospects, resulting in a few carloads of oxidized lead ore which was shipped to a smelter in El Paso, Texas (Kiersch, 1951).

The Bureau of Land Management's Arizona State office documents the claimants differently. According to their records, in July of 1923 the claims on the Brick #1 through #4, #9 and #10 were filed by Miller Wallis. In September of 1926, J. D. Selleck, along with Wallis, filed claims on the Brick #5 through #8, #11 and #12. In July 1927, Lee Reagan filed his first claims on the Lead-Silver #1 through #8 and later, in August 1928, claimed the Lead-Silver #9. There are no records of when Reagan took over the Brick claims. It is interesting and curious to note the dates of the various claimants regarding the location and numbering of the claims. (The numbers are random. See claim map.)

Lee Reagan's daughter, the current president of the Kullman-McCool Mining Company, repeatedly refused to grant an interview for this article. It is also interesting to note that either all or part of the claims have, in the recent past, twice been cross-claimed, once in 1978 and again in 1981. Both cross-claims were declared null and void due to the lack of assessment-work affidavits.

GEOLOGY

A detailed description of the geology of the Hayden quadrangle has been given by Banks and Krieger (1977). A brief and general description of the geology relevant to the mines of the Kullman-McCool claims follows. Individual claim names are used for clarification of the locality (see claim map).

Figure 4. **The Overland mine. K. D. Smith photo.**

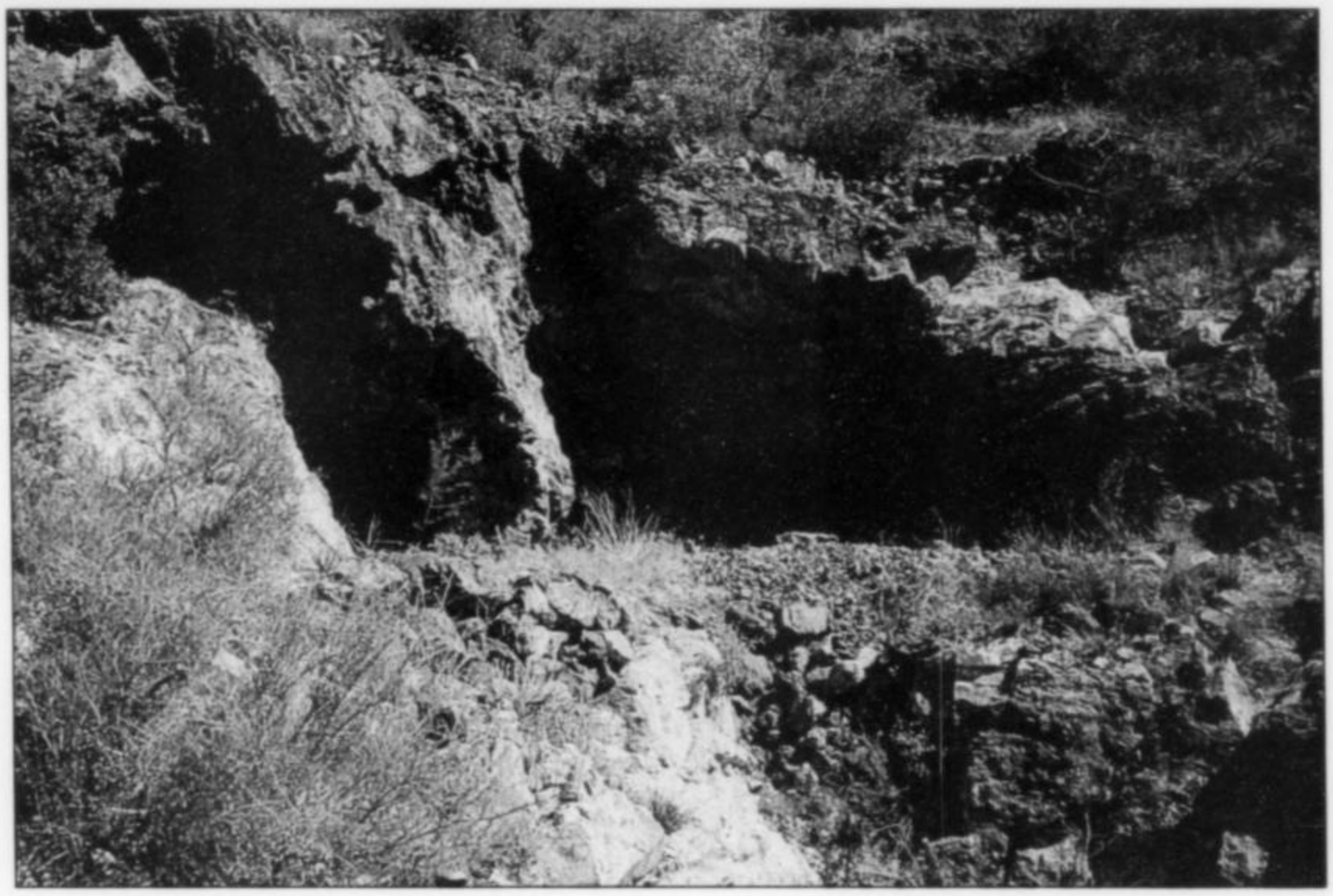


Figure 5. **Eastern portal of the DH claim. K. D. Smith photo.**

Mineralization in this area occurs at the contact zones of limestones with igneous porphyries, and along dikes, fractures, fissures and favorable bedding planes. A major southwest-trending fault running through the Lead-Silver 8, Lead-Silver 7, Brick 2, Brick 3 and Brick 4 claims is a branch off the Keystone Fault located to the east. Most mineralization occurs along this fault.

On the northern side of the fault lies Naco Limestone (Middle to Lower Pennsylvanian in age). On the south side are Upper Cretaceous andesite and andesitic porphyries.

The Naco strikes generally N60°W, dipping 35° southwest on the southwestern edge of the contact on the Lead-Silver 9 and Brick 2 claims. Closer to the workings on the Lead-Silver 7, the dip increases slightly to 40°–45°S. On the Brick 3 the limestone strikes N55°E, dipping at 23°SE. A minor, south-trending fault occurs here and passes north-

Figure 6. **Eastern portal of the Finch mine, and the cut above the mine. K. D. Smith photo.**

northwest through the Brick 5, 7 and 11 claims.

Tilting of the limestone beds occurred as a result of faulting and folding associated with formation of the Williamson Canyon Volcanics (Upper Cretaceous), preceded by the deposition of andesite and andesitic porphyries. Throughout the area, microscopic and macro-fossils of marine life can be found in the limestone.

During the Lower and Middle Paleocene, rhyodacite dikes and quartz porphyry dikes cut both the limestone and andesite in this area.

At an area on the Lead-Silver 7, several round, parallel "tubes" of basalt (Upper Cretaceous) can be observed where they pushed their way through the limestone. The thin east-westerly dikes in the region did not have the thermal energy needed to push through the limestone, and show only rare instances of forceful intrusion. The abundance, consistent lateral displacement and the narrowness of these dikes suggests that they were probably intruded in association with tectonic forces, with possible shearing and compression in a general northwest-southeast direction. Other evidence in the region and nearby quadrangles, as well as elsewhere in Arizona, indicate that compression may have originated from movement of lithospheric plates in Laramide time (Banks and Krieger, 1977).

MAJOR WORKINGS

All of the Kullman-McCool claims show mineralized outcrops; however only the more significant ones will be described here.

Exposed by the workings are lead-molybdate and lead-vanadate ores, and oxidized lead, zinc and copper ores, some reportedly carrying gold and silver (Orem, 1953a).

Brick #1

The Brick 1 is also known as the **Overland mine** and the **Reagan shaft**. This claim has a 69-meter vertical shaft. During World War I, a small concentration table was used to make molybdate and vanadate concentrates using the ores taken from the other claims and the water pumped from this shaft. Later, in the early 1930's, Lee Reagan constructed a small table here, and pumped water from the shaft at a rate of 50 gpm over extended periods of time. The concentrates were sold in Tucson (Orem, 1939 and 1953a).

Today, ruins of the tables are scattered. A small ore pile, a water tank, part of a pump, and piping remain. The shaft is poorly fenced and the collar is very unstable. In 1988, I attempted to rappel down the shaft. After I had descended about 10 feet, a large section of the collar collapsed, which left me hanging, covered with dirt, in a huge cloud of dust. Needless to say, I made no further attempt to continue exploration of this shaft.

Brick #2

The Brick 2 is also known as the **Lower DH** claim and the **D & H**. Here a 38-meter cross-cut tunnel was driven to the southwest. Approximately 15 meters beyond the portal is an 18-meter drift trending northeast and southwest which shows minor mineralization. At 30 meters in, a short drift

and raise show heavy oxidation along a fault plane; however, these workings are quite small and very unstable.

Brick #3

The Brick 3 is also known as the **Finch mine** and the **Barking spider mine**. Two parallel 24-meter tunnels are connected by a drift approximately 30 meters long, following a nearly vertical fracture in the limestone at the contact with andesite and andesitic porphyries.

Towards the southwestern end of the drift, a winze was sunk 47 meters at an angle of 55° to the southeast. On the 38-meter level, a drift approximately 32 meters long follows a fissure parallel to the one in the connecting drift above. Two 15-meter cross-cut tunnels run northwesterly from this drift and show lead and copper ore in places.

At the bottom of the winze, a third fracture has been drifted on for about 12 meters, also showing ore in places (Orem, 1954).

Lead-Silver #7

The Lead-Silver 7 is also known as the **Brick Group**, **D & H** and **DH claim**. This claim consists of several shallow drifts totaling about 122 meters, with several more surface cuts, prospects and outcrops. The workings at the southwestern-most point show the most mineralization, and consists of two drifts, parallel to each other, totaling about 38 meters. These drifts are low, full of muck and have poor air circulation.

DISCUSSION

The Kullman-McCool group has carried a number of names in the past, leading to confusion regarding the already vague history, and resulting in a number of discrepancies in locality discussions and specimen labels among various collections. With this in mind, I suggest that the following names be formally adopted.

The Finch mine should be used for the workings on the Brick #3, also known as the Barking Spider mine. The Finch mine name was used for years prior to the brief time during which the mine was cross-claimed as the Barking Spider.

The DH claim should be used for the workings on the Lead-Silver #7, and the **Lower DH claim** for the Brick #2. These names have been used for many years; however, occasionally one might see the names "Brick Claims" and "D & H."

The Overland mine should be used for the workings on the Brick #1. It has sometimes been referred to as the Reagan Shaft and the Reagan Camp. The shaft on this property was named the Overland mine prior to Lee Reagan acquiring any of the claims. The Reagan Camp is actually located on the Lead-Silver #8, evidenced by scattered debris and ruins of a building.

It should also be noted that any specimen labeled from this claim is more than likely material that had been transported there from either the DH claims or the Finch mine, as this was a water shaft and concentration plant.

MINERALOGY

The following is a brief description of the minerals present in the Kullman-McCool claims.

Actinolite $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$

Actinolite has been found in the workings of the Brick 2 and Lead-Silver 7 in cracks and fissures in contact-metamorphosed limestone, as white to gray, flexible, compact matted masses.

Andradite $Ca_3Fe_2(SiO_4)_3$

Andradite occurs as corroded, dodecahedral, crystalline masses ranging in color from olive-green to greenish brown. It is found throughout the area along the contact zones due to metasomatic replacement of intruded limestones.

Anglesite $PbSO_4$

Anglesite has been reported as small residual lenses in the bedding planes over the crosscut portal on the Lead-Silver 7. It occurs with cerussite and replacing galena (Orem, 1953).

Beudantite $PbFe_3^{3+}(AsO_4)(SO_4)(OH)_6$

Beudantite is found as brown, earthy, massive material associated with descloizite in the Brick 3 (Finch mine) (H. Hori, personal communication, 1984).

Calcite $CaCO_3$

Calcite is common throughout the workings at the Lead-Silver 7 and Brick 3 (Finch mine), as vitreous, chocolate-brown rhombohedrons. It is also found as snow-white, tabular crystals, up to 5 mm in cavities in limestone, and commonly as a gangue mineral.

Cerussite $PbCO_3$

Cerussite occurs as minute, dull, white to yellow granules in a limonite gossan near the contact of the limestone and porphyry. It occurs in association with anglesite, galena, wulfenite, vanadinite and descloizite in the Lead-Silver 7. Cerussite is found rarely at the Brick 3 (Finch mine) as vitreous, "V"-shaped twins up to 1 cm.

Chalcophanite $(Zn,Fe,Mn)Mn_4O_7 \cdot 3H_2O$

Chalcophanite occurs in an oxidized zone of the Brick 2 as metallic black drusy coatings on a gossan matrix, as minute tabular plates, and occasionally as pseudo-octahedral or (more correctly) trigonal dipyramidal crystals to 1 mm. It is associated with serpierite, ktenasite and other zinc and iron sulfates and oxides. (Spectrographic analysis was provided by David Shannon and XRD by Ray Grant.)

Chrysocolla $(Cu,Al)_2H_2Si_2O_5(OH)_4 \cdot nH_2O$

Chrysocolla occurs sporadically throughout the workings. It ranges from a pale, sky-blue powder to vitreous, bright-blue, gemmy material. It also occurs rarely as minute, bubbly green coatings in the Lead-Silver 7.

Clinozoisite $Ca_2Al_3(SiO_4)_3(OH)$

Clinozoisite occurs on the saddle and hill above the adits on the Brick 3 (Finch mine), as short prismatic crystals which are pink to pinkish red in color. It also occurs as granular crystalline coatings in seams in metamorphosed limestone, and as bladed and intermeshed prismatic crystals.

Descloizite $PbZn(VO_4)(OH)$

Descloizite is a common secondary mineral in these claims. It occurs in a variety of colors—bright yellow to orange to red, and vitreous brown to dark green and black.

The crystals are opaque to transparent. Bladed microcrystals are abundant on hemimorphite and drusy quartz coating limestone. Occasionally, it is found as pseudomorphs after vanadinite and wulfenite.

Devillite $CaCu_4(SO_4)_2(OH)_6 \cdot 3H_2O$

Wet chemical and microscopic study indicates the presence of devillite as tiny flattened and tabular platy clusters of bluish-white crystals occurring sparingly at the Brick 2 with serpierite and ktenasite.

Epidote $Ca_2(Fe,Al)_3(SiO_4)_3(OH)$

Epidote is found scattered throughout the area as pistachio-green, intermeshed aggregates of prismatic crystals and as granular massive rock. It generally forms as a result of low to medium thermal metamorphism of igneous and sedimentary rocks.

Ferro-actinolite $Ca_2(Fe,Mg)_5Si_8O_{22}(OH)_2$

Ferro-actinolite occurs as compact, elongated, radiating crystalline aggregates in an oxidized area of the Brick 2. The color varies from gray-brown to a dark olive-green, with crystal masses up to 13 cm along the *c* axis. (Microprobe analysis was provided by Jeff Roberts, Arizona State University.)

Galena PbS

Galena is found occasionally at the Lead-Silver 7, as partially altered remains of cubic and massive material. Anglesite and cerussite have replaced most of it.

Gypsum $CaSO_4 \cdot 2H_2O$

Gypsum occurs sparsely in an oxidized zone in the workings of the Brick 2, as attractive white microcrystals up to 3 mm, curved at the ends, and also as crude, glassy, highly included crystals groupings up to 5 cm.

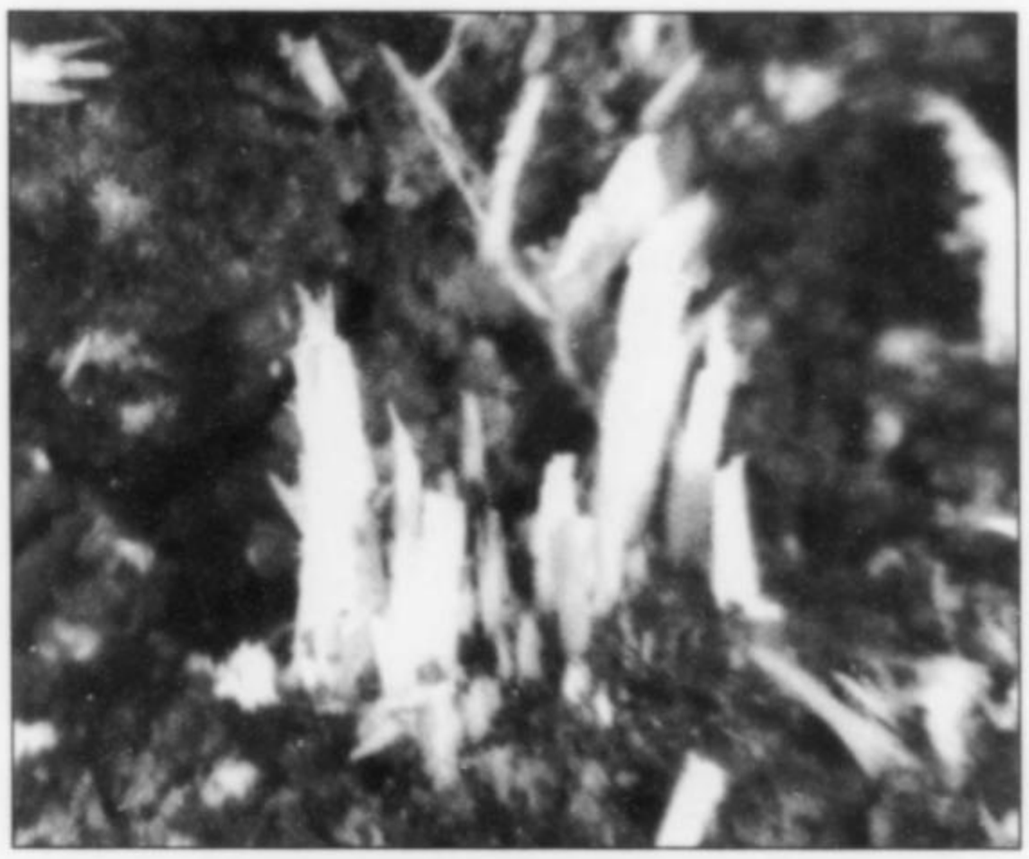


Figure 7. **Halotrichite growths to 1 mm from the Lower DH claim. K. D. Smith collection; C. W. Allred photo.**

Halotrichite $FeAl_2(SO_4)_4 \cdot 22H_2O$

Halotrichite occurs in an oxidized zone of the Brick 2 as minute, white, fibrous and acicular crystals. "Ramshorn" and "corkscrew" forms are abundant. It is found on a highly altered pyritic matrix associated with serpierite, ktenasite, gypsum and other sulfates.

Hematite Fe_2O_3

Hematite is sparsely present as black, oolitic concretionary coatings throughout the oxidized zones of the Brick 2 and Lead-Silver 7. It also occurs very rarely as tarnished, iridescent, botryoidal coatings.

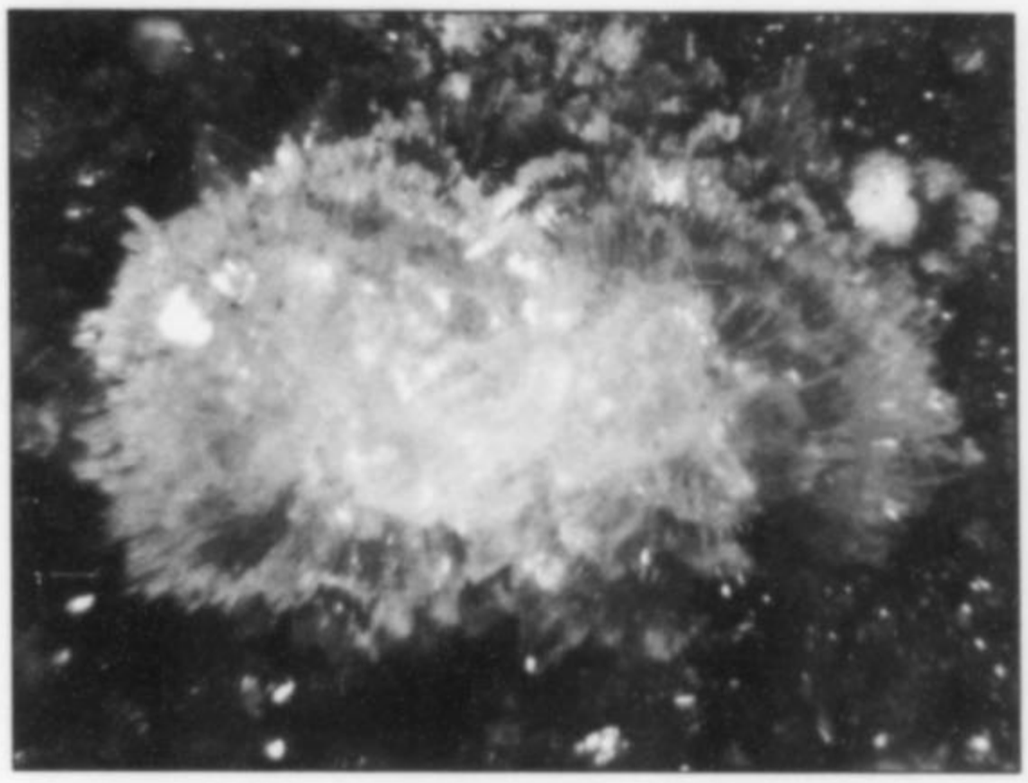


Figure 8. **Hemimorphite cluster 2 mm across from the Finch mine. K. D. Smith collection; C. W. Allred photo.**

Hemimorphite $Zn_4Si_2O_7(OH)_2 \cdot H_2O$

Hemimorphite is abundant as resinous, pale blue to dark blue to greenish mammillary and botryoidal masses lining cavities and seams in the highly silicified metamorphosed and brecciated limestone of the Brick 3 (Finch mine). It also occurs less commonly as vitreous, transparent to white and pale blue radiating prismatic sprays to 5 mm. It is found sparsely at the Brick 2 and Lead-Silver 7.

Ktenasite $(Cu,Zn)_5(SO_4)_2(OH)_6 \cdot 6H_2O$

Ktenasite occurs very sparsely as tabular crystals and as rosettes of glassy, blue-green microcrystals up to 1 mm in clusters in an oxidized zone of the Brick 2. Associations include serpierite, chalcophanite, halotrichite, gypsum and other sulfates. (Spectrographic analysis was provided by David Shannon and XRD analysis by Ray Grant.)

Magnetite Fe_3O_4

Magnetite is found widespread throughout the surface of the claims as dull, dark, reddish brown to black, compact, fine-grained masses often resembling meteorites. The size varies from 1-mm octahedral crystals in wash sands, to approximately 25-cm worn, rounded masses.

Montmorillonite $(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$

Montmorillonite occurs as a massive, waxy white, slickenslide deposit along a fault in the Brick 2. Manganese dendrites on the clay appear to be "stretched," indicating additional fault movement after deposition.

Pyrite FeS_2

Pyrite is found in the Brick 2 as highly altered cubes and

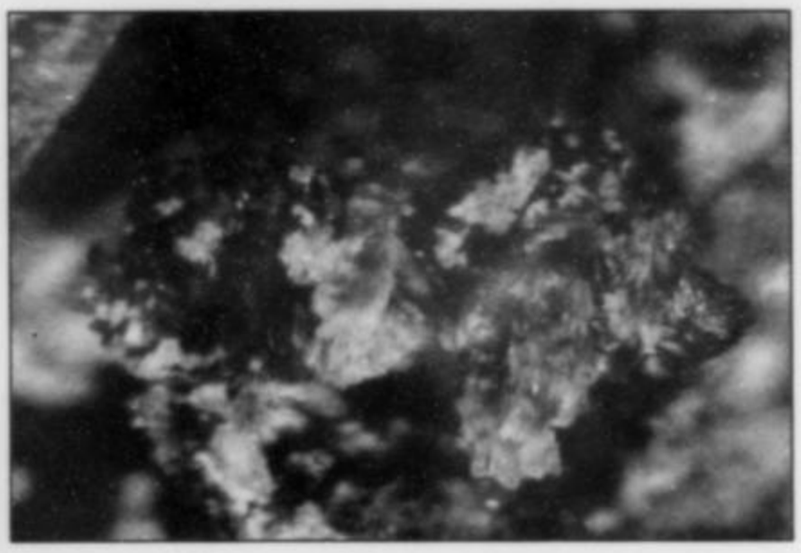


Figure 10. Ktenasite crystals to 0.5 mm from the Lower DH claim. K. D. Smith collection; C. W. Allred photo.

Figure 9. (left) Descloizite pseudomorphs after vanadinite crystals to 2 mm from the Finch mine. K. D. Smith collection; Allred photo.

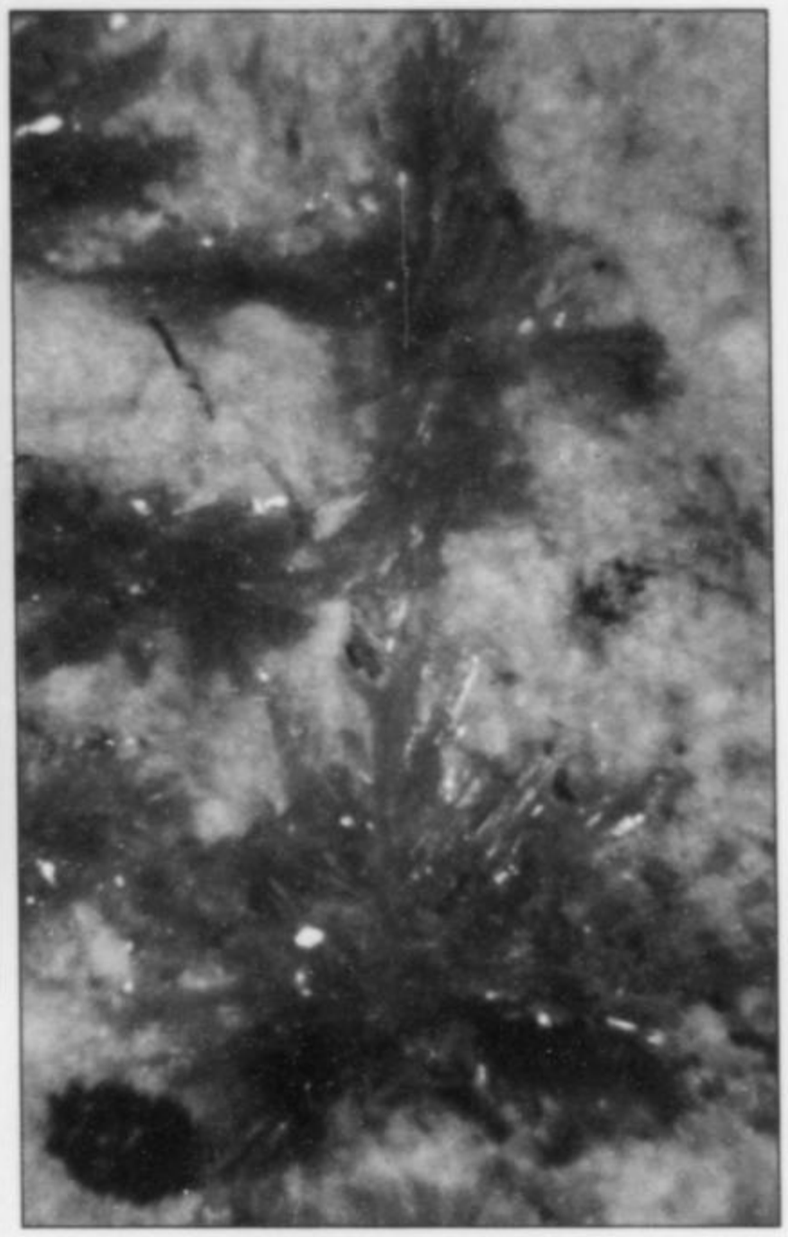


Figure 11. Serpierite crystal sprays to 1 mm from the Lower DH claim. K. D. Smith collection; C. W. Allred photo.

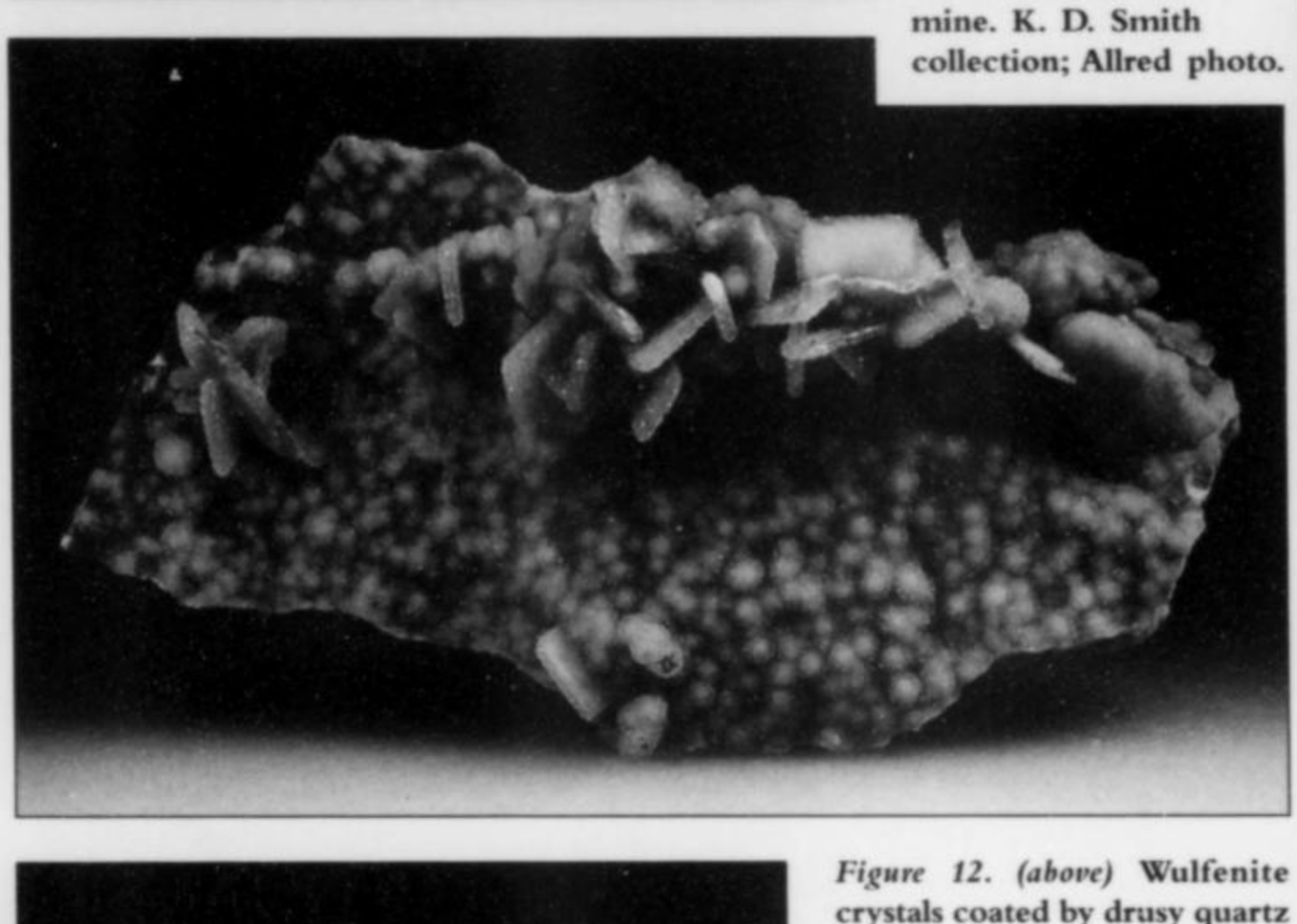


Figure 12. (above) Wulfenite crystals coated by drusy quartz on pale green hemimorphite crust, 10.7 cm across, from the Finch mine. K. D. Smith collection.

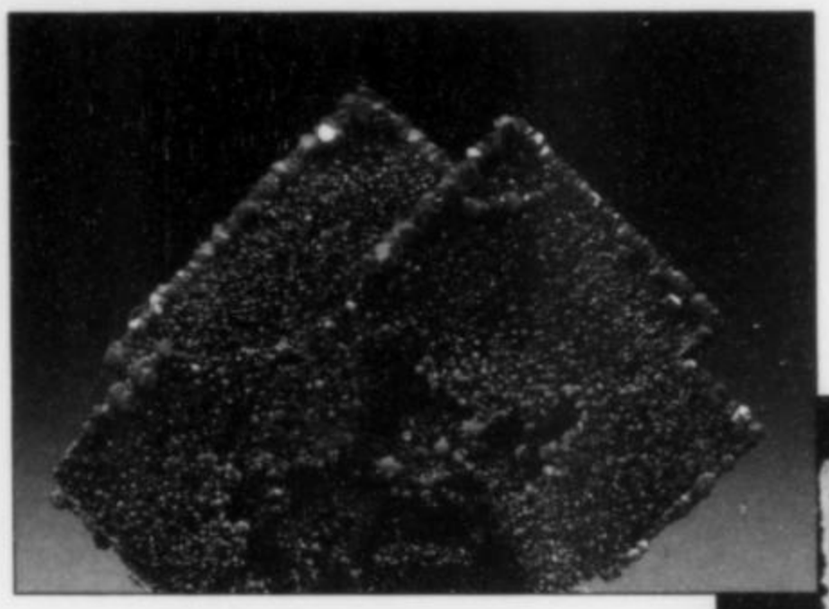


Figure 13. (above) Vanadinite crystals coating wulfenite, 2.5 cm across, from the Finch mine. K. D. Smith collection.

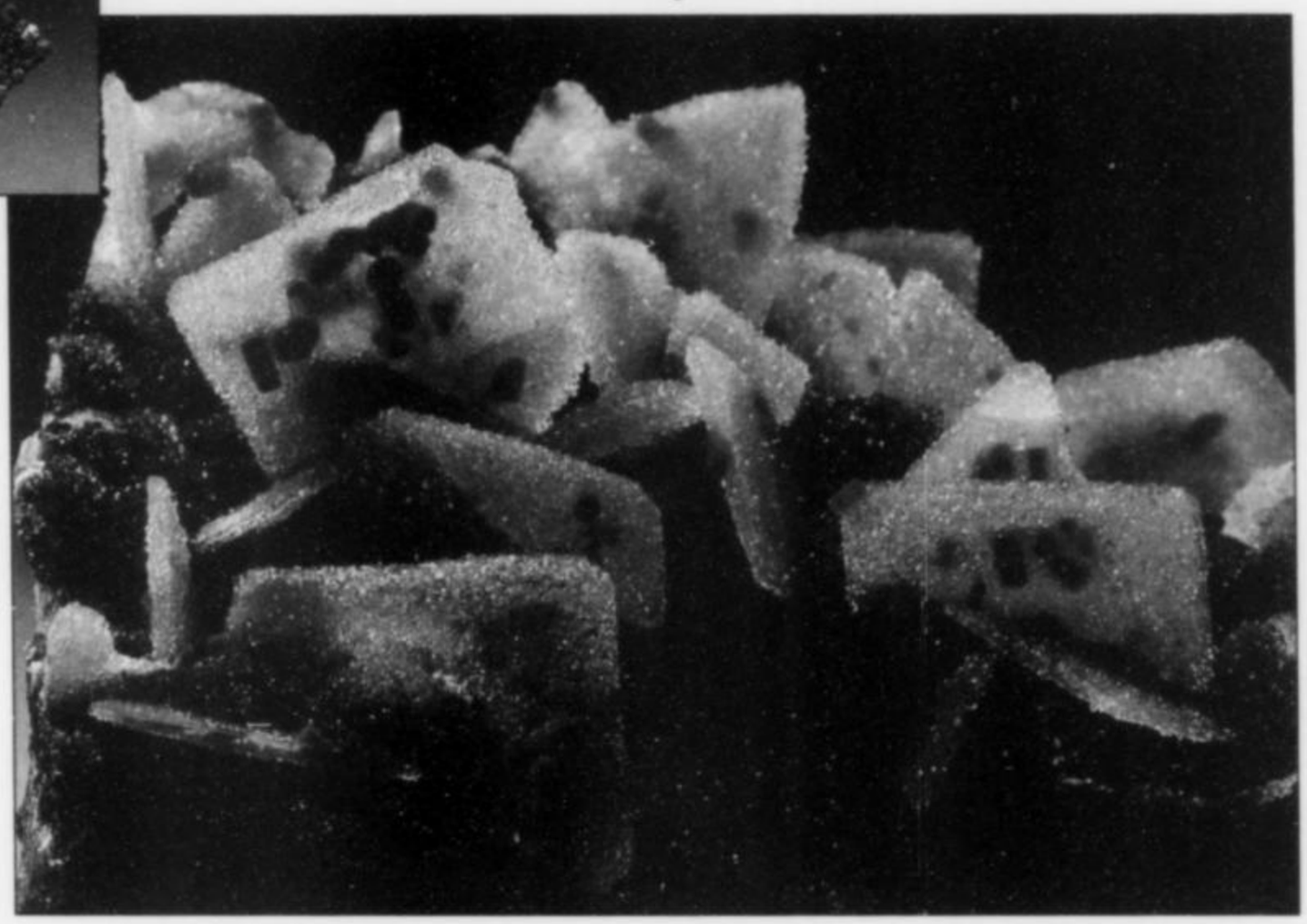
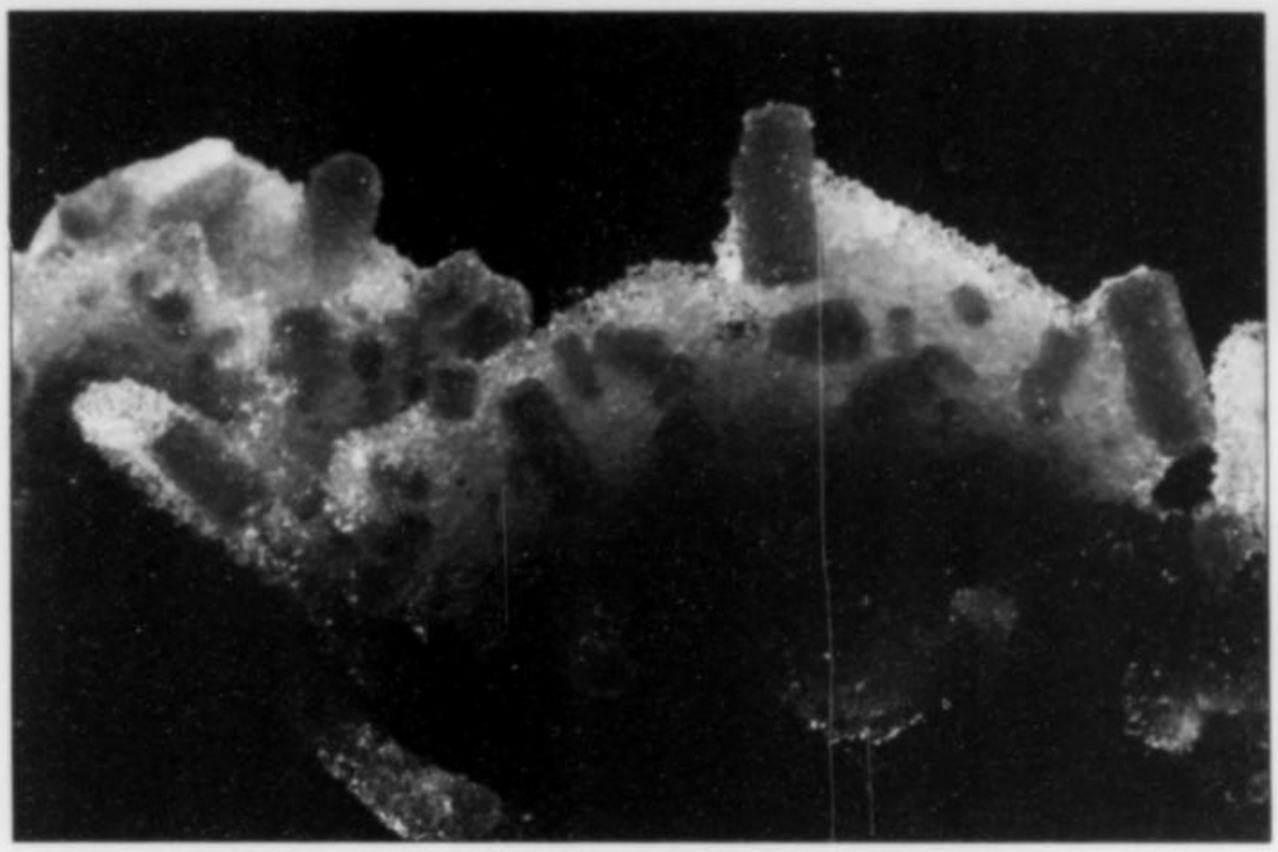


Figure 14. Vanadinite crystals on drusy quartz paramorphs after wulfenite crystals to 1.3 cm, from the Finch mine. K. D. Smith collection.



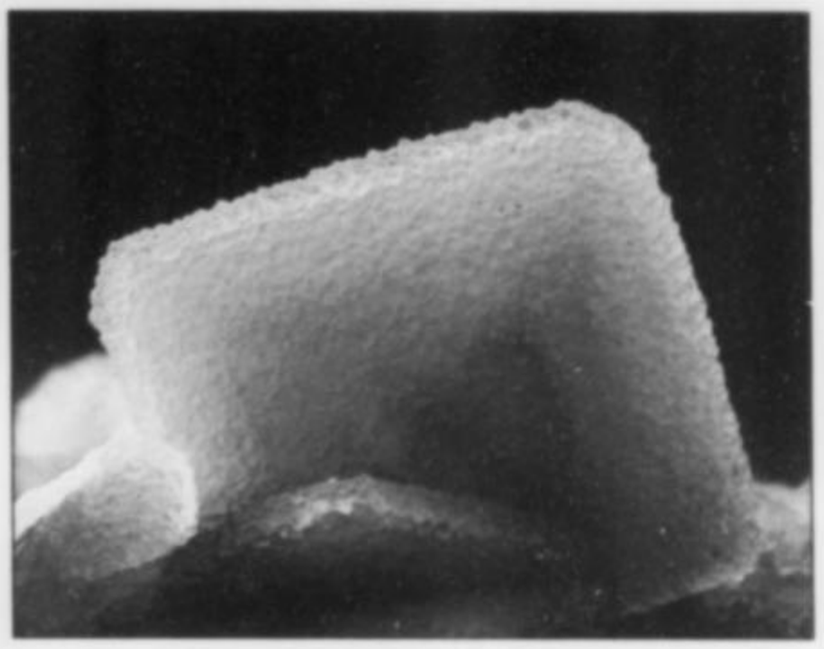
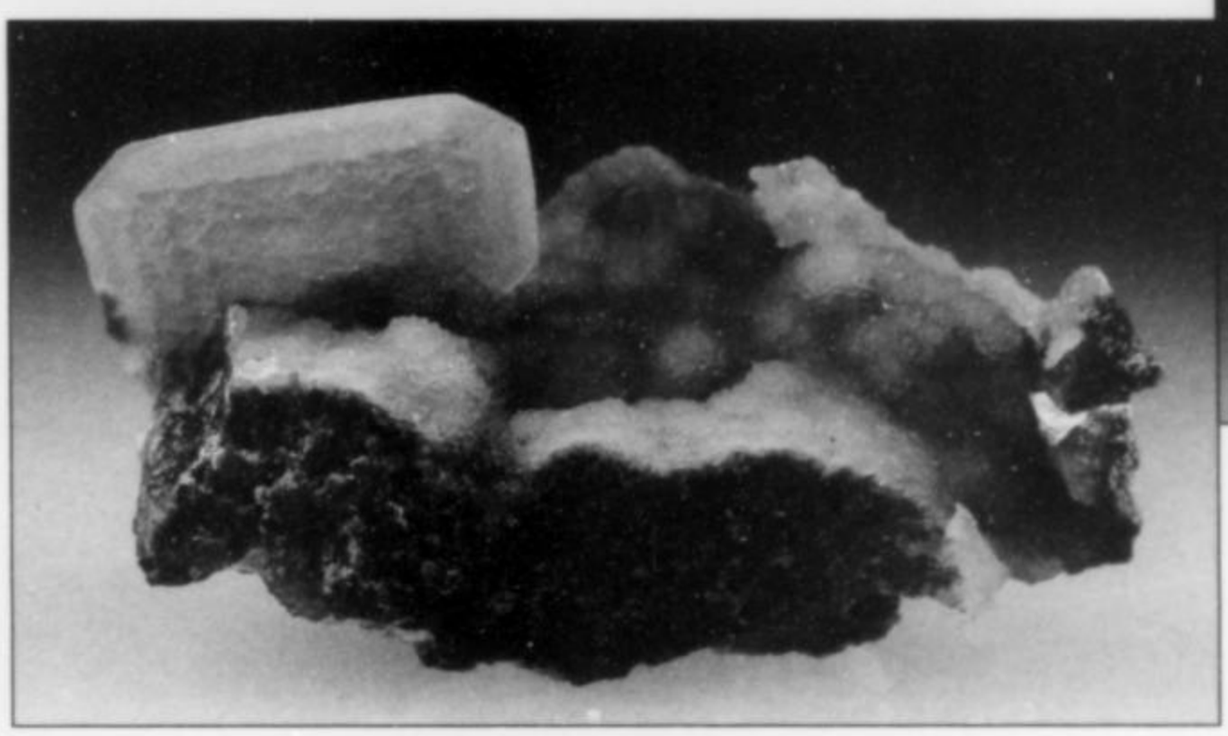


Figure 16. Drusy quartz coating a wulfenite crystal 1.4 cm across, from the Finch mine. K. D. Smith collection.

Figure 15. Vanadinite crystals to 2 mm on wulfenite crystals, both coated by a thin layer of drusy quartz, from the Finch mine. K. D. Smith collection.

Figure 17. A large group of wulfenite crystals to 1 cm coated by a thin layer of cryptocrystalline white quartz, from the Finch mine. K. D. Smith collection.

Figure 18. Wulfenite crystals to 1.2 cm covered by a thick layer of drusy milky quartz, from the Finch mine. K. D. Smith collection.



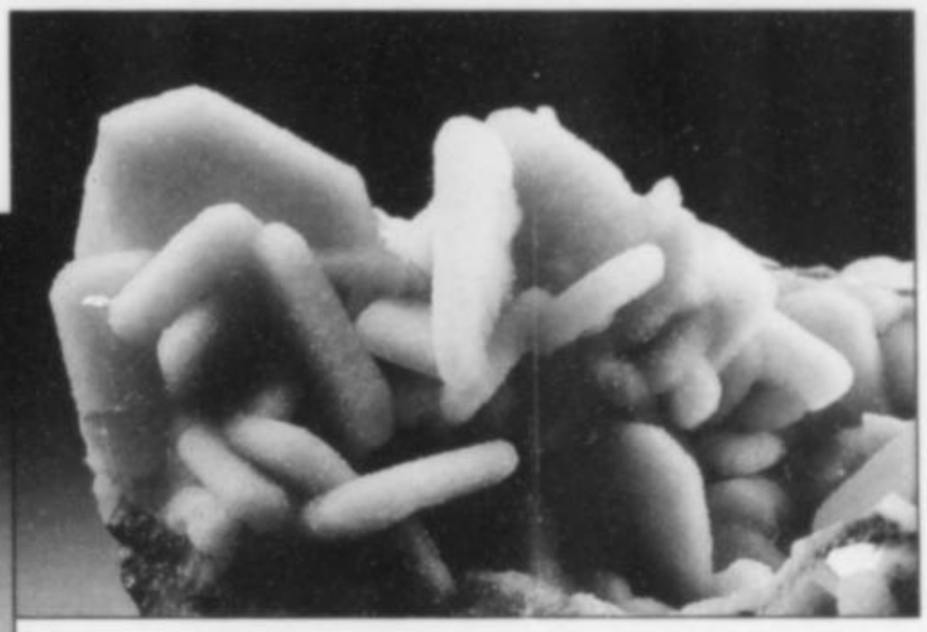


Figure 19. Wulfenite crystals to 1.2 cm covered by a thick layer of drusy milky quartz, from the Finch mine. K. D. Smith collection.

Figure 20. Wulfenite crystals, 1.2 cm, coated by drusy quartz, on matrix, from the Finch mine. George Godas collection.

masses, with ferro-actinolite. It is brass-yellow in color with a high degree of tarnish and oxidation.

Quartz SiO_2

Quartz occurs abundantly in the Brick 3 (Finch mine), as colorless, transparent, microcrystals coating and partially to completely replacing hemimorphite, wulfenite and vanadinite.

Serpierite $Ca(Cu,Zn)_4(SO_4)_2(OH)_6 \cdot 3H_2O$

Serpierite occurs at the Brick 2 as minute, vitreous, transparent, flattened and elongated sky-blue crystals forming radiating tuffs to 2 mm on smithsonite and oxidized matrix. It is also found as microcrystals covering matrix pieces up to 5 cm in area.

Smithsonite $ZnCO_3$

Smithsonite is found sporadically in an oxidized portion of the Brick 2 as microscopic, pale-green botryoidal masses up to 5 mm across.

Sphalerite ZnS

Sphalerite occurs as small, brown to blood-red, interstitial masses throughout the ferro-actinolite matrix at the Brick 2. It has a submetallic luster and is associated with pyrite.

Tenorite CuO

Tenorite occurs as dark brown to flat-black seams and veinlets cutting through and adjoining chrysocolla. It is found sporadically through the workings of the Brick 3 (Finch mine) and Lead-Silver 7.

Vanadinite $Pb_5(VO_4)_3Cl$

Vanadinite is found sparsely at the Brick 3 (Finch mine) and Lead-Silver 7 as small, stubby, brown to dull blood-red hexagonal prisms, and very rarely as attractive, lustrous, chocolate-brown, hexagonal crystals to 4 mm across the *c* face. Occasional molds of descloizite covering vanadinite are found. It is also found coating and replacing wulfenite in the Brick 3.

Wulfenite $PbMoO_4$

Wulfenite occurs in the Brick 3 (Finch mine) as yellow to orange tabular crystals to 2 cm, resting on hemimorphite, usually covered with and/or partially replaced by quartz. Smaller, delicate yellow to orange-red to brown crystals occur with vanadinite and descloizite in the Lead-Silver 7. It occurs rarely as complete replacements by clear to white quartz at the Brick 3.The Brick 3 (Finch mine) is one of the dozen or so Arizona localities that are most famous among collectors for wulfenite.

CONCLUSION

The Kullman-McCool group of claims, an area of about 420 acres, as well as the adjoining parts of the Dripping Springs Mountains, have a rich history of mining, not to mention the beautiful landscapes and wildlife habitats.

The mines of the Kullman-McCool group have produced many fine mineral specimens, and will, without doubt, continue to do so in the future. However, these mines do not give anything away. A lot of hard collecting work is required. Many of the mineralized areas are covered with muck. The mineralized zones need additional development work to expose more mineralization. Other areas are unstable and dangerous.

Due to the current low price for ore, and the lack of sizable reserves, it is unlikely that commercial mining would be economically feasible. Likewise, any attempts to mine specimen material on a large scale could prove too costly.

ACKNOWLEDGMENTS

This paper would not have been possible without the help of several individuals. I am especially grateful to Claytor Allred, who generously provided his expertise, talent and many hours to produce fine photomicrographs of specimens from this locality, as well as many useful editorial suggestions. Sincere appreciation goes to David Shannon for his continued encouragement, lengthy discussions, specimen analysis, critical reviews and suggestions. I am also grateful to Dr. Raymond Grant, who provided technical assistance, support, discussion and critical suggestions which improved this paper. I also wish to thank Toby Nasif who spent countless days accompanying me in the field for research.

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The Gold Quarry Mine

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The Gold Quarry mine, an active open-pit operation in northeastern Nevada, has yielded an exceptional array of rare and interesting micromineralogicals. Among those identified are burangaite (second world occurrence), corderoite, fervanite, fluellite, hewettite, heyite, kazakhstanite, mandarinoite, richellite, schubnelite (second world occurrence), sincosite, tinticite (in crystals!) and many others. Over 100 species in all have been found, including several unknown and possibly new minerals and several that are the finest known specimens for their species. The future looks promising for additional discoveries.

INTRODUCTION

Located in northeastern Nevada's Carlin-trend gold belt (Fig. 1), Newmont Mining Corporation's Gold Quarry mine is one of the largest producers of gold in North America, and was the first to produce more than one million troy ounces in one year (1991). The deposit is mined by open-pit methods, and current daily pit production varies between 200,000 and 250,000 metric tons.

During the course of mining, mineralogically interesting zones have been exposed, which have subsequently yielded exceptional, crystallized specimens of a wide variety of uncommon and rare mineral species. Radiating sprays of

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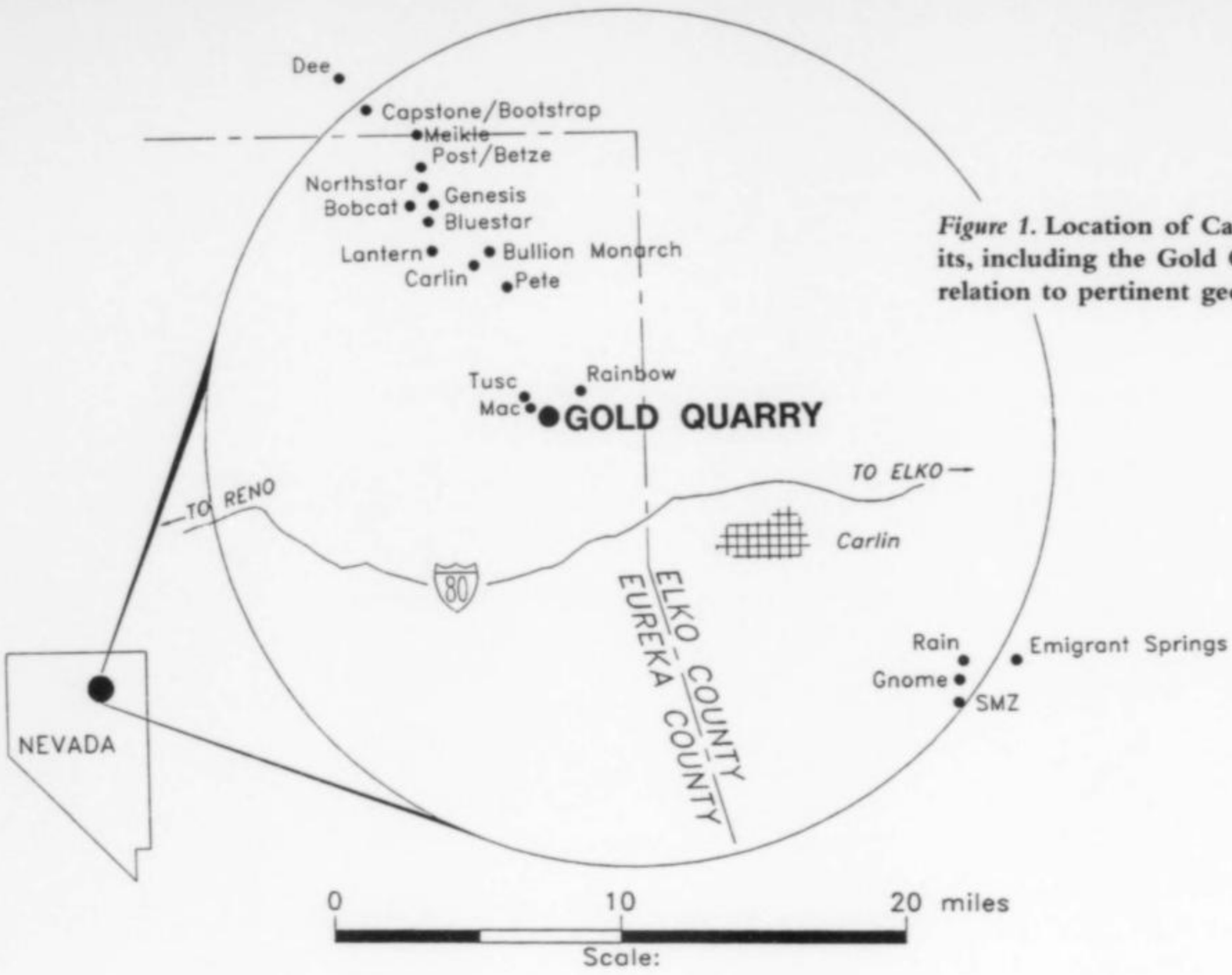


Figure 1. **Location of Carlin-Trend gold deposits, including the Gold Quarry mine, and their relation to pertinent geographic features.**

brilliant maroon-red hewettite crystals, lustrous golden yellow fluellite crystals, and dense mats of intergrown selenium crystals are only a few of the interesting discoveries made recently. At least two species have been recovered which are new to science.

The most surprising feature of the deposit is the relatively common occurrence (in a hydrothermal gold system) of phosphates, vanadates and uranates in association with minerals containing nickel, copper, zinc, arsenic, selenium, cadmium, mercury and lead. Similar minerals and assemblages have recently been observed at Newmont's Rain mine about 15 km to the southeast. The Post/Betze deposit (a joint venture between Newmont and American Barrick) about 10 km to the north, has also yielded phosphate and vanadate minerals. Clearly, these new assemblages are not unique, and it is believed that additional observation and documentation could have substantial implications for our understanding of the genesis of these important deposits.

The main Gold Quarry open-pit mine and mill complex is situated 11 km northwest of the town of Carlin (population approximately 2,000), in Eureka County, amidst rolling, sagebrush-covered hills on the east flank of nearby Mary's Mountain (elevation 2,273 meters). Interstate 80, the main all-weather highway across the state, passes through Carlin, as do the lines of the Southern Pacific and Western Pacific Railroads, and the Humboldt River.

Climatic conditions of the area are typical of the Great Basin high desert: 45 to 60 cm of snow and temperatures down to -20°F in winter, and afternoon thunderstorms and temperatures up to 104°F in summer. About 35 km to the east lies the city of Elko, home of most of the approximately 1,000 mine employees, and (with a population in excess of 18,000) the largest community in northeastern Nevada. Like most of the state, the remainder of the area within a radius of at least 80 km is essentially uninhabited.

HISTORY

The Gold Quarry mine is located in the south-central portion of a northwesterly alignment of sediment-hosted, epithermal, disseminated gold deposits known as the Carlin trend. Large-scale open-pit mining of disseminated gold began in 1964 by Newmont Mining Corporation at the Carlin deposit. Since then, gold mining by Newmont and other companies has been carried out at a number of deposits including Dee, Bootstrap, Ren, Goldstrike/Post, Genesis, Bluestar, Bullion-Monarch, Maggie Creek (now a part of Gold Quarry) and Rain. To date, Newmont Mining alone has produced well over 10 million troy ounces of gold from mines on the Carlin trend. Initial prospecting in the area around Gold Quarry, locally known as the Maggie Creek subdistrict (Christensen *et al.*, 1986), began in 1870 and by 1935 several small underground and surface mines had produced a few hundred tons of copper, lead and barite (Roberts *et al.*, 1967). Intermittent small-scale mining continued into the 1960's. Total recorded precious metals production for the Maggie Creek subdistrict from 1932 to 1958 was 858 ounces of gold and 4387 ounces of silver. Newmont Mining Corporation became involved in the district around 1960 (Ramsey, 1973; Hausen, 1982) and discovered anomalous gold values from jasperoid outcrops above what ultimately proved to be the Gold Quarry deposit. In 1979 the main Gold Quarry ore zone was discovered beneath 76 m of unmineralized basin-fill by rotary exploration drilling.

Following completion of feasibility studies and mill con-

Figure 2. **Panoramic view to the southeast of the main Gold Quarry open-pit-mine and mill complex. The lowest exposed level of the pit at the time of the photo (April 1992) was elevation 5,050.**

struction, the first production of gold from the Gold Quarry deposit began in 1985. As of May 1993, the open-pit mine was over 2,070 meters long, 1,580 meters wide, and 305 meters deep; the mine crests at an elevation of 1,805 meters or 5,925 feet. Static groundwater elevation stands at 1,520 meters (5,000 feet); because the lowest working level in the mine is currently the 4,950-foot level, limited dewatering is necessary to keep the pit dry. An extensive dewatering program is planned so that mine operations may continue down to 4,250 feet. Total waste and ore tonnage moved to date from the open pit is estimated in excess of 382.5 million tons; total gold production to date has exceeded 5.5 million ounces. Proven and probable reserves at Gold Quarry were estimated at the end of 1992 at 7,299,000 ounces of gold contained in 163 million tons of ore at an average grade of 0.041 ounce/ton.

Active mining operations continue 24 hours a day, 7 days a week at Gold Quarry; entrance to the property is through heavy security and by prior permission only. Although academic or industry group tours are welcome, individual traders and "wholesale" collectors are discouraged.

GEOLOGY

The Maggie Creek subdistrict contains a thick sequence of Paleozoic sedimentary rocks covered in most places by late Tertiary basin sediments (West, 1976; Stewart, 1980). Mineralization at Gold Quarry is located within: (1) 62 meters of carbonate section that may include both the upper Siluro-Devonian Roberts Mountains Formation and an unnamed Devonian limestone, (2) an overlying 308-meter-thick sequence of parallochthonous upper Devonian siltstone, shale, sandstone, silty limestone and chert (locally referred to as the Rodeo Creek unit), and (3) up to 92 meters of allochthonous Ordovician Vinini siliceous mudstone, chert and interbedded siltstone and shale. Relatively permeable coarse siltstone, highly fractured siltstone, and decalcified silty limestone units host the highest local concentrations of gold.

Two geologically dissimilar orebodies are recognized within the deposit: (1) the Gold Quarry Main, an upper, structurally controlled disseminated "stockwork" hosted by siliceous sedimentary rocks, and (2) the Deep West, a lower, "stratabound" silica replacement (jasperoid) unit primarily contained within highly altered silty carbonate rocks (Rota, 1991).

Gold ore consists of minute (<1 micron diameter) particles of native gold finely disseminated within the host rock in the upper oxidized ore zones. Like the Carlin gold deposit (Radtke, 1985), extensive hydrocarbon-rich areas are spatially associated with the gold deposits below the zone of surficial weathering and oxidation; these primary ores are described as material that: (1) has not been subjected to either late hydrothermal oxidation or supergene weathering and, (2) contains over 0.5 weight % of organic hydrocarbons and/or base metal sulfides. Gold is directly associated with finely disseminated sulfides (dominantly pyrite) in the lower, unoxidized ore zones.

The hydrothermal system responsible for gold mineralization at Gold Quarry probably consisted of deeply circulating, principally meteoric waters in the upwelling portion of a convection cell driven by heat from an underlying intrusive

source (Rota, 1991). No evidence of surficial hot springs (e.g. such as siliceous sinters) has been found to date. Hydrothermal activity appears to have occurred at moderate to shallow depths, and was both extensive and episodic, as indicated by the intense wallrock alteration halo within and surrounding the deposit and by evidence of multiple events of brecciation and mineral deposition. An Oligocene age (35 million years) for mainstage Gold Quarry mineralization seems likely based upon a late-Tertiary regional thermal anomaly (Cunningham, 1985) and other indirect evidence (Rota, 1991).

Although numerous locations throughout the mine exhibit mineralogically interesting assemblages, two specific occurrences are noteworthy for their wide variety of unusual, well-crystallized minerals. These will be referred to frequently in the text, and are designated as ***location 1*** (coordinates 16500N, 19500E) and ***location 2*** (coordinates 15800N, 20200E). These coordinates and all others are based on a grid system, devised by Newmont Mining Corporation, utilizing 1000-foot centers. The exposed rocks at each of these sites consist of silicified sediments (jasperoids) of the Rodeo Creek unit, which exhibit poorly preserved layered beds up to 70 cm in thickness.

Brecciation is locally common and appears to be of two types: (1) as zones to several meters thickness of finely crushed, tightly packed material clearly related to fault movement, and (2) as coarse, rubbly zones, also to several meters thickness, exhibiting significant open-space texture. The latter breccias display textures characteristic of late fluid movement, as evidenced both by the rounding of rock fragments, as well as the occurrence of crystallized minerals largely upon the footwall or "gravity-down" surfaces. It is these localized and discontinuously exposed jasperoid bodies which have typically provided the best mineral occurrences. Presumably, the tendency of the hard jasperoid rock to fracture during deformation and form open spaces (in comparison to the more plastic behavior of the less-silicified surrounding rocks) has facilitated the formation of the observed minerals, largely as euhedral crystals in open spaces.

MINERALOGY

A total of 105 mineral species have been identified from the Gold Quarry deposit to date; of these, there are two which are currently being studied further as probable new species. Methods of identification and characterization have included X-ray diffraction (XRD), scanning electron microscopy (SEM) with an energy dispersive spectrometer (EDS) for chemical microanalysis, and optics. As with the interesting minerals discovered in the past from other Carlin Trend deposits (such as carlinite, christite, ellisite and weissbergite), the mineralogy of the Gold Quarry mine also appears to be particularly diverse and prolific. It is the authors' opinion that this specific region of Nevada probably contains the most complex and noteworthy mineralogical occurrences in the entire state.

The following alphabetically arranged listing is a complete description of the mineralogy and mineral assemblages of the deposit to date, and is a result of the productive collaboration between industry, academia and government. Photography of the various minerals was carried out by J. Marty (color pictures) and M. Jensen (SEM micrographs), and all specimens are from the collection of the senior author.

Allophane amorphous hydrous aluminum silicate

Selected rare specimens collected from the southern end of the pit on the 5,075-foot bench (the mining company uses feet rather than meters for their bench references) contain partial coatings of glassy allophane. The species ranges in color from bright aqua-blue to colorless, and occurs alone on tight joint and fracture surfaces.

Alunite $KAl_3(SO_4)_2(OH)_6$

Alunite is a widespread and common mineral in the central core of the deposit, and is readily recognized by its pale pink to rose-pink color. Variation in the composition, including significant substitutions of calcium, phosphorus and vanadium, account for the atypical color; some specimens have historically been misidentified as woodhouseite. The most typical occurrence for the species is as massive, cream-white, finely crystalline veinlets to 5 cm thickness. Lustrous, equant, trigonal crystals to 0.2 mm may be found lining vugs in silicified barite breccias (as on the 5075 bench at coordinates 17250N, 22000E) in association with white to colorless carbonate-fluorapatite crystals.

Anatase TiO_2

Very small, rounded and partially corroded crystals of anatase to 100 microns (0.1 mm) are particularly abundant as an early mineral on bleached, gray to white breccia fragments at location 1, on the 5,400-foot bench. Depending upon the specific zone, a thin druse of lustrous quartz crystals may be present as a coating on the anatase crystals. Associated (later) minerals include variscite, fluellite, leucophosphite, unknown #1, hewettite, tyuyamunite, torbernite and tiemannite/corderoite, commonly all on the same specimen.

Aragonite $CaCO_3$

Colorless to white, acicular crystals of aragonite have been identified from the "Knob Hill" area at the northeast end of the deposit.

Arsenopyrite FeAsS

Arsenopyrite has been verified in samples of siliceous, sulfide-rich barite breccia collected from numerous locations on the 5,400 through 5,050 benches. The species is present most typically as very minute grains associated with pyrite, sphalerite, tetrahedrite, galena and greenockite. Examples from an exposure on the north side of the 5,050 bench have been found which consist of abundant, slightly corroded arsenopyrite crystals to 1 mm, both within matrix and as free-standing individuals in quartz-lined vugs.

Augelite $Al_2(PO_4)(OH)_3$

Augelite has been verified from stockwork veinlets in silicified siltstone exposed on the 5,200 level. The species occurs as pale blue solid seams to 1 cm thick and as rarer single crystals.

Azurite $Cu_3(CO_3)_2(OH)_2$

Perhaps the finest examples of crystallized azurite known from Nevada were recovered from the 5,100 bench in the northwestern part of the pit (April 1994). Lustrous, bladed

crystals to 6 mm were found with malachite, brochantite, cyanotrichite and dodecahedral cuprite crystals to 3 mm. Azurite druses and powdery blue coatings are also seen periodically on joint surfaces in the lower portions of the deposit.

Barite $BaSO_4$

Barite occurs commonly throughout the deposit, in a wide variety of habits. Coarsely crystalline vein barite is most typical and widespread, with free-standing euhedral crystals in vugs being surprisingly rare. When present, crystals are colorless, simple, tabular individuals attaining sizes of up to 2 cm. At location 2 on the 5,425 bench, slightly rounded, tabular crystals to 2 mm are colored bright yellow by finely dispersed particles of tyuyamunite. An extremely unusual morphology for the species is found at location 1 on the 5,425 bench, where spherical patches to 5 mm of white, curving, fibrous barite occur, having an appearance similar to cotton.

Bindheimite $Pb_2Sb_2O_6(O,OH)$

Bindheimite was identified as earthy yellow coatings and masses associated with coarse cleavable galena and minor cerussite from the 5,280 level in the southeast corner of the pit.

Bornite Cu_5FeS_4

Bornite was identified by Newmont Gold Company in selected polished mounts of heavy liquid separates of unoxidized, black, siliceous siltstone samples from the 5,260 level. The species has also been observed in association with bladed barite and stibiconite from the 5,260 level.

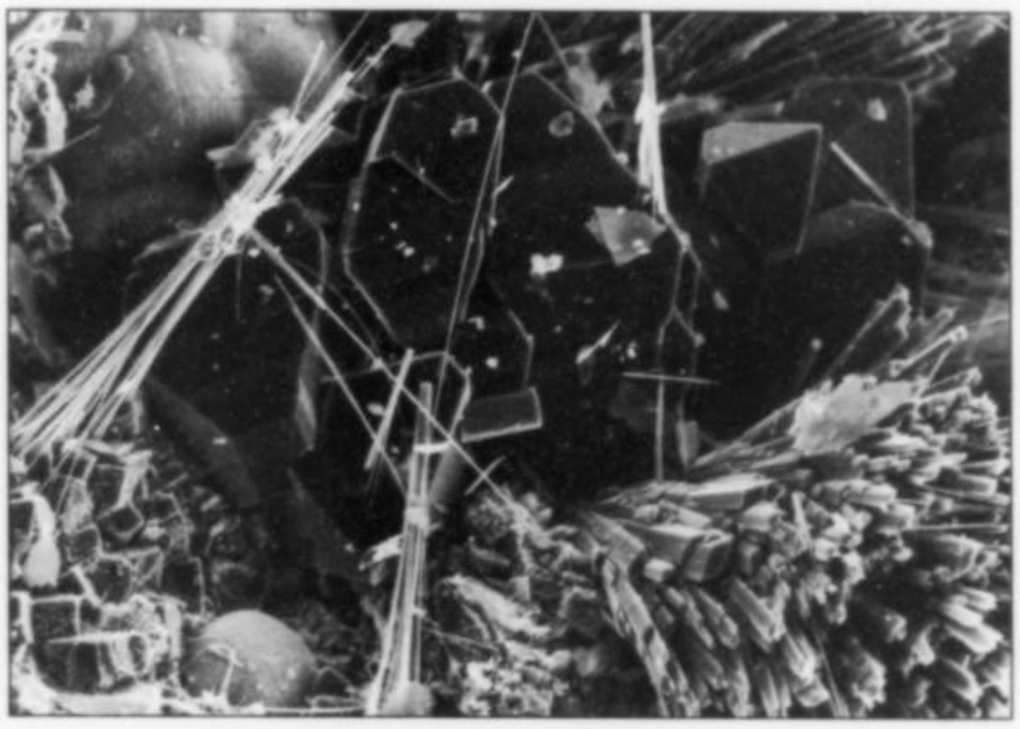


Figure 3. **Burangaite, radiating spray of pale green crystals to 80 microns (lower right) associated with blocky variscite crystals, carbonate-fluorapatite needles and spherules of crandallite from the 5,075 bench, at coordinates 17250N, 22000E.**

Brochantite $Cu_4(SO_4)(OH)_6$

Brochantite occurs as pulverulent patches and flattened green crystals to 0.5 mm on samples of carbonate-cyanotrichite from the southeast corner of the 5,075 bench.

Burangaite-analog

$(Na,Ca)_2Mg_2Al_{10}(PO_4)_8(OH,O)_{12}\cdot 4H_2O$

A second world occurrence for the rare mineral burangaite (?) has been verified (by Gandolfi camera technique and by SEM with EDS) at the Gold Quarry mine, from coordinates 17250N, 22000E, on the 5,075 bench. Samples of partially silicified, pyrite-rich, alunite-bearing barite breccia from this location exhibit very rare vugs to 2 cm containing secondary phosphate assemblages. Burangaite occurs as pale green radiating groups and hemispheres (to 0.3 mm) of simple prismatic monoclinic crystals, associated with englishite, carbonate-fluorapatite and variscite.

Chemical data on type material from the Buranga pegmatite, Rwanda, Africa (von Knorring *et al.*, 1977) shows appreciable calcium substituting for sodium, and magnesium substituting for iron. Qualitative chemical microanalysis of Nevada specimens shows predominant sodium and magnesium, with about 0.5 weight % vanadium (which presumably may be responsible for the greenish color). The lack of detectable iron suggests that the Gold Quarry mineral may actually be the magnesium analog of burangaite, and therefore a new species.

Caxoxenite $(Fe,Al)_{25}(PO_4)_{17}O_6(OH)_{12}\cdot 75H_2O$

Excellent crystallized cacoxenite is present at location 1 on the 5,375 bench. The mineral occurs as druses and isolated spherules to 0.3 mm of radiating yellow-orange to orange-brown acicular crystals, locally in association with ferrian variscite and gypsum. The species may be locally abundant as a coating on joints and fractures of the brecciated host rock; completely coated surfaces more than 10 cm across have been collected. Upon initial examination on the outcrop, it is very easy to mistake cacoxenite for jarosite or goethite. Microscopic imaging or chemical analysis can be used to readily differentiate these species.

Calcite $CaCO_3$

Calcite, like barite, is also a very widespread and common mineral in the deposit. Solid veins up to 50 cm in thickness of intergrown, coarsely cleavable white calcite are periodically exposed in the footwall carbonate rocks. Vugs also occur commonly, lined with crystals up to 5 cm which may display a wide variety of habits. At location 1 on the 5,425 bench, lustrous, colorless calcite rhombs to 0.2 mm occur rarely as an associated mineral with wavellite, fluellite, aluminian strengite and hewettite.

Carbonate-cyanotrichite

$Cu_4Al_2(CO_3,SO_4)(OH)_{12}\cdot 2H_2O$

Prismatic crystals of azure-blue carbonate-cyanotrichite (identified by XRD) were recovered from the southeast corner of the mine on the 5,075 bench, and may constitute the finest examples of this species yet known. Unfortunately only a few specimens were collected, and the exact exposure has been mined away. The species occurred as druses, covering surfaces up to 1 cm across, consisting of radiating clusters to 2 mm of fan-shaped, orthorhombic crystals.

Carbonate-fluorapatite $Ca_5(PO_4,CO_3)_3F$

Crystallized carbonate-fluorapatite has been noted from several locations throughout the pit and, although rare, probably is quite widespread. Radiating clusters of barrel-shaped crystals, typical for hydrothermal gold deposits in Nevada, are the most commonly seen examples, although drusy crusts also occur. Individual hexagonal crystals do not

exceed 1 mm in size and vary in color from white to colorless (in barite-jasperoid breccias) to mustard-yellow (location 1). Distinct variations in morphology also exist, from elongated, prismatic crystals to stubby, flattened individuals. Associated minerals may include almost all other phosphates, vanadates and sulfates known from the deposit.

Cerussite $PbCO_3$

Cerussite is not especially common at Gold Quarry, having been observed as a local alteration mineral on large galena masses from a vein in the southeast corner of the pit, and as small crystals in jasperoid rock from the 5,520 level.

Chalcanthite $CuSO_4 \cdot 5H_2O$

Thin crusts of blue to blue-green, poorly crystalline chalcanthite occur as an efflorescence on freshly exposed clay-rich sediments on the face of the 5,075 bench, south ramp. Finely disseminated granular pyrite and minor black chalcocite have been detected in the sedimentary host rock.

Chalcocite Cu_2S

The best examples of chalcocite occur as thin, sooty black patches to 3 mm across associated with gypsum on fracture surfaces in brecciated and silicified rock from location 1 on the 5,375 bench.

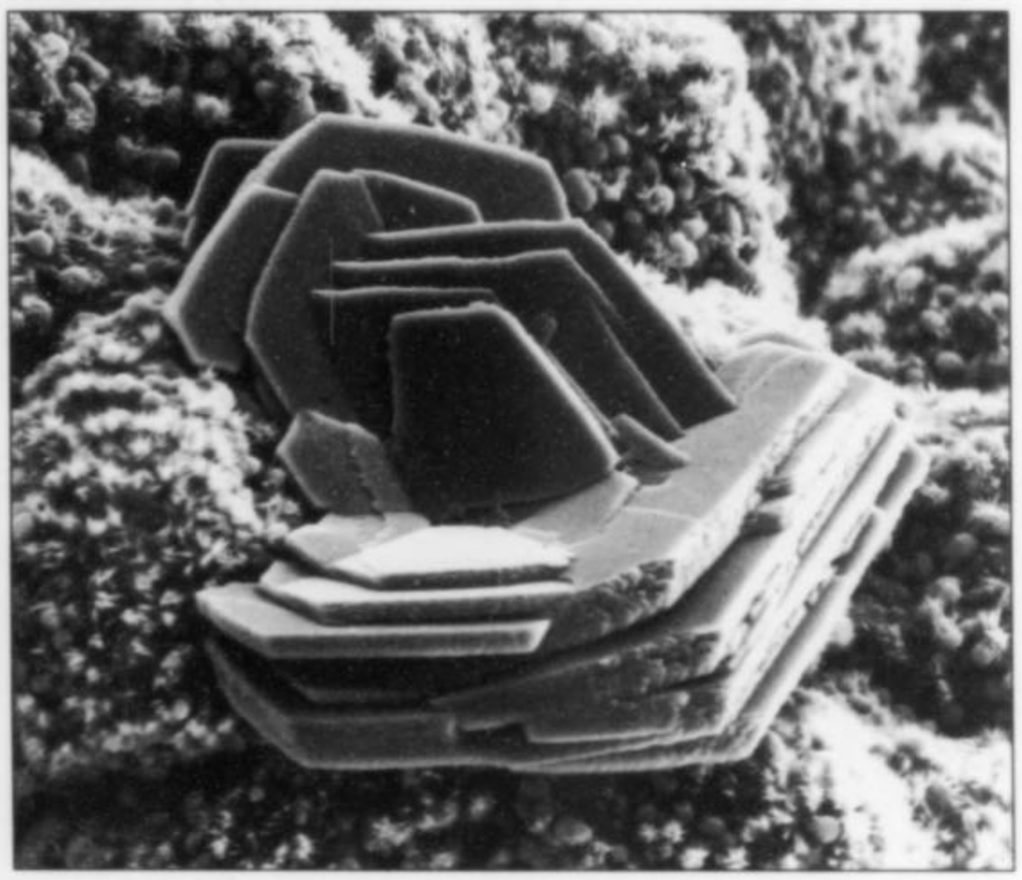


Figure 4. **Chalcophanite rosette of flattened, black crystals to 60 microns on edge, from the northwest corner of the 5,350 bench.**

Chalcophanite $(Zn,Fe,Mn)Mn_4^{3+}O_7 \cdot 3H_2O$

Chalcophanite has been verified from vuggy, iron-stained jasperoid breccias seen in the northwest corner of the 5,350 bench. The species occurs as rosettes to 0.1 mm consisting of thin, tabular, trigonal crystals distributed randomly on goethite. Individual crystals display a brilliant, silvery metallic luster and are transparent red-brown in transmitted light. Rare colorless calcite crystals constitute the only other associated mineral.

Chalcopyrite $CuFeS_2$

Within polished mounts of heavy liquid separates of samples of cherty sandstone from the 5,280 level, chalcopyrite has been observed as a minor constituent.

Chrysocolla $(Cu,Al)_2H_2Si_2O_2(OH)_2 \cdot nH_2O$

Chrysocolla is common at locations throughout the pit, typically as porcelaneous, pale blue-green coatings on secondary copper minerals.

Cinnabar HgS

Cinnabar is surprisingly rare at Gold Quarry, having been found only in very small amounts at location 1 on the 5,375 bench. The species occurs as bright orange-red pulverulent patches to 1 mm on colorless gypsum overgrowths on hewettite crystals.

Conichalcite $CaCu(AsO_4)(OH)$

Radiating druses of pale, apple-green conichalcite needles to 0.1 mm occur on iron-stained jasperoid rock in association with fibrous malachite, blocky barite and reddish drusy carbonate-fluorapatite. Qualitative chemical microanalysis of the conichalcite shows the presence of minor vanadium substituting for arsenic.

Copper Cu

Small grains to 60 microns of bright orange-brown native copper occur associated with spongy cuprite and other minerals lining fractures in black, siliceous siltstone on the 5,260 level.

Corderoite $Hg_3S_2Cl_2$

Black spongy masses to 2 mm of finely intergrown corderoite with tiemannite are locally abundant at location 1 on the 5,400 bench, and are the most common mercury-bearing species currently identified from the mine. The minerals occur as somewhat globular coatings on fragments of brecciated jasperoid rock in direct association with crystallized fluellite, leucophosphite, strengite-variscite and anatase. The association of mercury minerals with hydrated phosphates and other secondary minerals may offer clues to the interpretation of ore genesis for these types of deposits.

Covellite CuS

Covellite has also been identified as a constituent of heavy liquid separates from black, siliceous siltstone from the 5,260 level.

Crandallite $CaAl_3(PO_4)_2(OH)_5 \cdot H_2O$

Crandallite occurs as white to orange-yellow concentric bands to a maximum diameter of 1 cm lining tight fractures in gray, silicified siltstone. Upon breaking apart selected fractures, the species may be found on druses of terminated quartz crystals, as an earthy and locally corroded coating. Crandallite has been found specifically at coordinates 17250N, 22000E, on the 5,075 bench, but is probably widespread in minor amounts elsewhere throughout the lower levels of the mine.

Cuprite Cu_2O

Spongy masses to 2 mm of deep red-purple cuprite are quite common as disseminations in barite-alunite-lined fractures in black, siliceous siltstone on the 5,260 level. Other associated minerals include carbonate-fluorapatite, copper, kaolinite, libethenite, pseudomalachite, quartz and volborthite.

Cyanotrichite $Cu_4Al_2(SO_4)(OH)_{12}\cdot 2H_2O$

A zone containing rather abundant cyanotrichite associated with malachite, chrysocolla, azurite, jarosite, barite, goethite and quartz was formerly found in muck on the south portion of the 5,575 bench layback. Cyanotrichite from this zone was found as pale blue to blue, finely fibrous radiating sprays up to 3 mm.

Descloizite $PbZn(VO_4)(OH)$

Descloizite containing minor amounts of copper substituting for the zinc was formerly quite common from the Vanna Fault exposed on the 5,280 bench. Druses of brilliant black orthorhombic crystals to 1 mm were common, associated with heyite pseudomorphs of earlier descloizite and partially corroded pale brown vanadinite crystals. More recently, the species has been found intimately intergrown with selenium needles and vanadinite crystals on the outer surfaces of marcasite pods exposed in the south area of the mine on the 5,050 bench.

Dolomite $CaMg(CO_3)_2$

Small rhombohedral crystals to 0.5 mm of pale orange to pink dolomite have been found locally as an associated mineral lining calcite vugs exposed in the footwall carbonate rocks in the northwest corner of the 5,175 bench.

Englishite $K_3Na_2Ca_{10}Al_{15}(PO_4)_{21}(OH)_7\cdot 26H_2O$

The rare species englishite has been identified with other crystallized phosphates (burangaite, carbonate-fluorapatite and variscite) from unusual vugs at coordinates 17250N, 22000E on the 5,075 bench.The mineral occurs as groupings to 2 mm of colorless to white, extremely delicate, thin, micaceous crystals. The slightest breath of wind during collecting is enough to blow the crystals out of the vugs.

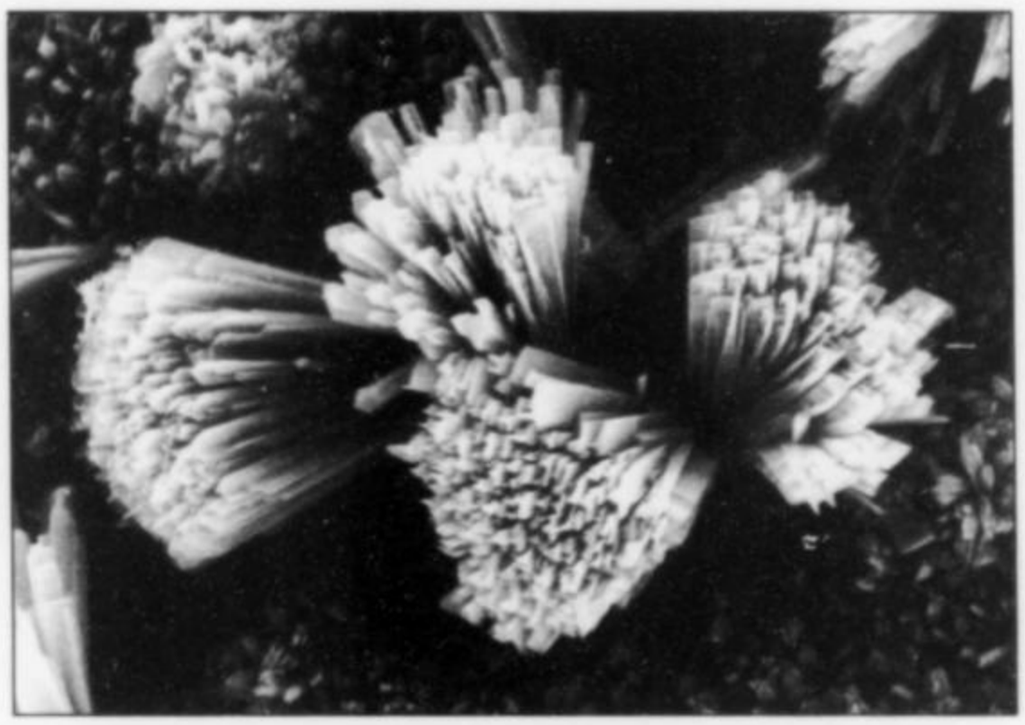


Figure 5. **Fervanite in radiating, fan-shaped groups to 15 microns of yellow-brown crystals, from location 2 on the 5,425 bench.**

Fervanite $Fe_4^{3+}(VO_4)_4\cdot 5H_2O$

Fervanite, a species new to Nevada, is locally abundant at location 2 on the 5,425 bench, most commonly as thin, botryoidal coatings on black kazakhstanite. Selected fervanite specimens, however, may exhibit radiating clusters to 0.5 mm of distinct, lath-like crystals. The species is easily distinguished by its brown to yellow-brown to pale green color. The original description of the mineral (Hess and Henderson, 1931) was done with difficulty on material which occurred as an impregnation in sandstone from Colorado Plateau uranium-vanadium deposits. The new occurrence at Gold Quarry has therefore provided the best-formed examples of the mineral yet known.

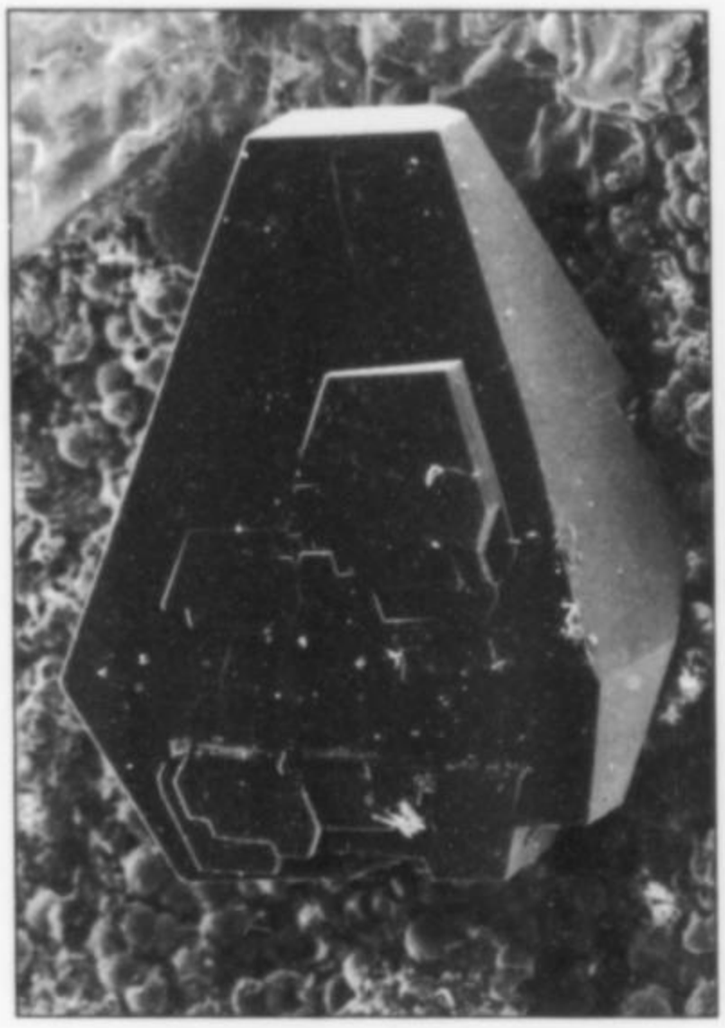


Figure 6. **Fluellite, a single, colorless, euhedral crystal 0.5 mm long from location 1 on the 5,375 bench.**

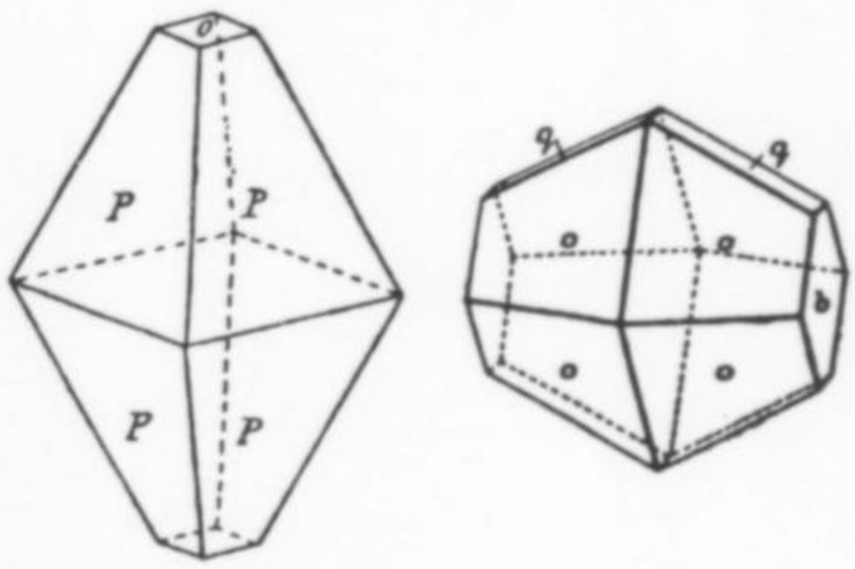


Figure 7. **Fluellite crystal drawings: (A) idealized, from Goldschmidt (1918); (B) variety "kreuzbergite," from pegmatitic deposits at Pleystein, Germany (from Laubmann and Steinmetz, 1920).**

Fluellite $Al_2(PO_4)F_2(OH)\cdot 7H_2O$

At location 1 from the 5,425 to 5,375 benches, brilliant and transparent fluellite crystals occur quite prolifically, and constitute the first reported examples of this mineral from Nevada. Associated crystallized species may include wavellite, hewettite, tyuyamunite, torbernite, leucophosphite, anatase, tinticite, phosphofibrite, blue unknown #1 and strengite-variscite. Golden yellow appears to be the most common

color for fluellite, although colorless, dark purple and black varieties are locally abundant. Zoned crystals exhibiting purple cores and yellow rims have also been seen. Single individuals to 2 mm and larger, radiating, flattened clusters to 6 mm occur, and fracture surfaces to 20 cm across liberally coated with lustrous crystals have been observed. The best specimens of fluellite from Gold Quarry are probably the finest examples of the species yet known.

Galena PbS

Unlike in other Carlin-Trend deposits, galena is surprisingly widespread in minor amounts throughout most of the Gold Quarry deposit. A notable occurrence is a massive to coarsely crystalline, 10 cm-wide, discontinuous vein which was exposed on the 5,340 through 5,280 levels in the southeast corner of the mine. Assay reports of samples from this location run up to 100 ounces/ton of silver.

Gersdorffite NiAsS

Grains of impure gersdorffite to 15 microns have been noted in samples of sulfide-rich siliceous barite breccias collected from different locations in the southern part of the deposit. Associated sulfide minerals include pyrite, sphalerite, tetrahedrite and arsenopyrite.

Goethite α-$Fe^{3+}O(OH)$

Goethite, as iron-staining and "limonite," is common throughout the deposit. Varieties containing substantial vanadium (unusual for the species) have also been observed and tend to be of a somewhat dark, olive-green color.

Gold Au

Gold is the primary economic metal at the deposit. It occurs associated with pyrite, as discrete particles less than 0.1 micrometers in diameter, and as a coupled atomic substitution (As in an S site and Au in an Fe site) within metastable arsenian pyrite grains (Arehart *et al.*, 1993).

An anomalous discovery of visible gold was made in mid-1993 on the 5,675 bench, west wall, within a 15-meter-wide, northeast-trending shear zone. Assay values of samples from this exposure varied from 0.1 to 3.0 ounces per ton, confirming a high-grade occurrence. Closer examination of iron-oxide-coated surfaces of brecciated and altered siliceous limestone fragments revealed rather common supergene spongy nests of very pure (by EDS microchemical analysis) native gold to 1 mm.

Greenockite CdS

An interesting occurrence at Gold Quarry is greenockite, locally in euhedral crystals. The mineral is more widespread than expected, but, due to its generally small crystal size, it frequently passes unnoticed. Specimens identified to date have come from localized zones of siliceous, sulfide-rich barite breccias exposed on the 5,100 through 5,050 benches in the lower portion of the pit. Greenockite occurs on fracture surfaces as small orange-yellow grains resembling orpiment, and within vugs as brilliant yellow acicular crystals to 0.1 mm. The silicified host rock is gray to black in color, and commonly contains minor associated impure alunite and drusy carbonate-fluorapatite.

Gypsum $CaSO_4 \cdot 2H_2O$

Gypsum is widespread throughout the mine as colorless, transparent, flat-lying crystals and intergrowths. Whitish crusts up to 2 cm in thickness of tightly intergrown crystals have been observed. The species is a very late mineral and commonly occurs coating other earlier phases.

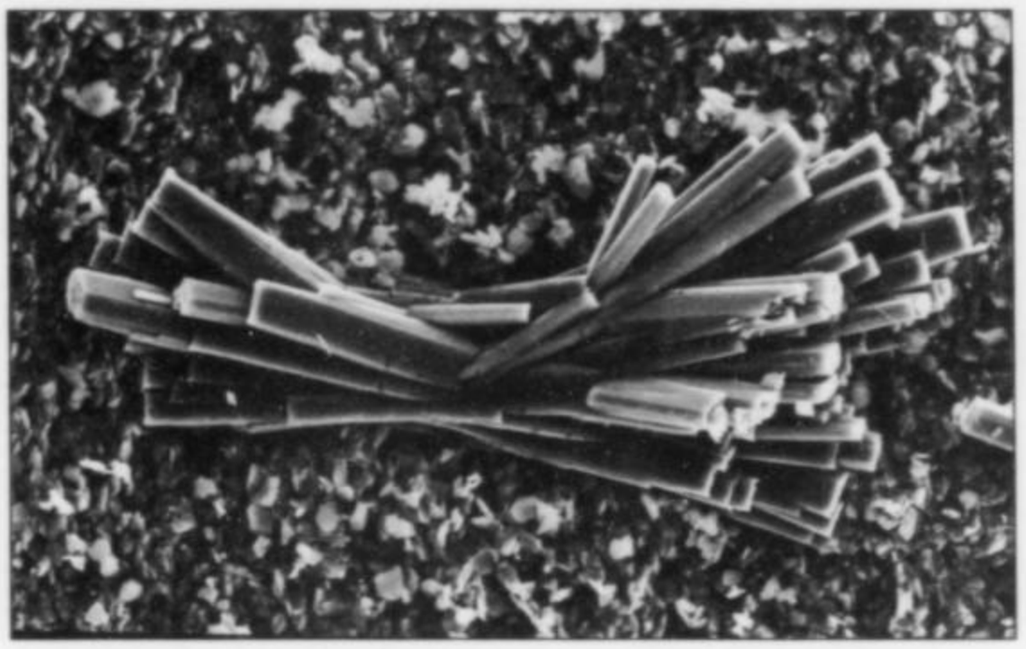


Figure 8. **Haggite "bow-tie" 0.2 mm across consisting of brilliant black crystals on kaolinite from the 5,075 bench at coordinates 17250N, 22000E.**

Haggite $V_2O_2(OH)_3$

Haggite, typically in association with hummerite, occurs commonly as an efflorescence on freshly exposed pit walls in the vicinity of coordinates 17250N, 22000E on the 5,075 bench. Both of these species are new to Nevada. The species is easy to locate simply by scanning for large, black zones along the otherwise highly altered and bleached white sedimentary rock exposures. The majority of black material is largely kaolinite impregnated with haggite. Some examples, however, show botryoidal crusts and disseminated radiating groups (to 0.15 mm) of excellent, lustrous haggite crystals.

Halloysite $Al_2Si_2O_5(OH)_4$

Halloysite, associated with azurite, forms a clayey fracture coating on oxidized siltstone from the 5,175 level, and is probably prevalent at other locations throughout the pit as well.

Halotrichite $FeAl_2(SO_4)_4 \cdot 22H_2O$

Some joint surfaces of bleached and altered siltstone exposed at coordinates 19500N, 22500E on the 5,075 bench locally exhibit thin coatings to 2 cm across of pale olive-green vanadiferous halotrichite. The species is present as an efflorescence, and occurs as tightly compacted fibrous spherules to 1 mm.

Hematite α-Fe_2O_3

Brilliant black, pseudocubic crystals of vanadium-bearing hematite have been found lining vugs of a barite breccia exposed briefly on the 5,075 bench. The crystals consistently average 20 microns in size, and are associated with colorless fluorapatite crystals and minute alunite and kaolinite crystals, all of which occur on top of tabular barite crystals.

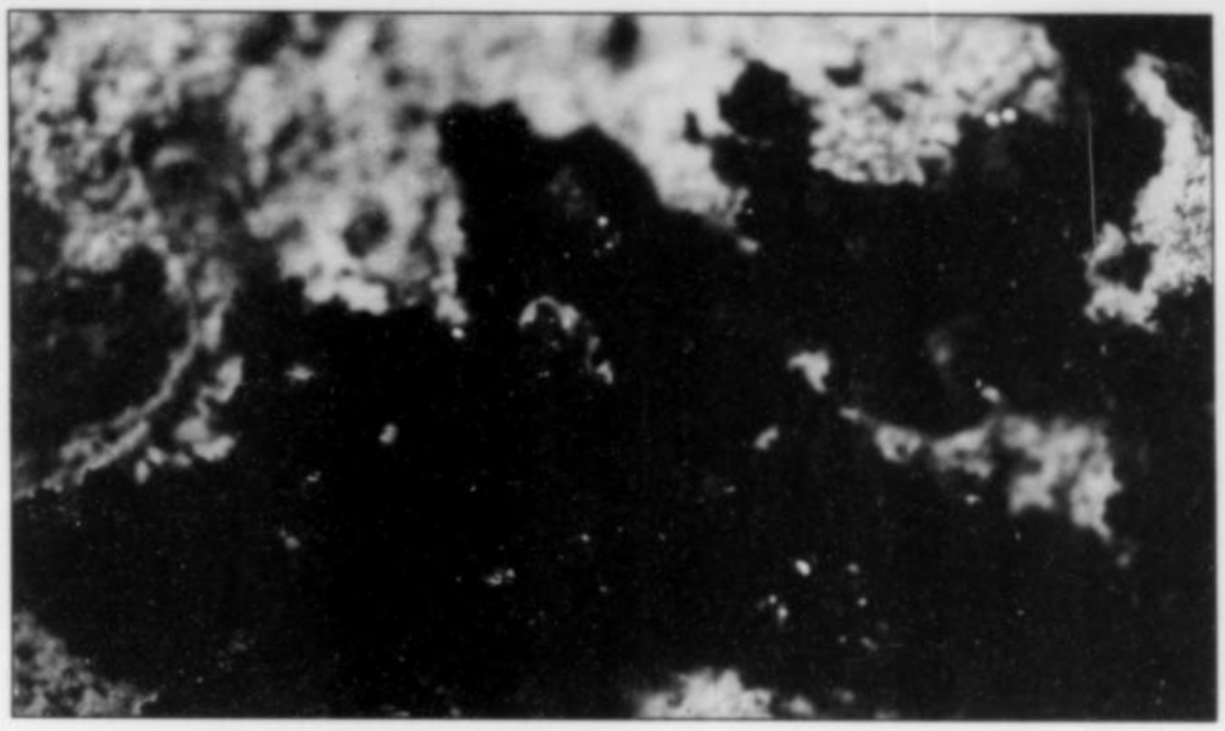


Figure 9. Carbonate-cyanotrichite clusters to 2 mm of euhedral orthorhombic crystals, from the southeast corner of the 5,075 bench.

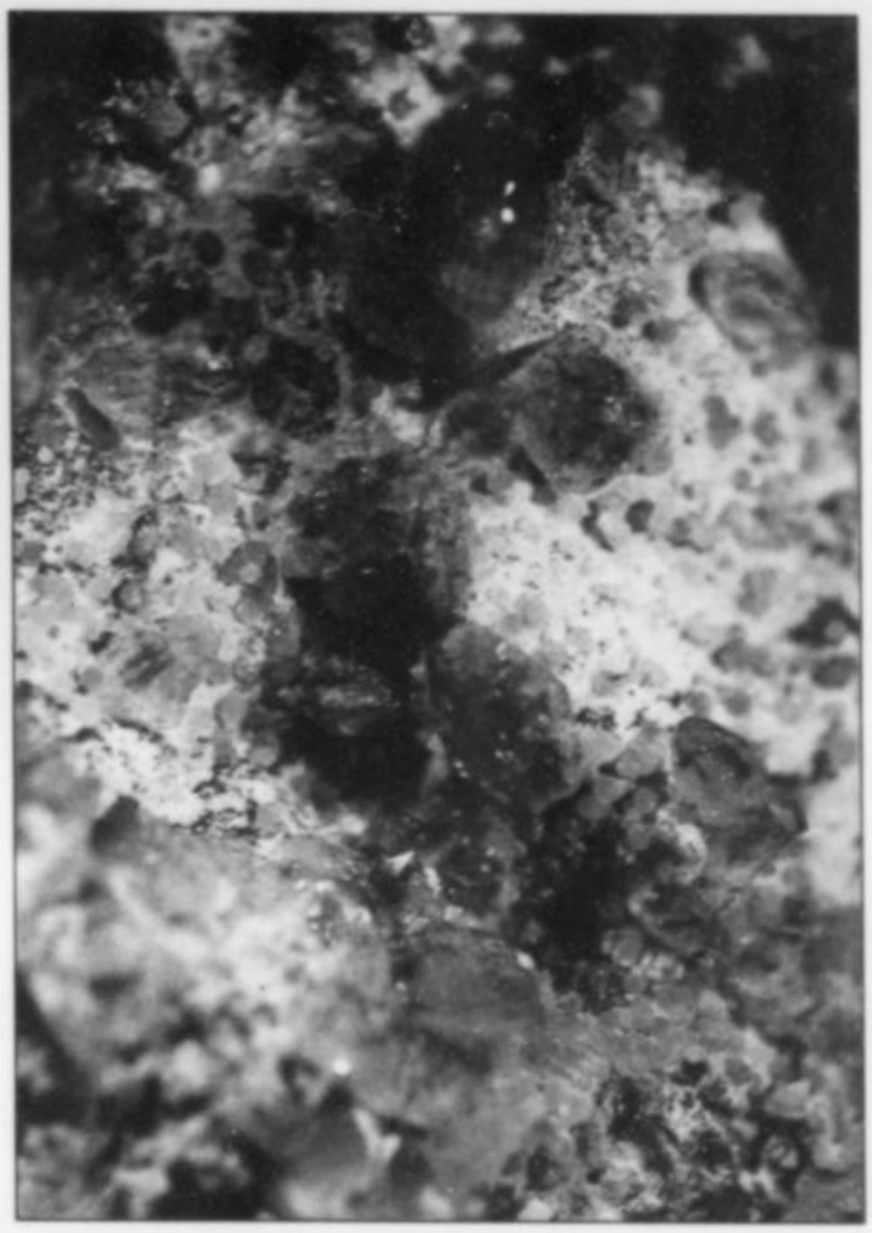


Figure 10. Lustrous fluellite crystals to 2 mm associated with ferrian variscite from location 1, 5,400 bench.

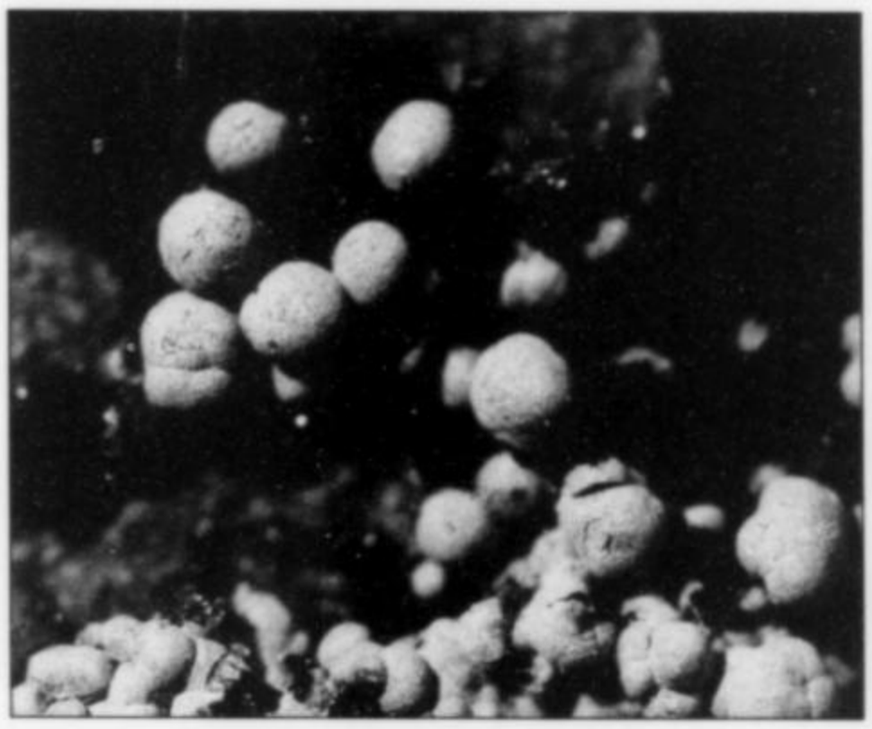


Figure 11. Fervanite in yellowish spherules to 0.2 mm on black kazakhstanite from location 2, 5,425 bench.

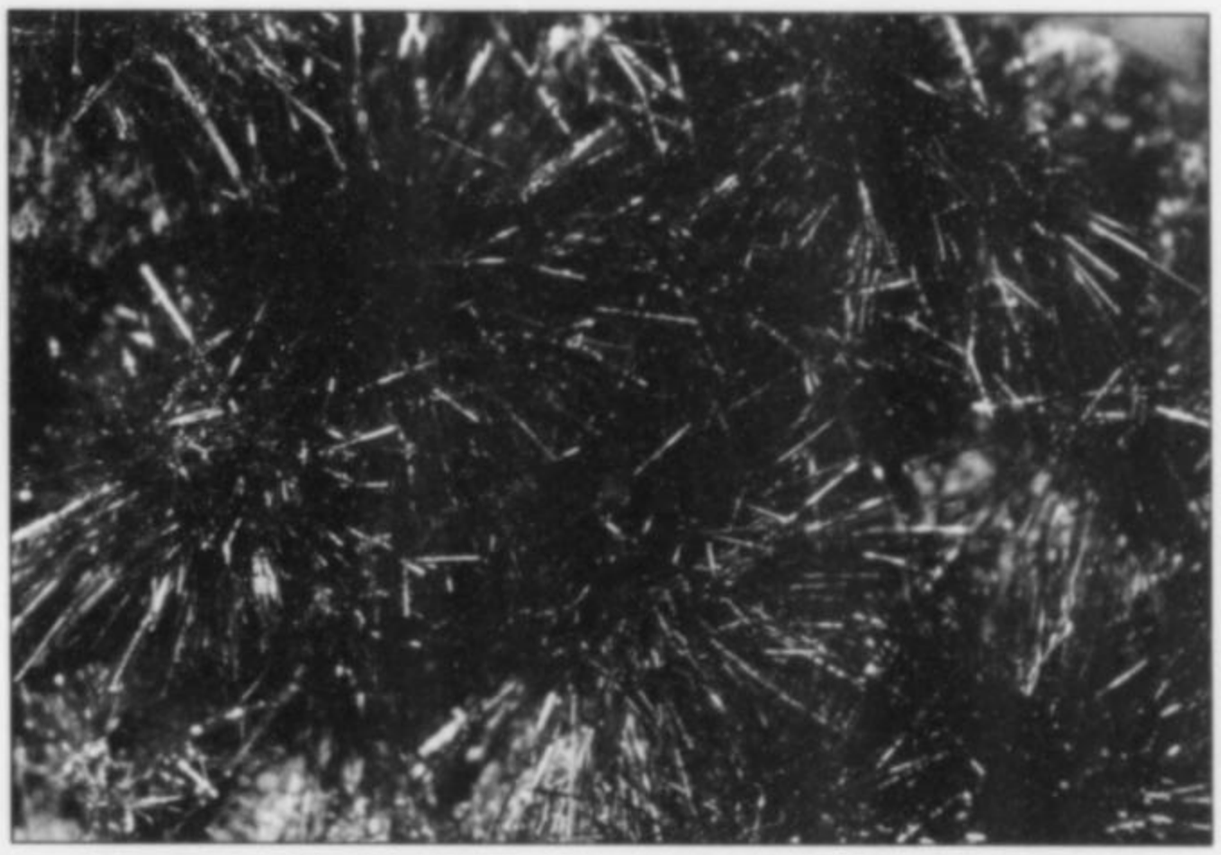


Figure 13. Hewettite in radiating clusters to 1 mm of lustrous brown crystals, on tyuyamunite, from location 2, 5,425 bench.

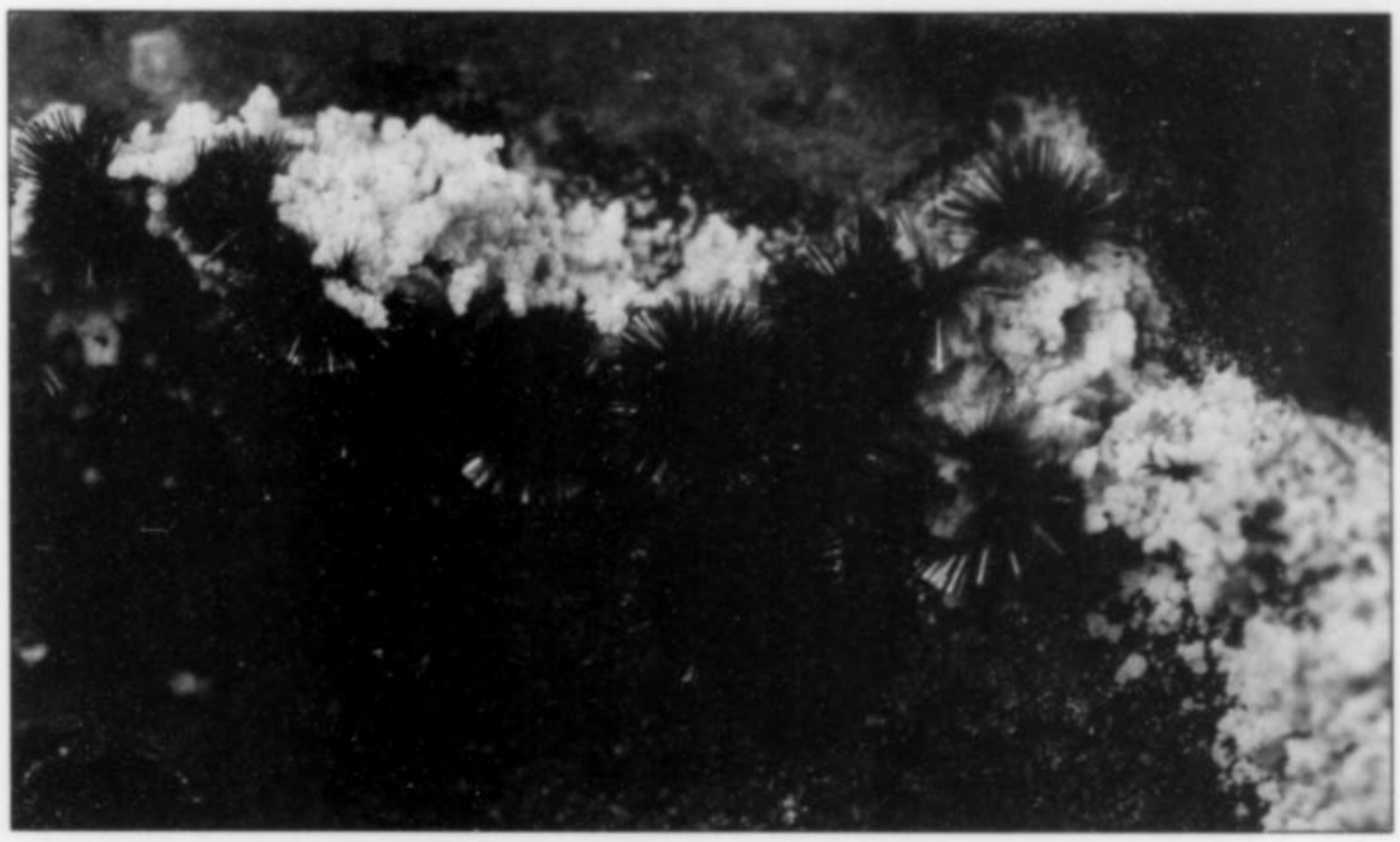


Figure 12. Hewettite in intergrown radiating crystals to 3 mm from location 2 on the 5,425 bench.

Figure 14. Gold, a supergene spongy native mass 1 mm across on goethite from the west wall of the 5,675 bench.

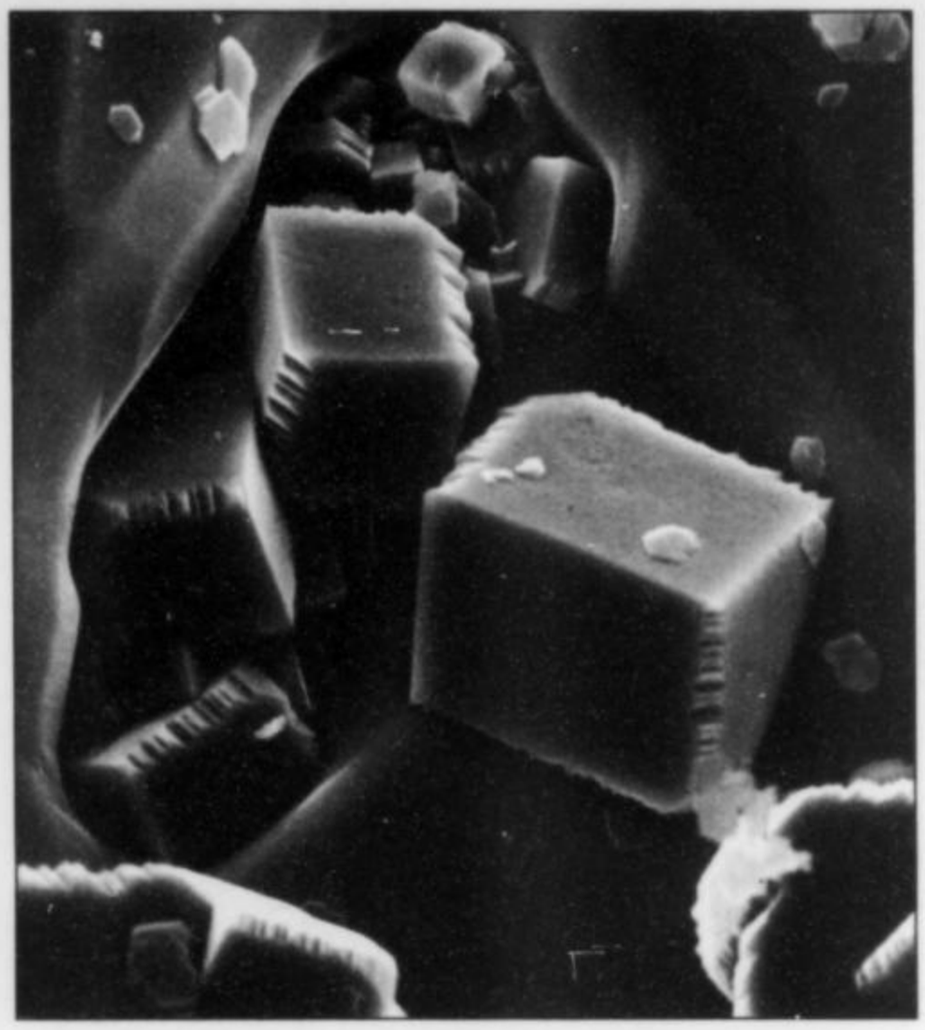


Figure 15. **Hematite in pseudocubic vanadiferous crystals to 10 microns on edge on barite, associated with minor hexagonal kaolinite platelets, from the 5,075 level, central pit.**

Hewettite $CaV^{5+}_{6}O_{16}\cdot 9H_2O$

Exceptionally well-crystallized hewettite found at the Gold Quarry mine constitutes both a new type of occurrence for this species, and the first one documented from Nevada. The mineral has historically been found only in Colorado Plateau uranium-vanadium deposits, and its occurrence within a hydrothermal gold system is therefore most unexpected. At Gold Quarry, the mineral appears to be quite widespread, occurring strictly as crystalline, maroon-red, "hair-like" needles. Individual crystals may range from 10 microns up to *2 cm* in length, and occur prolifically at location 1 on the 5,425 bench as delicate, radiating and divergent sprays. The most well-developed groups are present in association with drusy yellow carbonate-fluorapatite and white to colorless opal in large, open spaces of a rubble-like breccia.

In addition to this occurrence, a second exposure is also present on the same bench, at location 2. Here, the mineral is even more abundant but in generally smaller crystals. In a highly fractured jasperoid rock, flat surfaces more than 1 meter across have been found totally covered with a velvety, fibrous red layer of hewettite needles. Individual needles may reach 7 mm, but 2 to 3 mm is typical. Hewettite from this location also displays a variation in paragenesis and color, from small, early, chocolate-brown radiating clusters, to later, bright cherry-red, larger needles and mats. Associated minerals commonly include opal, tyuyamunite, kazakhstanite, fervanite and minor barite. Although not as large or as abundant, some truly remarkable prismatic crystals of hewettite were preserved from the 5,150 bench in the southeast corner of the mine. These specimens consist of exquisite, deep red, transparent, terminated, lath-like crystals to 3 mm exhibiting a brilliant luster. The hewettite occurs as divergent sprays and spherical clusters hidden inside small vugs to 2.5 cm within a fine-grained, sulfide-rich rock. In some instances, single hewettite crystals were found partially to completely overgrown by water-clear, lustrous gypsum crystals in a possible topotaxial manner.

Even though crystals of hewettite up to 0.5 x 15 mm were found in the famous Monument No. 2 mine in Arizona during the mid-1950's (Witkind and Thaden, 1963), it is believed that the Nevada find has provided the best examples of this species currently known. Whereas all of the Arizona material quickly faded to a dull, chocolate-brown color following removal, most specimens from Gold Quarry appear to remain lustrous and maroon-red. Changes in color with exposure to sunlight and heat seem to be negligible, but it is possible that the species is sensitive to changes in humidity over prolonged periods of time. X-ray diffraction patterns of specimens which have been water-washed do indeed display marked differences from those of actual hewettite, and show that the state of hydration of the species can readily be increased.

Heyite $Pb_5Fe_2(VO_4)_2O_4$

Heyite has been found as an orange-brown replacement of early descloizite crystals to 1 mm, on specimens of gossan collected from the Vanna fault on the 5,280 bench. A second generation of lustrous, black descloizite crystals to about the same size, associated with slightly corroded, brownish vanadinite prisms, occurs sprinkled randomly on the earlier pseudomorphs.

Hummerite $KMgV^{5+}_{5}O_{14}\cdot 8H_2O$

Like haggite, hummerite is also a species new to Nevada, the two commonly occurring together. Hummerite, mixed with varying proportions of kaolinite or gypsum, is present as an efflorescence on flat joint surfaces to 5 cm, and is readily distinguishable by its bright yellow to orange color.

Hydronium jarosite $(H_3O)Fe^{3+}_{3}(SO_4)_2(OH)_6$

Brilliantly lustrous, transparent orange, euhedral crystals of hydronium jarosite in association with greenish spherules of phosphatian scorodite have been identified on specimens from the 5,375 bench at location 1. Individual tabular crystals range up to 1 mm in size, and may locally contain minor concentrations of sodium and potassium.

Illite $(K,H_3O)Al_2(Si_3Al)O_{10}(H_2O,OH)_2$

Illite has been identified as pale green spherules to 0.5 mm on drusy quartz crystals on jasperoid rock from the 4,950 bench, middle pit, and as a white clayey fracture coating and rock matrix constituent in upper portions of the deposit.

Jarosite $KFe^{3+}_{3}(SO_4)_2(OH)_6$

Druses of lustrous, deep orange-brown jarosite crystals to 1 mm have been found locally on joint surfaces on the 5,400 bench at location 2. The species most commonly occurs as yellow, fine-grained coatings on fractures, and is quite widespread in this area of the deposit. Crystallized barite, scorodite and kazakhstanite are the only associated species observed to date.

Kaolinite $Al_2Si_2O_5(OH)_4$

Kaolinite is widespread throughout the deposit, and may be found as white coatings, vug fillings and thin veinlets to 2.5 cm thick. Under the SEM some specimens exhibit stacked, euhedral pseudo-hexagonal crystal plates.

Kazakhstanite $Fe_5^{3+}V_3^{4+}V_{12}^{5+}O_{39}(OH)_9 \cdot 9H_2O$

The original characterization of kazakhstanite (Ankinovich *et al.*, 1989) was carried out using aggregates (<1.5 cm) of round, 0.01-mm grains which cemented breccias of a carbonaceous-siliceous formation in southern Kazakhstan. The Gold Quarry mine represents only the second world occurrence for this species, and some very fine examples have recently been collected.

At location 1 on the 5,425 bench, the best specimens of crystallized kazakhstanite, although quite rare, were encountered in a small, fractured zone within bleached and silicified carbonate rocks. Here, radiating groups of lustrous, brown-black, bladed crystals less than 0.5 mm occur with variscite, fluellite, cacoxenite, hewettite and leafy green unknown #1.

At location 2 on the same bench, kazakhstanite is much more abundant, but not as readily discernible crystals. Instead, it occurs as sooty black patches up to 10 cm across on joint surfaces of a heavily brecciated and fractured jasperoid rock. Under the binocular microscope these patches are seen to consist of druses of spherical clusters of minute crystals resembling black velvet. Fervanite, minor schubnelite, hewettite and tyuyamunite are commonly associated.

Kingite $Al_3(PO_4)_2(OH,F)_3 \cdot 9H_2O$

A dehydrated variety of kingite has been found at location 1 on the 5,400 bench within heavily brecciated, gray siliceous siltstone. Two slightly different habits of kingite occur: one as flat-lying, radiating, silky, crystalline spherules to 6 mm, and the other as spongy masses to 2 cm of small, sugary crystals. The color varies from snow-white to cream-white, however, most examples appear yellowish due to varying concentrations of tyuyamunite as an impregnation. Other associated minerals are surprisingly few, and include only hewettite, blue unknown #1, kazakhstanite and variscite-strengite.

Leucophosphite $KFe_2^{3+}(PO_4)_2(OH) \cdot 2H_2O$

A very interesting occurrence at Gold Quarry is that of crystallized leucophosphite from location 1. In addition to providing the first documented report of the species from Nevada, this discovery is also the first reported from a sediment-hosted hydrothermal gold deposit. Although no large crystals have yet been found, the species is locally quite common at location 1 (5,400 and 5,375 benches), especially in association with blue unknown #1, fluellite, tinticite, phosphofibrite and variscite. Leucophosphite occurs as isolated, golden yellow to brown, spherical and flattened crystal aggregates to 1 mm in diameter, looking very much like the associated variscite. Surfaces more than 2 cm across richly covered with large spherules have been seen. Its composition varies from an almost pure, iron-rich end-member to one containing substantial aluminum. An additional variety containing substantial vanadium has also been discovered here, suggesting that a new vanadium end-member to this series may await discovery at the mine.

Libethenite $Cu_2(PO_4)(OH)$

Euhedral orthorhombic crystals (to 0.1 mm) of transparent, pale green libethenite occur associated with cuprite and vesignieite in samples from the 5,260 level. The host rock, a black siliceous siltstone, contains numerous, very thin, barite-lined fractures. Within these fractures the secondary minerals are present as vug linings between intergrown barite crystals.

Malachite $Cu_2(CO_3)(OH)_2$

Unlike in other Carlin-Trend deposits, malachite is encountered frequently during mining, and has been found throughout the mine, from the 5,520 level down to the 5,100 level. It typically occurs as green stains, thin coatings and small acicular crystals.

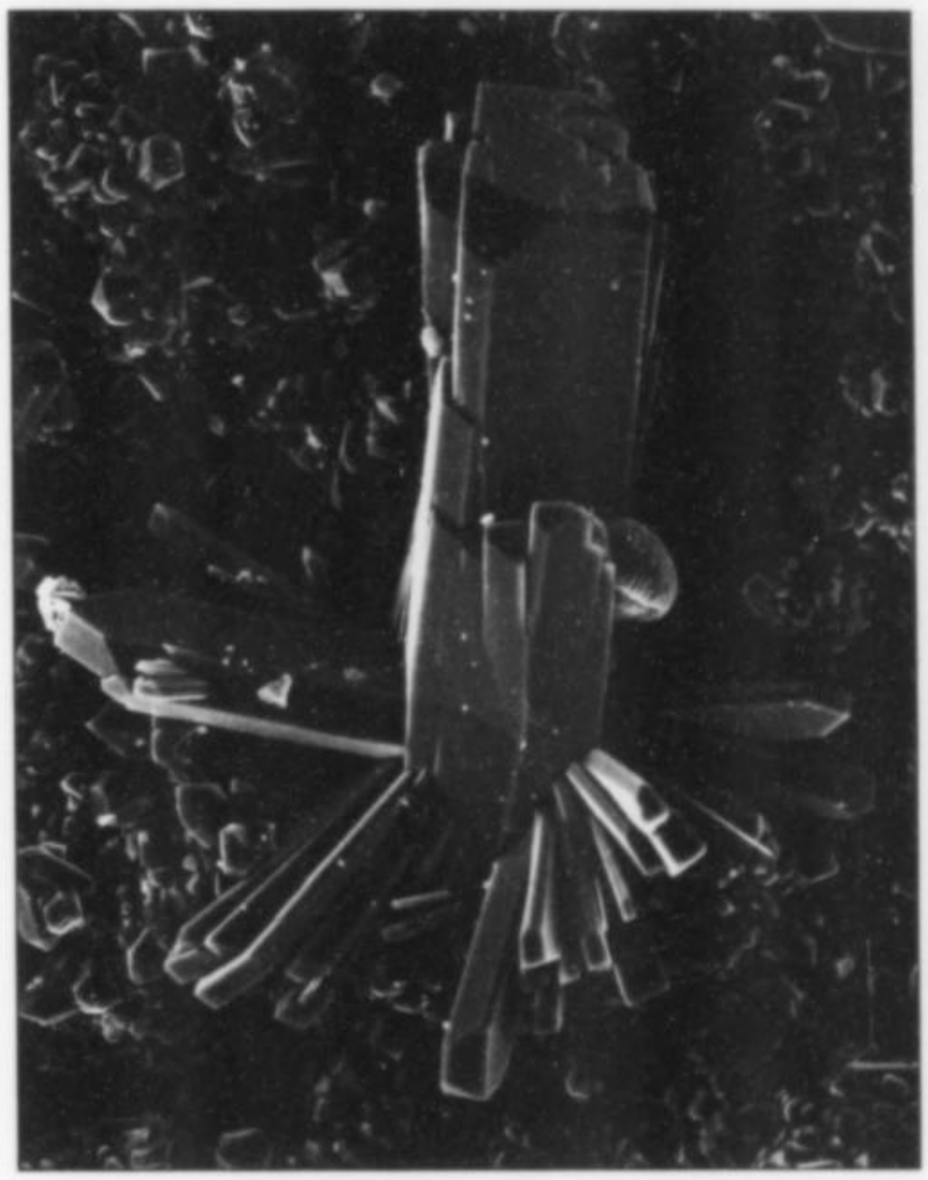


Figure 16. **Mandarinoite cluster of transparent yellow-green crystals to 0.2 mm associated with strengite and quartz crystals, from location 1 on the 5,375 bench.**

Mandarinoite $Fe_2^{3+}Se_3O_9 \cdot 6H_2O$

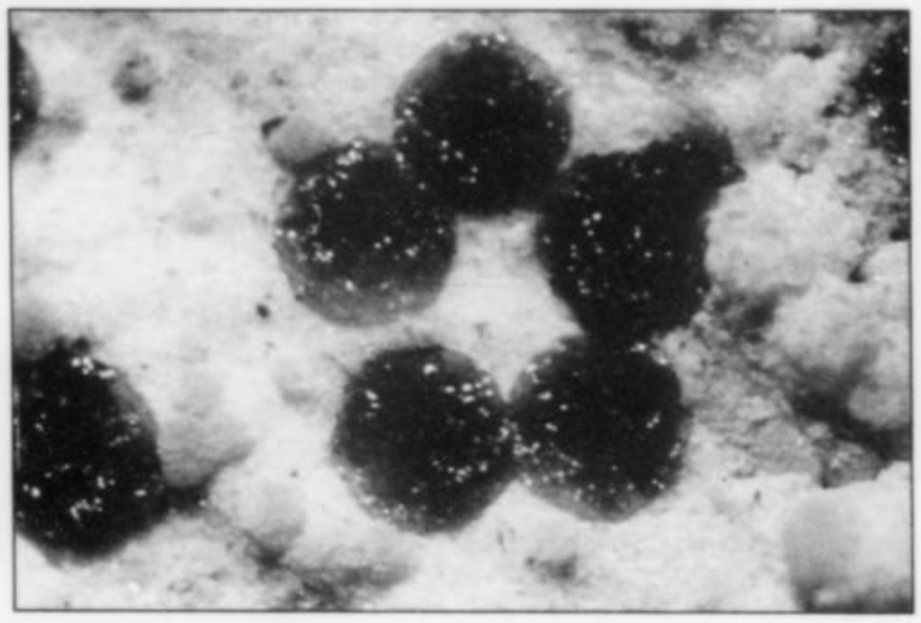
In addition to the earlier known occurrence of abundant crystals of mandarinoite (to 3 mm) at the Wind Mountain mine in Washoe County, a second Nevada occurrence has recently been identified on the 5,375 bench at location 1 in the Gold Quarry mine. Here the species has been found in gray, brecciated jasperoid rock as a rare mineral associated with pale green spherules of aluminian strengite and small, colorless barite crystals. Mandarinoite crystals occur as elongated individuals and as radiating clusters (to 0.5 mm) of brilliant and transparent euhedral, yellow-green crystals. Because of the transparency and small size of the crystals, the species is easily overlooked.

Figure 17. **Heyite as orange-brown pseudomorphs after descloizite crystals to 1 mm, associated with black, lustrous descloizite crystals from the Vanna Fault on the 5,280 bench.**

Figure 18. **(*right*) Hydronium jarosite crystals to 0.5 mm with minor phosphatian scorodite from location 1, 5,375 bench.**

Figure 19. **(*left*) Kingite (dehydrated), a radial, flat-lying spray 5 mm across with minor yellow tyuyamunite impregnation, from the 5,400 bench at location 1.**

Figure 20. **(*below*) Leucophosphite in radiating crystal clusters to 1 mm associated with ferrian variscite from location 1, 5,375 bench.**



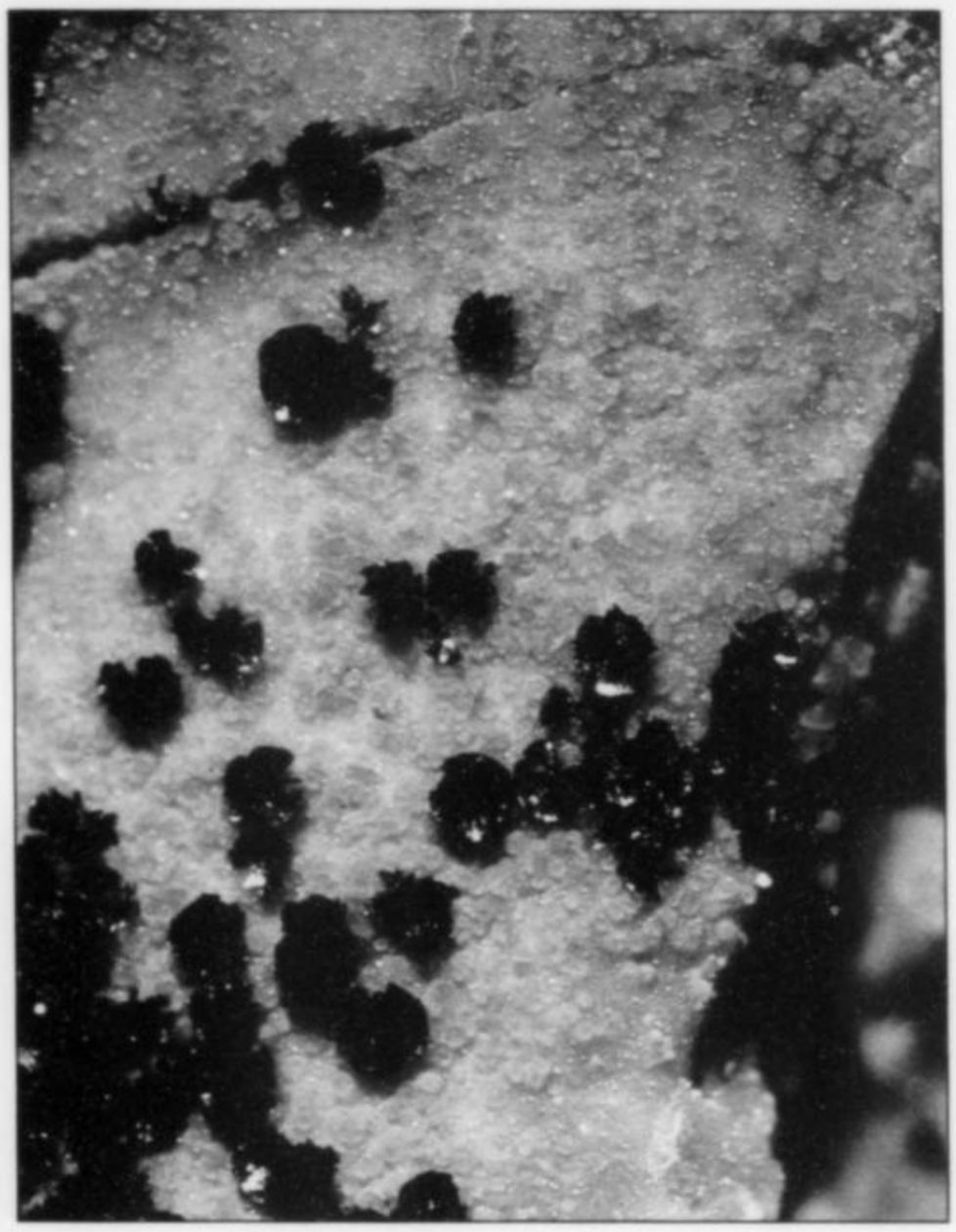


Figure 21. **Kazakhstanite spherules to 1 mm composed of euhedral crystals associated with yellow cacoxenite from location 1, 5,375 bench.**

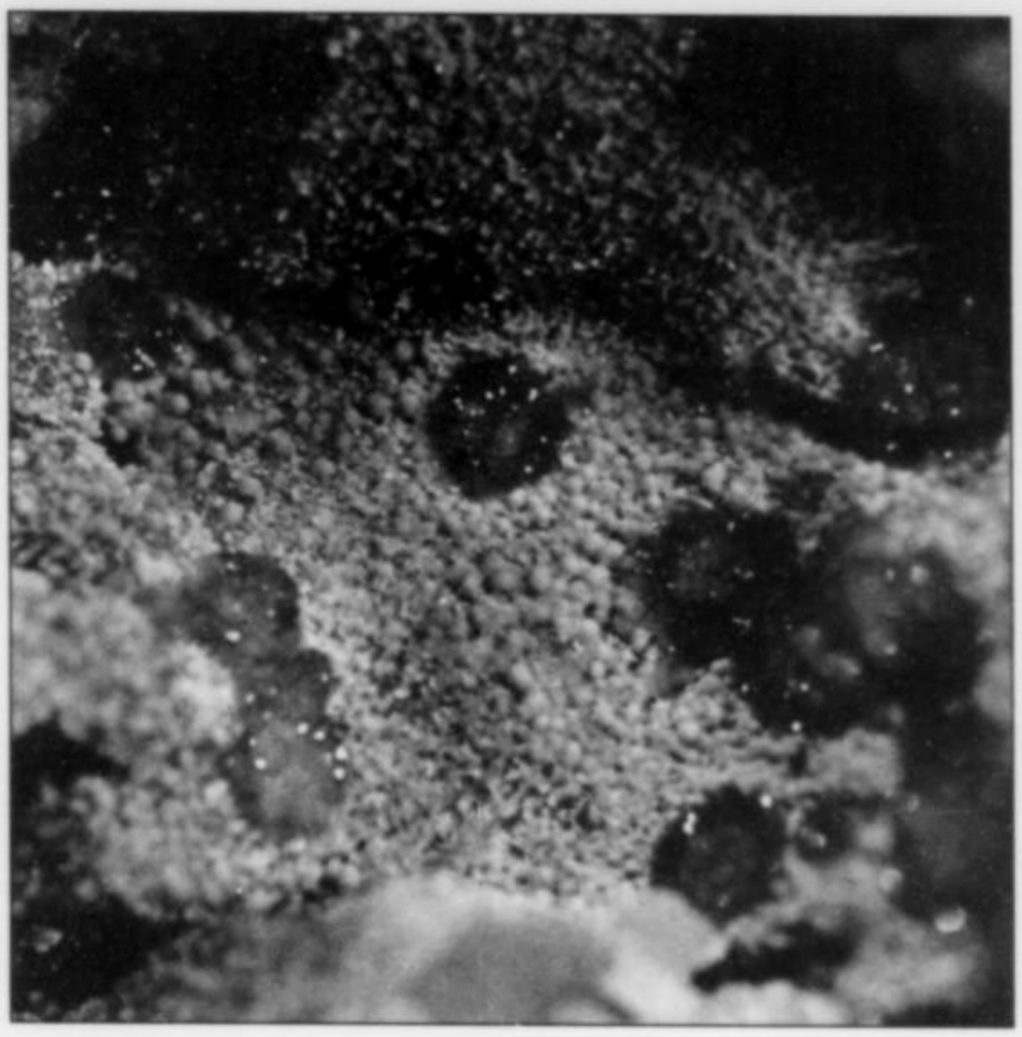


Figure 22. **Acicular phosphofibrite (or Fe-analog) in yellow spherules to 0.15 mm associated with aggregates of crystallized colorless fluellite from location 1, 5,400 bench.**

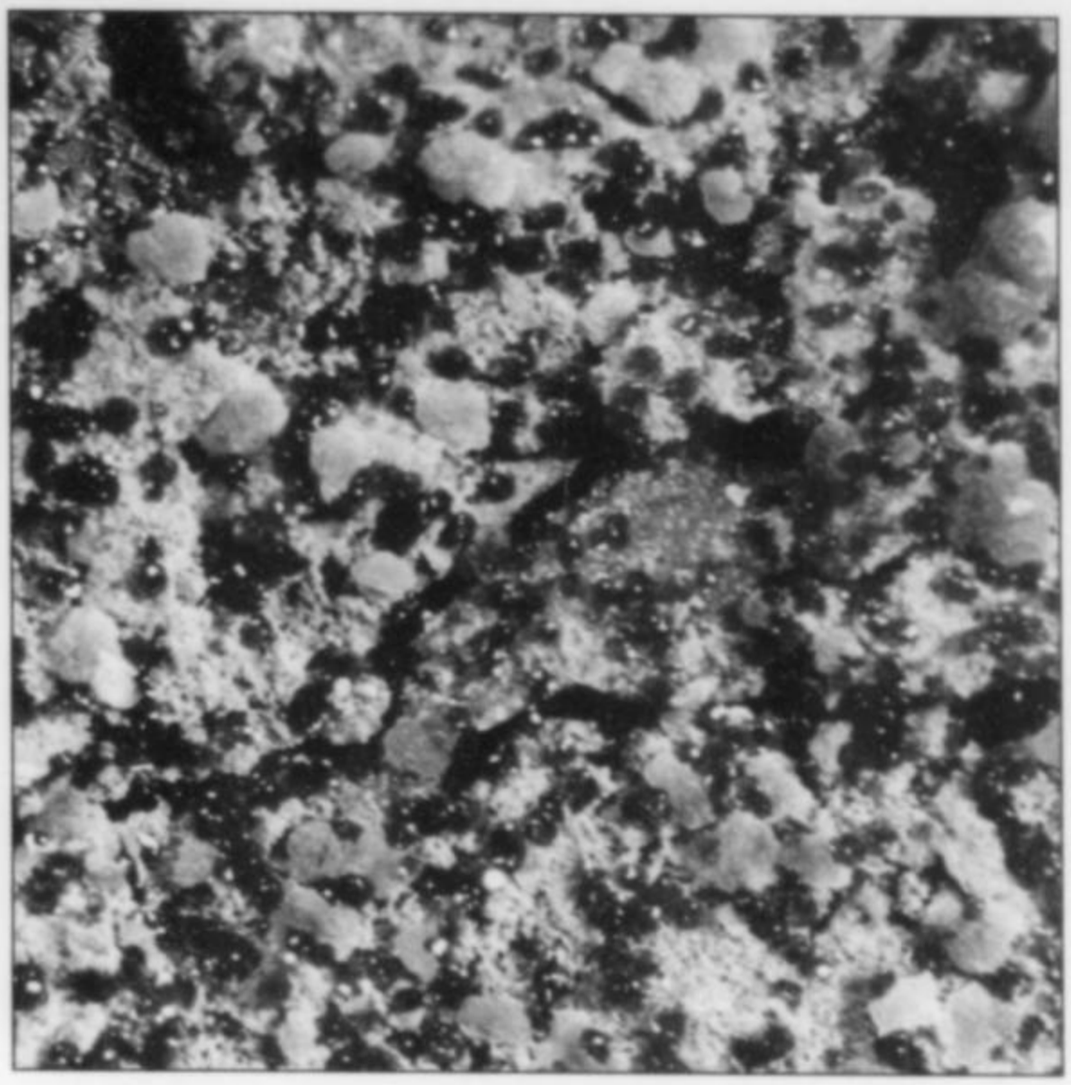


Figure 23. **Tinticite in abundant tan to medium-brown crystals to 0.2 mm with ferrian variscite from location 1 on the 5,375 bench.**

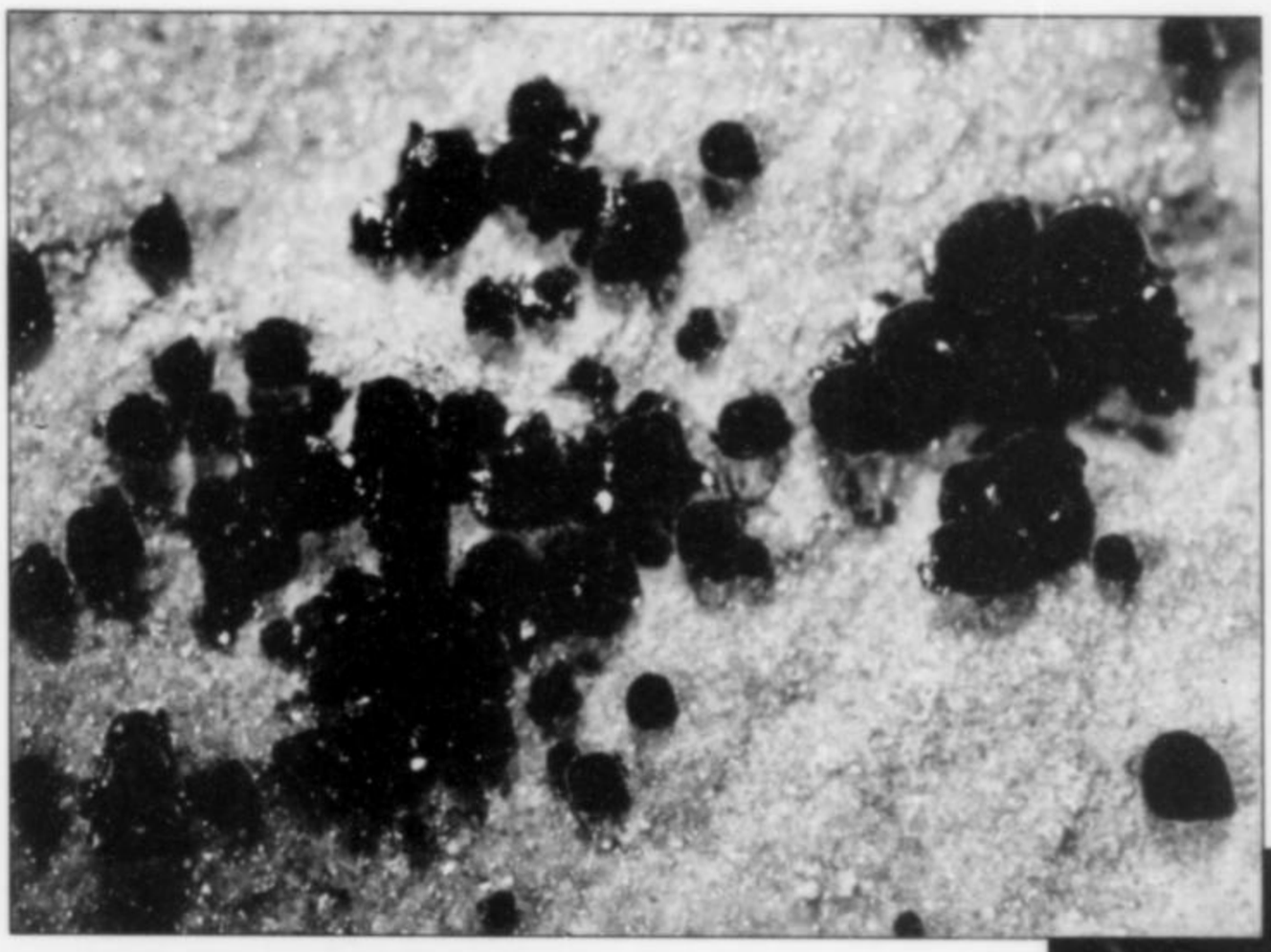


Figure 24. **Fervanite in brownish spherules to 0.5 mm with intergrown bladed and lustrous schubnelite crystals on jarosite, from location 1, 5,350 bench.**

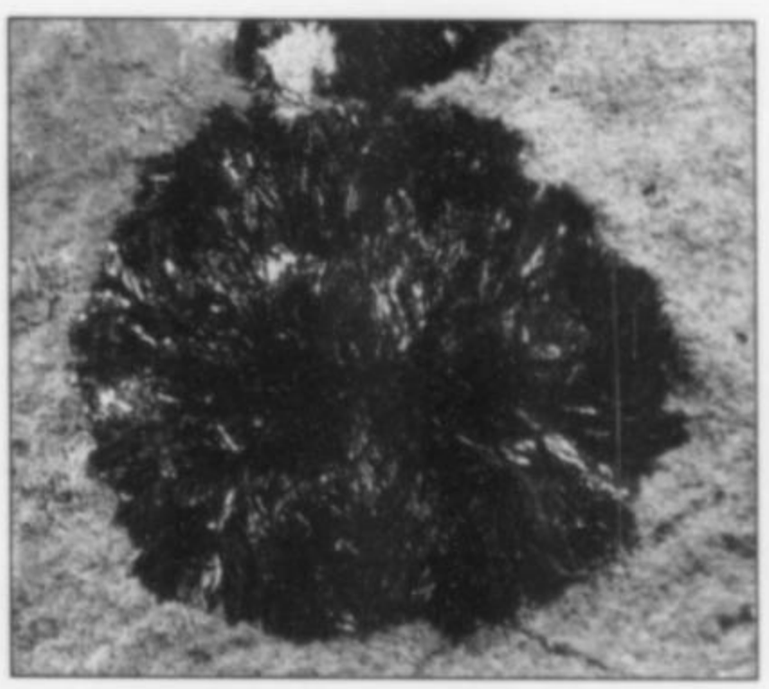


Figure 25. **Volborthite as a flat-lying crystallized patch 12 mm across, from the southwest side of the pit.**

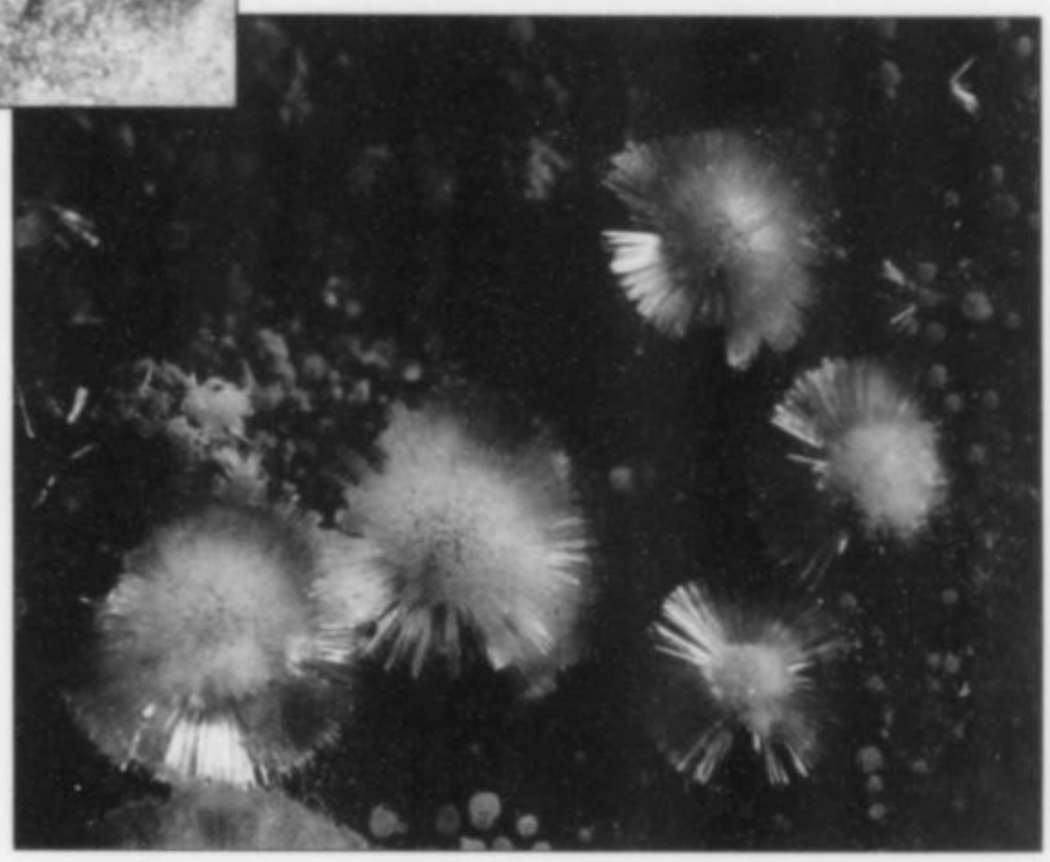


Figure 26. **Wavellite spherules to 2 mm composed of euhedral crystals associated with milky white aluminian strengite spherules, from location 1 on the 5,425 bench.**

Marcasite FeS_2

Marcasite in spherules to 1 cm is a rare constituent of the sulfide-rich, silicified barite breccias exposed in the lower levels of the mine. Broken spherules wholly enclosed within the rock exhibit a fresh, golden brown, metallic color and a radiating internal structure. Larger, bulbous masses (to 6 cm) associated with crystallized native selenium, vanadinite and descloizite have been collected from the southeast corner of the 5,050 bench. Examples of well-crystallized marcasite have been collected from the west side of the 5,025 level, where open spaces between breccia fragments may be filled with dendritic cockscomb aggregates to 1.5 cm.

Metatorbernite $Cu(UO_2)_2(PO_4)_2 \cdot 8H_2O$

Some specimens of torbernite that have been removed from the mine and exposed to the dry Nevada climate have lost their clarity and deep green color rather quickly, as well as some molecular water, thus becoming metatorbernite. The change typically takes about one to two weeks and is non-reversible.

Metatyuyamunite $Ca(UO_2)_2V_2^{5+}O_8 \cdot 3H_2O$

Similar to the alteration of torbernite to metatorbernite, specimens of bright yellow tyuyamunite may change over time, loosing some molecular water and becoming a dull yellow-brown metatyuyamunite.

Mimetite $Pb_5(AsO_4)_3Cl$

Mimetite occurs as transparent, pale yellow hexagonal crystals to 50 microns, associated with cerussite crystals and pulverulent bindheimite, on samples of galena from the southeast side of the 5,280 bench.

Monazite-(Ce) $(Ce,La,Nd,Th)PO_4$

Backscattered-electron SEM images of samples of a possible intrusive dike from the 5,200 level show anhedral grains of monazite-(Ce) to 10 microns across. Associated minerals include anatase, apatite, calcite, illite, muscovite (sericite), pyrite, quartz and zircon.

Montmorillonite $(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$

In addition to being a major constituent of the Tertiary Carlin Formation, montmorillonite (and possibly beidellite) is widespread throughout the mine as white to pale green coatings on siltstone.

Muscovite $KAl_2(Si_3Al)O_{10}(OH,F)_2$

Muscovite (variety sericite) has been reported (unpublished report, Newmont Gold Company, 1991) as whitish clayey coatings on fractures in siltstone and as relict laths in a possible intrusive dike on the 5,200 level.

Opal $SiO_2 \cdot nH_2O$

Very thin crusts of botryoidal, transparent, colorless opal liberally coat most rock fragment surfaces exposed in the rubbly breccia zones on the 5,425 bench at locations 1 and 2. Where present, the species imparts a slippery feel to the rock.

Orpiment As_2S_3

Relative to other Carlin-Trend gold deposits, orpiment has remained unexpectedly scarce at the Gold Quarry mine. To date, it has been observed only as thin, yellow-orange veinlets in specimens of carbonaceous sediments from deeper drill holes into the deposit.

Pararealgar AsS

Realgar from Gold Quarry, as is typical at other localities, quickly alters upon exposure to light and the atmosphere and acquires a thin, surficial coating of powdery, orange-yellow pararealgar.

Phosphofibrite $KCuFe_{15}^{3+}(PO_4)_{12}(OH)_{12} \cdot 12H_2O$

Phosphofibrite, a new mineral described by Walenta and Dunn (1984) from the Clara mine, Germany, has also been found at the Gold Quarry mine, at location 1 on the 5,400 and 5,375 benches. Here, within the zone of gray, heavily brecciated and crushed jasperoid rock, radial aggregates to 0.2 mm of fibrous, pale yellow, crystallized phosphofibrite are locally common. Fracture surfaces up to 6 cm across liberally coated with radiating sprays have been found. Abundant associated minerals include fluellite crystals, leucophosphite spherules, tinticite crystals, hewettite needles, spongy tiemannite/corderoite intergrowths, and spherules of strengite/variscite. Although X-ray diffraction data for Gold Quarry phosphofibrite match those of material from the type locality, electron microprobe analyses show a lack of any copper whatsoever. It is possible that one atom of ferrous iron may instead be occupying the copper position, and that the species is actually the iron analog. Alternatively, there may be little or no copper in the type phosphofibrite. The crystal structure of the mineral has yet to be solved. Further work is continuing on this problem.

Plumbogummite $PbAl_3(PO_4)_2(OH)_5 \cdot H_2O$

Spherical clusters to 20 microns of colorless, leafy plumbogummite crystals have been identified on specimens of phosphofibrite, tinticite, fluellite, variscite and anatase from location 1 on the 5,400 bench. Plumbogummite aggregates are visible only with the aid of the SEM.

Pseudomalachite $Cu_5(PO_4)_2(OH)_4$

Spherical clusters of dark green pseudomalachite as large as 2 mm across occur on joint surfaces, associated with chrysocolla and azurite, from the west side of the mine on the 5,175 and the 5,260 benches.

Pyrite FeS_2

Pyrite occurs predominantly in unoxidized rocks exposed in the lower levels of the mine, especially as a constituent of gray, barite-rich, silicified and brecciated, vein-like zones ("Deep Sulfide Feeder" zones). Bright, anhedral pyrite grains to 2 cm and rarer simple cubes to 1 cm, both totally enclosed within rock, are locally common. Much larger vuggy masses of solid pyrite more than 20 cm thick have been recovered from a zone exposed in the southwest portion of the mine on the 5,325 bench. Vug linings of this material consist of drusy cuboctahedral crystals to 0.5 mm and later, brown siderite rosettes.

Pyrolusite $Mn^{4+}O_2$

What is probably pyrolusite, in its most typical occurrence as black dendrites, is exposed locally on joint and fracture surfaces of the footwall carbonate rocks on the northwest

corner of the 5,175 bench. The identity of this mineral has not been confirmed by X-ray diffraction methods.

Quartz SiO_2

In addition to widespread silicification and formation of jasperoid rocks as a fine-grained replacement, quartz also occurs locally as typical euhedral crystals to 0.5 mm within small vugs and on joint surfaces.

Realgar AsS

As mining progresses deeper, and more unoxidized rocks are exposed, zones of highly carbonaceous limestone are being encountered. Locally abundant, massive realgar in association with coarse, cleavable white barite has been found in rocks of this type on the northern side of the 5,175 bench. Rare specimens displaying small druses of brilliant, orange-red crystals up to 3 mm in length have been collected.

Richellite $Ca_3Fe^{3+}_{10}(PO_4)_8(OH,F)_{12}\cdot nH_2O$ (?)

Samples from the 5,450 bench of an amorphous, caramel-colored material have been identified as an aluminum-bearing richellite. Solid specimens to 3 x 3 cm consisting entirely of this species have been found.

Romanechite $(Ba,H_2O)(Mn^{4+}, Mn^{3+})_5O_{10}$

Dull black patches (to 3 mm) of a slightly vanadium-bearing romanechite (psilomelane) have been found on siltstone from the 5,075 bench. The mineral is probably widespread throughout the deposit.

Rutile TiO_2

Rutile was noted by Hausen (1982) during thin-section examination of drill cuttings, and has also been observed during SEM studies of silicified siltstone samples from the 5,375 bench near location 1. The species occurs wholly enclosed within rock as slightly corroded grains to 45 microns, associated with zircon, xenotime and pyrite.

Schubnelite $Fe^{3+}_{2-x}(V^{5+},V^{4+})_2O_4(OH)_4$

A second world occurrence for the rare mineral schubnelite has been found at the Gold Quarry mine, from location 2 on the 5,425 bench. The mineral is not particularly common, but occurs, in general, on most specimens of kazakhstanite, fervanite and tyuyamunite. Very small yet brilliant, orange-brown crystals to 0.1 mm can be observed under the binocular microscope randomly sprinkled across kazakhstanite and fervanite druses. At the type locality (Mounana mine, Gabon) schubnelite occurred as larger, brilliant black crystals to 0.5 mm, at the base of the oxidation zone (Cesbron, 1970).

Scorodite $Fe^{3+}AsO_4\cdot 2H_2O$

In addition to strengite and variscite, another member of the variscite group, scorodite, has also been found at Gold Quarry. Samples of siliceous siltstone with vuggy bladed barite exposed locally at location 2 on the 5,375 bench have typically provided the better examples of crystallized scorodite. Equant, platy, orthorhombic crystals from this occurrence are lustrous and green-yellow in color, and range up to 60 microns in size. Associated minerals include white powdery kaolinite, brown-black kazakhstanite spherules, purplish

Figure 27. **Schubnelite in triclinic, orange-brown crystals to 80 microns on a druse of small fervanite crystals from location 2.**

pseudocubic alunite crystals, gypsum and quartz. Microchemical analyses conducted on this scorodite have shown that it contains substantial phosphorus and vanadium in solid solution with arsenic.

Impure phosphorus-bearing scorodite has also been verified from location 1 on the 5,375 bench, as druses of small, gray-green spherules. Specimens from this site are identical in occurrence and appearance to strengite and variscite, which also occur here, and a chemical analysis is necessary to differentiate between the species.

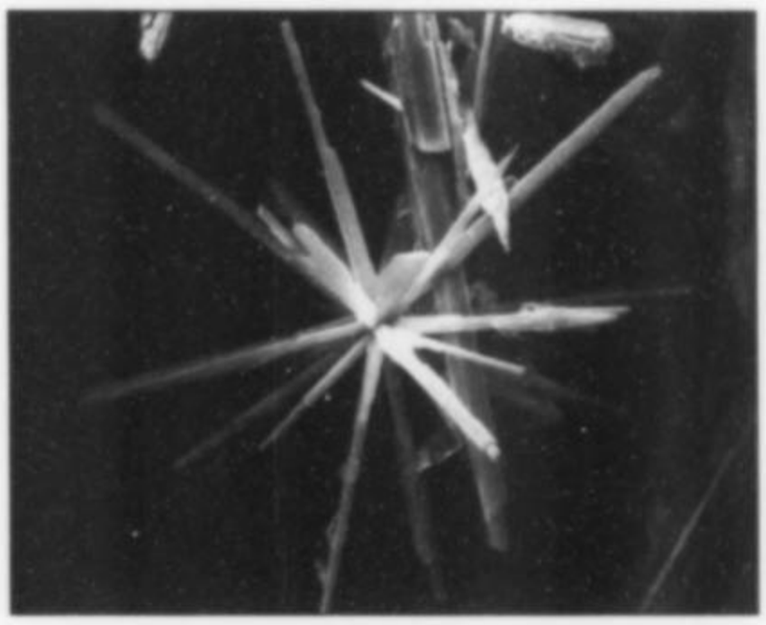


Figure 28. **Native selenium in a stellate spray 30 microns across consisting of black-red crystals, from coordinates 17250N, 22000E, on the 5,075 bench.**

Selenium Se

Crystallized native selenium has been identified from two specific locations on the 5,050 bench at the top of the

unoxidized zone in the southeast area of the mine, and it may be assumed that additional exposures exist elsewhere in this general area. The species is found both as an encrustation on marcasite, where it is associated with vanadinite and descloizite, and as a surficial coating on bedding planes and joints in highly argillized sedimentary rocks. These coatings, which display a dark purple to flat-black color, are actually composed of interlocking to freestanding black needles to 50 microns, some of which display an orange-red transparency when viewed in the binocular microscope.

Siderite $FeCO_3$

Large specimens of vuggy, fine-grained pyrite containing siderite crystals have been collected from the west area of the pit on the 5,350 bench. The siderite, which forms curved, pale green-brown crystals to 5 mm, is irregularly distributed throughout the vugs, on brilliant, small pyrite crystals.

Sincosite $CaV_2^{4+}(PO_4)_2(OH)_4 \cdot 3H_2O$

Micaceous cleavages of sincosite to 4 mm have been identified as thin fracture fillings within altered siltstone from the lower levels of the pit. The mineral varies in color from grass-green to pale brown and could easily be mistaken for muscovite. As with many of the other minerals from Gold Quarry, sincosite is new to Nevada.

Sphalerite ZnS

Dark brown, anhedral grains of slightly iron-rich sphalerite to 1 mm are widespread throughout the sulfide-rich, siliceous barite breccias exposed along the 5,075 bench in the southwest area of the mine. Associated minerals include pyrite, galena, greenockite and variscite.

Stibiconite $Sb^{3+}Sb_2^{5+}O_6(OH)$

Stibiconite, along with tripuhyite, was found as an alteration mineral of totally oxidized intergrown stibnite crystals from the 5,320 level. Pseudomorphs after stibnite crystals to 1 cm wide by 3 to 4 cm long have been collected.

Stibnite Sb_2S_3

Good specimens of euhedral stibnite crystals have not yet been found at the Gold Quarry mine. Instead, the species has been observed as small, acicular crystals in vuggy Tertiary conglomerate on the 5,280 bench, and as solid masses intergrown with galena from the 5,520 bench.

Strengite $Fe^{3+}PO_4 \cdot 2H_2O$

Iron-rich examples of the strengite-variscite series are common at location 1 on the 5,425 through 5,375 benches and may be found in association with all other species which occur here. Chemical microanalysis reveals that pure strengite is rare, and that most specimens have a significant component of aluminum. Visually identifying the species can be particularly difficult, as it may be present in a very wide variety of colors and morphologies, similar to variscite. The most common occurrence appears to be as white to gray-green isolated spherules to 0.5 mm, and druses coating surfaces of brecciated jasperoid fragments.

Sulfur S

Brilliant, though extremely small (to 25 microns), crystals of native sulfur occur locally on thin marcasite coatings

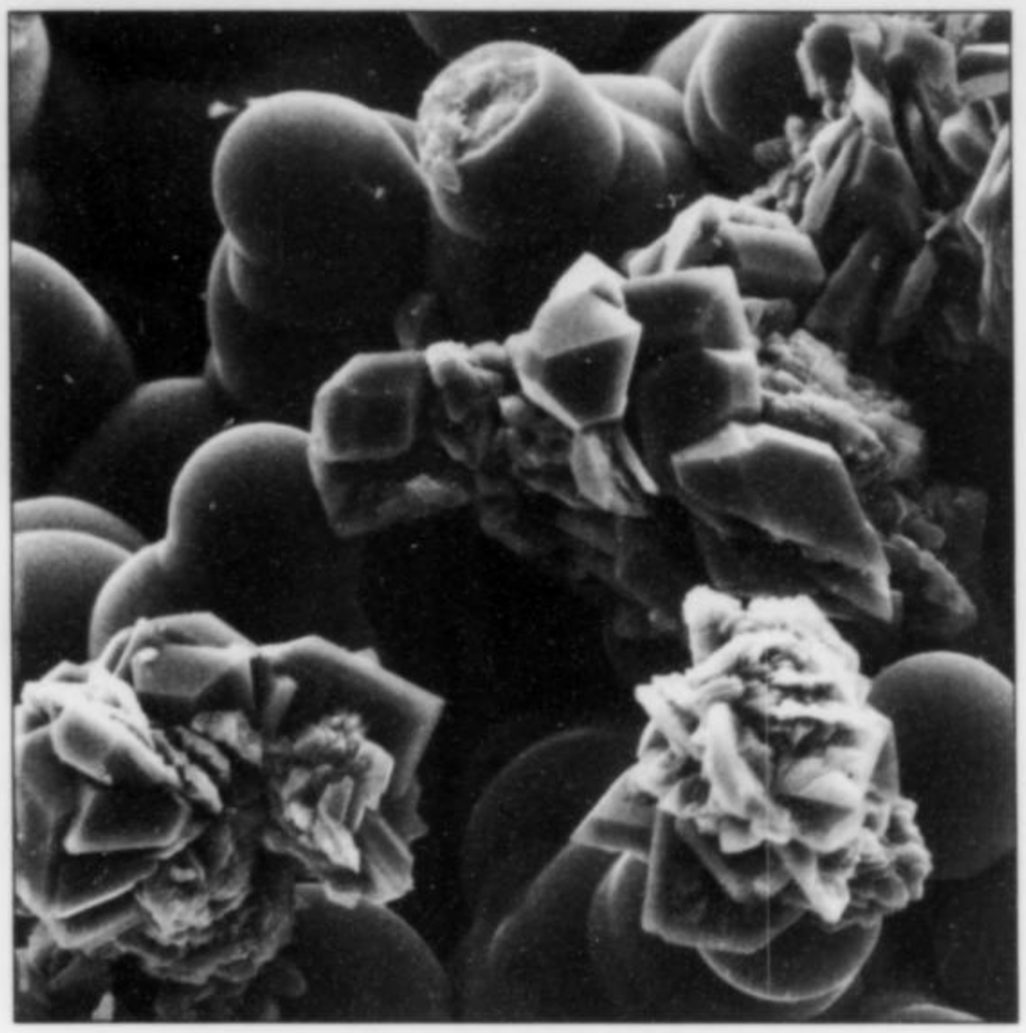


Figure 29. **Aluminian strengite in bladed to equant crystals to 15 microns, on botryoidal opal, from location 1, 5,425 bench. Note extreme similarity in morphology with ferrian variscite crystals shown in Figure 30.**

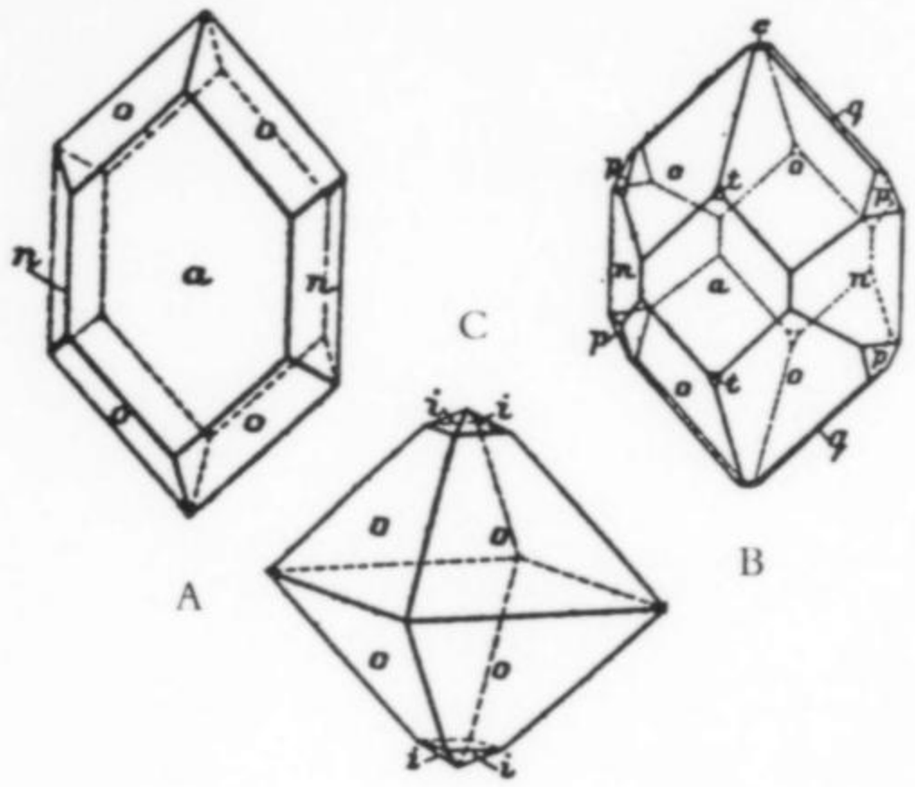


Figure 30. **Strengite-variscite crystal drawings: (A) flattened crystal of the "scorodite habit," (B) intermediate habit, (C) blocky, equant habit, more typically observed for variscite. All drawings from Laubmann and Steinmetz (1920).**

associated with haggite on the 5,075 bench at coordinates 17250N, 22000E.

Tenorite CuO

Specimens of brownish altered siltstone exhibiting minor malachite coatings also contain thin crusts of pulverulent black tenorite mixed with uncharacterized manganese oxides.

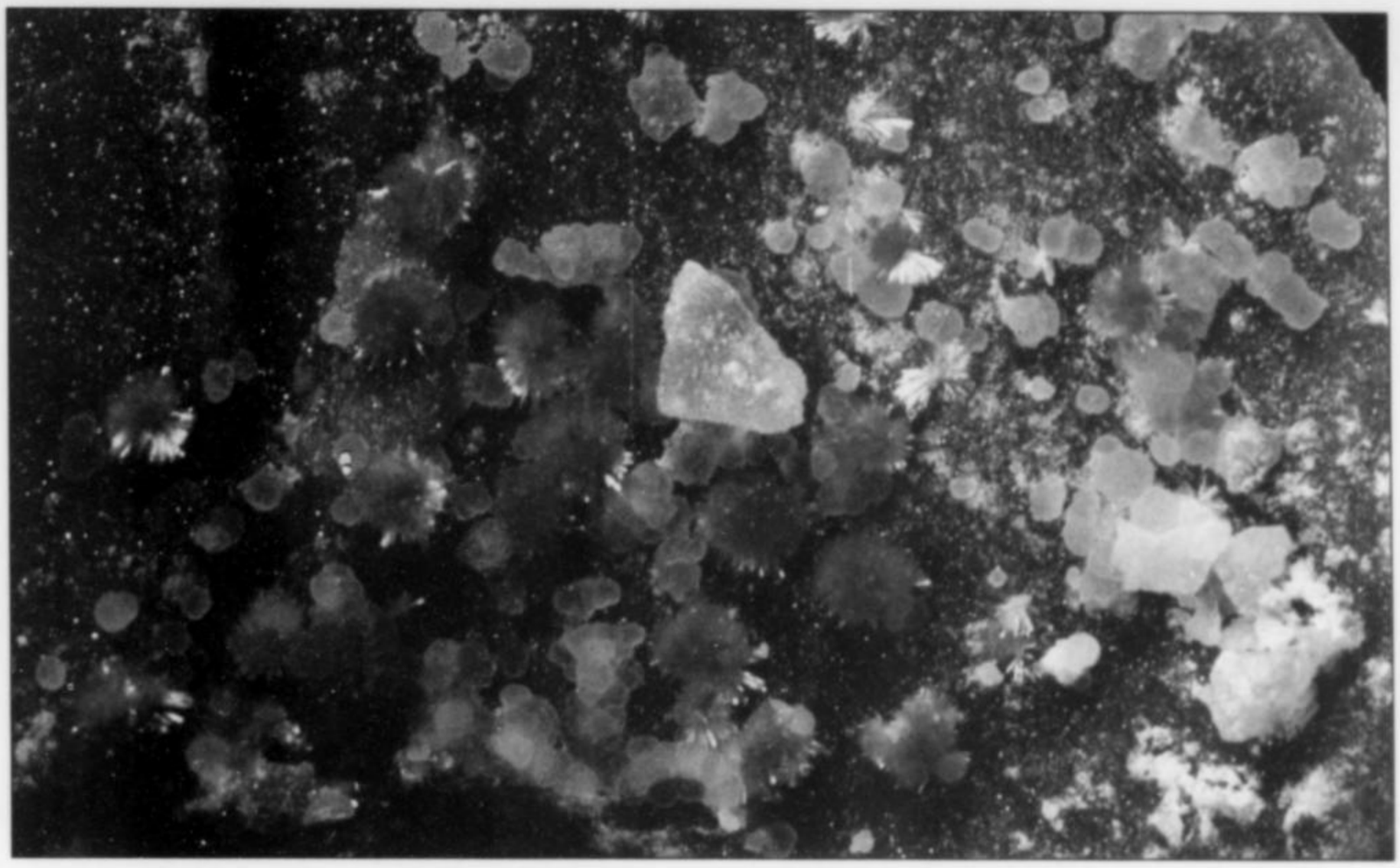


Figure 31. **Blue unknown #1 in radiating spherules to 1 mm associated with yellowish ferrian variscite, from the 5,375 bench, location 1.**

Tetrahedrite $(Cu,Fe)_{12}Sb_4S_{13}$

Samples of siliceous, sulfide-rich barite breccia from coordinates 17250N, 22000E on the 5,075 bench may locally exhibit small vugs to 2 mm lined with cleaved galena, anhedral pyrite and isolated, euhedral, slightly cadmium-bearing tetrahedrite crystals. Individual crystals are observable only with the aid of the SEM, but occur as equant, modified, tetrahedral crystals to 10 microns.

Tiemannite HgSe

Tiemannite, finely intergrown with corderoite, has been verified as black, spongy, crystalline masses to 2 mm from location 1 on the 5,400 bench. These intergrowths are locally quite abundant, and occur predominantly with fluellite and other crystallized hydrated phosphates as fracture coatings in heavily brecciated and crushed jasperoid.

Tinticite $Fe^{3+}_4(PO_4)_3(OH)_3 \cdot 5H_2O$

Tinticite is an uncommon mineral, first found as a cream-colored pulverulent material in a limestone cave near the Tintic Standard mine, Utah County, Utah. A surprising occurrence at Gold Quarry consists of *crystallized* tinticite from location 1 on the 5,400 and 5,375 benches. The species may be locally abundant, and occurs as clusters to 0.2 mm of lustrous, intergrown, tan to medium-brown crystals lining fractures in gray, brecciated jasperoid rock. Associated minerals consistently include crystallized fluellite, leucophosphite and ferrian variscite spherules, although hewettite, carbonate-fluorapatite, blue unknown #l and phosphofibrite may also be present. Qualitative microchemical analysis of the tinticite reveals the presence of significant aluminum in substitution for iron in all samples yet examined.

Torbernite $Cu(UO_2)_2(PO_4)_2 \cdot 8–12H_2O$

Lustrous, grass-green, tabular torbernite crystals to 0.5 mm are locally common at location 1, especially on the 5,400 bench. Clusters to 2 mm of transparent crystals are found in association with crystallized fluellite, hewettite, leucophosphite, variscite, anatase and blue unknown #1. Upon exposure to the atmosphere, however, some specimens alter quite readily to metatorbernite, becoming opaque and pale green in color.

Tripuhyite $FeSb^{5+}_2O_6$

Tripuhyite, a species not uncommon from low-temperature hydrothermal deposits in Nevada, has also been identified at the Gold Quarry mine. It occurs as pale greenish yellow to brown powdery coatings associated with stibiconite as an aiteration product of stibnite. Specimens consisting of antimony oxides to 4 mm thickness associated with bladed barite and siliceous siltstone from the 5,320 level are among the best examples from the mine seen to date.

Tyuyamunite $Ca(UO_2)_2(VO_4)_2 \cdot 8H_2O$

Pulverulent bright yellow clots of tyuyamunite to 5 cm impregnating dehydrated kingite occur in heavily brecciated jasperoid rock exposed on the 5,400 bench at location 1. Thin, powdery coatings of pure tyuyamunite also occur here, associated with crystallized hewettite, fluellite, variscite and torbernite. Tyuyamunite has also been found as relatively abundant, pale yellow dustings coating kazakhstanite and fervanite on brecciated jasperoid fragments from the 5,425 bench at location 2. It should be noted that some specimens of Gold Quarry tyuyamunite do lose their bright yellow color upon exposure to light, altering to a dull orange-brown metatyuyamunite.

The fact that both tyuyamunite and hewettite are found closely associated at Gold Quarry is not unexpected, since both species are very stable and are the last phases to form in the sequence of alteration of vanadium minerals.

Uraninite UO_2

The primary uranium mineral, uraninite, has been identified as small grains to 2 microns in specimens of gray, silicified siltstone collected from sulfide-rich barite breccias on the 5,075 bench at coordinates 17250N, 22000E. Other associated, high-density minerals include galena, greenockite, arsenopyrite, sphalerite and pyrite.

Vanadinite $Pb_5(VO_4)_3Cl$

Corroded crystals of opaque, pale brown vanadinite to 3 mm were formerly common from the Vanna Fault on the 5,280 bench, associated with descloizite and heyite. Transparent, golden brown, elongated vanadinite crystals to 1 mm have also been observed from the 5,050 bench in the southeast area of the mine, associated with selenium, descloizite and massive marcasite.

Figure 32. **Ferrian variscite, a thick druse of bladed to equant crystals to 20 microns from location 1, 5,425 bench.**

Variscite $AlPO_4 \cdot 2H_2O$

Variscite is a widespread mineral occurring in small amounts in both the oxidized and unoxidized exposures of the mine. The most prolific occurrence is found at location 1, on the 5,400 and 5,375 benches, where impure variscite (containing substantial ferric iron) occurs in an almost bewildering variety of colors and habits. Single crystals of the scorodite habit (Laubmann and Steinmetz, 1920), compact spherical clusters and radiating flattened aggregates, varying from colorless to white, brown, yellow and gray-green, have been observed. Individual aggregates rarely exceed 1 mm in size, but surfaces to several centimeters liberally coated with the species are common. Variscite is early paragenetically, and may be associated with any of the other species which occur at location 1.

Elsewhere in the mine, pure variscite, with its characteristic trace impurity of vanadium and more typical bright green color, has been found as botryoidal vug fillings and fracture coatings. Siliceous, sulfide-rich barite breccias exposed on the 5,125 and 5,075 benches have provided examples of this type.

Vesignieite $BaCu_3(VO_4)_2(OH)_2$

Vesignieite has been verified by XRD on samples of black siliceous siltstone from the 5,260 level. The species occurs as druses and small rosettes to 50 microns of apple-green platy crystals coating and partially replacing tabular barite crystals (presumably the source of the barium). Other associated minerals include alunite, cuprite, libethenite and malachite. The color of vesignieite is remarkably similar to that of volborthite; a chemical test for barium or an XRD analysis is required to differentiate the two species.

Volborthite $Cu_3V_2^{5+}O_7(OH)_2 \cdot 2H_2O$

Excellent specimens of crystallized volborthite have been exposed locally throughout many areas of the deposit. Bright apple-green, platy crystals to about 2 mm are quite common, although much larger, dark, olive-green, flat-lying, radiating spheres to 1.5 cm lining tight fractures have been found. Chemical microanalysis has shown that most examples are quite pure, although varieties containing minor barium or nickel have been noted.

Wavellite $Al_3(PO_4)_2(OH,F)_3 \cdot 5H_2O$

Spherules of crystallized wavellite to 1 cm occur prolifically sprinkled on large fracture surfaces at location 1. The largest groups are compact and pale green in color, whereas smaller clusters consist of lustrous, radiating, prismatic, colorless crystals. Associated minerals most commonly include strengite (aluminian), fluellite, torbernite, hewettite and opal.

Xenotime YPO_4

Xenotime, associated with zircon, pyrite and sphalerite, has been found as grains to 12 microns wholly enclosed within samples of altered siltstone from blasthole cuttings preserved from the south side of the 5400 bench.

Zircon $ZrSiO_4$

Euhedral, colorless crystals of zircon were formerly found from an area of massive malachite exposed on the 5,250 level. Zircon is also abundant, however, as disseminated grains and subhedral crystals to 15 microns in altered siltstone from blasthole cuttings retrieved from the south side of the 5,400 bench.

Unknown #1 $Cu(Al,V,Fe)_5(PO_4)_4(F,OH)_5 \cdot 7H_2O$

An unknown and probably new mineral, consisting both of isolated spherules and druses of pale green to deep turquoise-blue acicular radiating crystals, is locally abundant

Table 1. **Mineral species identified from the Gold Quarry mine, Eureka County, Nevada.**

Native Elements	
Copper	Cu
Gold	Au
Selenium	Se
Sulfur	S
Sulfides, Selenides, Sulfosalts	
Arsenopyrite	FeAsS
Bornite	Cu_5FeS_4
Chalcocite	Cu_2S
Chalcopyrite	$CuFeS_2$
Cinnabar	HgS
Corderoite	$Hg_3S_2Cl_2$
Covellite	CuS
Galena	PbS
Gersdorffite	NiAsS
Greenockite	CdS
Marcasite	FeS_2
Orpiment	As_2S_3
Pararealgar	AsS
Pyrite	FeS_2
Realgar	AsS
Sphalerite	ZnS
Stibnite	Sb_2S_3
Tetrahedrite	$(Cu,Fe)_{12}Sb_4S_{13}$
Tiemannite	HgSe
Oxides, Hydroxides	
Anatase	TiO_2
Bindheimite	$Pb_2Sb_2O_6(O,OH)$
Chalcophanite	$(Zn,Fe,Mn)Mn_4^{3+}O_7\cdot 3H_2O$
Cuprite	Cu_2O
Goethite	α-$Fe^{3+}O(OH)$
Hematite	α-Fe_2O_3
Pyrolusite	$Mn^{4+}O_2$
Romanechite	$(Ba,H_2O)(Mn^{4+},Mn^{3+})_5O_{10}$
Rutile	TiO_2
Stibiconite	$Sb^{3+}Sb_2^{5+}O_6(OH)$
Tenorite	CuO
Tripuhyite	$FeSb_2^{5+}O_6$
Uraninite	UO^2
Carbonates	
Aragonite	$CaCO_3$
Azurite	$Cu_3(CO_3)_2(OH)_2$
Calcite	$CaCO_3$
Carbonate-cyanotrichite	$Cu_4Al_2(CO_3,SO_4)(OH)_{12}\cdot 2H_2O$
Cerussite	$PbCO_3$
Dolomite	$CaMg(CO_3)_2$
Malachite	$Cu_2(CO_3)(OH)_2$
Siderite	$FeCO_3$
Sulfates	
Alunite	$KAl_3(SO_4)_2(OH)_6$
Barite	$BaSO_4$
Brochantite	$Cu_4(SO_4)(OH)_6$
Chalcanthite	$CuSO_4\cdot 5H_2O$
Cyanotrichite	$Cu_4Al_2(SO_4)(OH)_{12}\cdot 2H_2O$
Gypsum	$CaSO_4\cdot 2H_2O$
Halotrichite	$FeAl_2(SO_4)_4\cdot 22H_2O$
Hydronium jarosite	$(H_3O)Fe_3^{3+}(SO_4)_2(OH)_6$
Jarosite	$KFe_3^{3+}(SO_4)_2(OH)_6$
Selenates	
Mandarinoite	$Fe_2^{3+}Se_3O_9\cdot 6H_2O$
Phosphates	
Augelite	$Al_2(PO_4)(OH)_3$
Burangaite	$(Na,Ca)_2(Fe,Mg)_2Al_{10}(PO_4)_8(OH,O)_{12}\cdot 4H_2O$
Cacoxenite	$(Fe,Al)_{25}(PO_4)_{17}O_6(OH)_{12}\cdot 75H_2O$
Carbonate-fluorapatite	$Ca_5(PO_4,CO_3)_3F$
Crandallite	$CaAl_3(PO_4)_2(OH)_5\cdot H_2O$
Englishite	$K_3Na_2Ca_{10}Al_{15}(PO_4)_{21}(OH)_7\cdot 26H_2O$
Fluellite	$Al_2(PO_4)F_2(OH)\cdot 7H_2O$
Kingite	$Al_3(PO_4)_2(OH,F)_3\cdot 9H_2O$
Leucophosphite	$KFe_2^{3+}(PO_4)_2(OH)\cdot 2H_2O$
Libethenite	$Cu_2(PO_4)(OH)$
Metatorbernite	$Cu(UO_2)_2(PO_4)_2\cdot 8H_2O$
Monazite-(Ce)	$(Ce,La,Nd,Th)PO_4$
Phosphofibrite	$KCuFe_{15}^{3+}(PO_4)_{12}(OH)_{12}\cdot 12H_2O$
Plumbogummite	$PbAl_3(PO_4)_2(OH)_5\cdot H_2O$
Pseudomalachite	$Cu_5(PO_4)_2(OH)_4$
Richellite	$Ca_3Fe_{10}^{3+}(PO_4)_8(OH,F)_{12}\cdot nH_2O$ (?)
Sincosite	$CaV_2^{4+}(PO_4)_2(OH)_4\cdot 3H_2O$
Strengite	$Fe^{3+}PO_4\cdot 2H_2O$
Tinticite	$Fe_4^{3+}(PO_4)_3(OH)_3\cdot 5H_2O$
Torbernite	$Cu(UO_2)_2(PO_4)_2\cdot 8$–$12H_2O$
Variscite	$AlPO_4\cdot 2H_2O$
Wavellite	$Al_3(PO_4)_2(OH,F)_3\cdot 5H_2O$
Xenotime	YPO_4
Unknown #1	$Cu(Al,V,Fe)_5(PO_4)_4(F,OH)_5\cdot 7H_2O$
Unknown #2	$(Cd^{1+},Cu^{1+})Al(PO_4)(F,OH)\cdot xH_2O$
Arsenates	
Conichalcite	$CaCu(AsO_4)(OH)$
Mimetite	$Pb_5(AsO_4)_3Cl$
Scorodite	$Fe^{3+}AsO_4\cdot 2H_2O$
Vanadates, Vanadium Oxysalts	
Descloizite	$PbZn(VO_4)(OH)$
Fervanite	$Fe_4^{3+}(VO_4)_4\cdot 5H_2O$
Haggite	$V_2O_2(OH)_3$
Hewettite	$CaV_6^{5+}O_{16}\cdot 9H_2O$
Heyite	$Pb_5Fe_2(VO_4)_2O_4$
Hummerite	$KMgV_5^{5+}O_{14}\cdot 8H_2O$
Kazakhstanite	$Fe_5^{3+}V_3^{4+}V_{12}^{5+}O_{39}(OH)_9\cdot 9H_2O$
Metatyuyamunite	$Ca(UO_2)_2V_2^{5+}O_8\cdot 3H_2O$
Schubnelite	$Fe_{2-x}^{3+}(V^{5+},V^{4+})_2O_4(OH)_4$
Tyuyamunite	$Ca(UO_2)_2(VO_4)_2\cdot 8H_2O$
Vanadinite	$Pb_5(VO_4)_3Cl$
Vesignieite	$BaCu_3(VO_4)_2(OH)_2$
Volborthite	$Cu_3V_2^{5+}O_7(OH)_2\cdot 2H_2O$
Silicates	
Allophane	an amorphous hydrous aluminum silicate
Chrysocolla	$(Cu,Al)_2H_2Si_2O_5(OH)_4\cdot nH_2O$
Halloysite	$Al_2Si_2O_5(OH)_4$
Illite	$(K,H_3O)Al_2(Si_3Al)O_{10}(H_2O,OH)_2$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2\cdot nH_2O$
Muscovite	$KAl_2(Si_3Al)O_{10}(OH,F)_2$
Opal	$SiO_2\cdot nH_2O$
Quartz	SiO_2
Zircon	$ZrSiO_4$

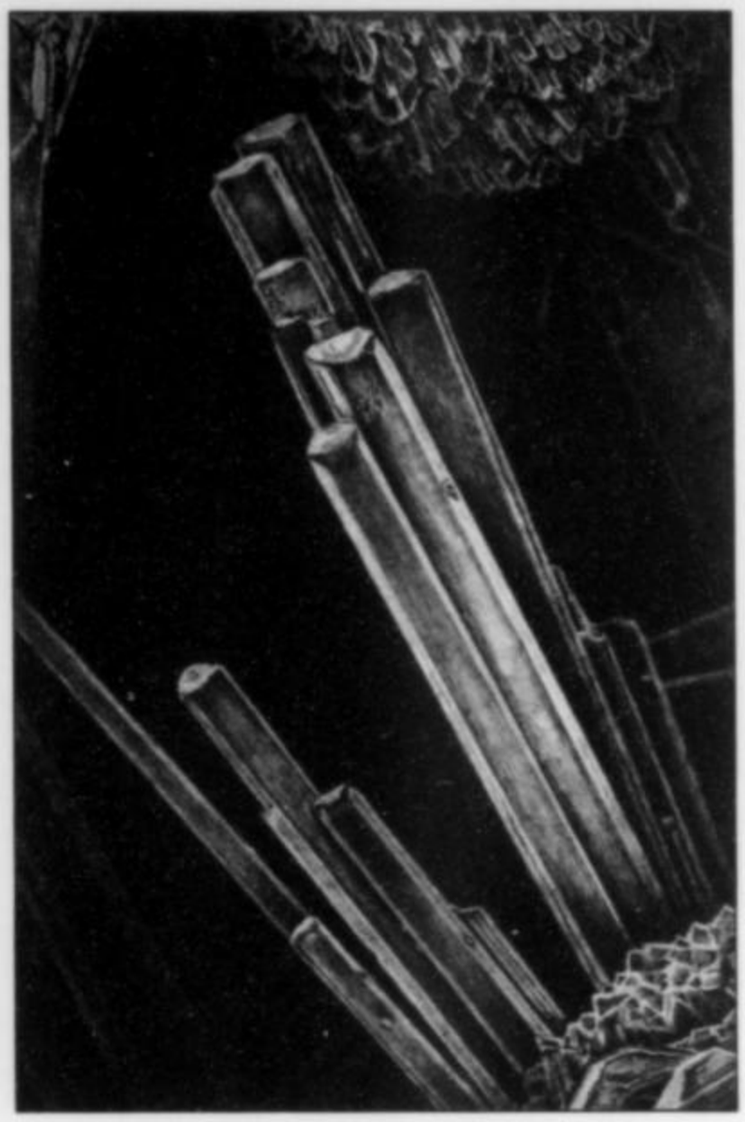


Figure 33. Blue **unknown #1 crystal sketch, with associated crystallized variscite and quartz, from location 1, 5,375 bench. Drawing by Barbara Rota.**

at location 1 on the 5,425 through 5,375 benches. Individual clusters range from loosely to tightly compacted and are composed of minute, lath-like orthorhombic crystals. Surfaces more than 2 cm across completely covered with spherules to 1 mm have been observed. Specimens from the 5,425 bench tend to be pale green in color, are smaller in crystal size, and exhibit high copper and low vanadium, whereas the blue varieties from the 5400 and 5375 benches contain more vanadium and less copper. Detailed mineralogical studies of this mineral are currently under way (by EEF and H. T. Evans, Jr.).

The blue variety contains approximately 8 weight % fluorine (F), whereas the green variety contains only about 2.5 weight % F. Both color varieties give nearly identical X-ray diffraction patterns, except for slight differences in intensity and peak positions. Precession camera studies show the mineral to be triclinic (pseudo-orthorhombic). Cell dimensions are approximately a = 12.10 Å, b = 18.95 Å, c = 4.94 Å for the pseudo-orthorhombic cell. The measured specific gravity of the deep blue variety is about 2.54 (measured in bromoform-acetone mixture). TGA analysis of 1.94 mg of the deep blue variety shows a total weight loss of about 27.5 weight % at 1000°C. Weight loss occurs in three discrete events: 13.5 weight % at about 225°C (H_2O), 6 weight % at about 320°C (OH), and 8 weight % (F) between about 350°C and 900°C. Optically, the mineral is biaxial (–) with α = 1.540, β = 1.548, and γ = 1.553 (for the deep blue variety). Refractive indices for the green variety are slightly lower; 2V = 76° (measured and calculated); dispersion $r < v$ strong; X = pale greenish blue, Y = very pale greenish blue, Z = blue; absorption $Z \gg X > Y$. Associated minerals occurring in crystals most commonly include fluellite, strengite/variscite and hewettite, although torbernite, leucophosphite, tinticite, tyuyamunite and anatase may also be present.

Unknown #2 exact formula uncertain, but is a $(Cd,Cu)Al(PO_4)(F,OH)$ compound, probably hydrated

A single specimen collected from the freshly blasted muckpile at location 1 on the 5,425 bench contains sprays to 3 mm, of radiating, glassy, blue acicular crystals of an unknown and probably new mineral associated with red hewettite and colorless opal. This mineral appears to be the first reported natural occurrence of a cadmium-dominant phosphate. The mineral is triclinic and all crystals are multiply twinned with {010} as the twin plane. It is biaxial (+) with 2V of about 30°, α = 1.570, β = 1.573 and γ = 1.578. Dispersion is strong, with $r < v$. There is insufficient material for TGA or IR analysis. The eight strongest lines (in Å, with intensities I) for the mineral (Gandolfi 114-mm camera) are: 9.50 (100); 6.15 (45); 4.75 (50); 3.85 (40); 3.67 (35); 3.15 (40); 2.90 (40); 2.80 (40). Specific gravity measured using sink-float techniques, with methylene iodide-acetone mixture, was determined to be 2.78 (± 0.01). Additional studies are under way on this mineral.

Unconfirmed Species

A number of mineral species described from the mine (unpublished report, Newmont Gold Company, 1991) have since been shown to be either invalid or incorrectly identified. The following alphabetical list gives first the original (improper) naming of these species and their subsequent current and correct identifications.

Cummingtonite: possibly an erroneous characterization by XRD of gossan-like material from the Vanna Fault. It is probably incorrect because no contact metamorphic or high-temperature metamorphic environments were observed in this part of the mine.

Magnetite: botryoidal coatings with bluish iridescence on goethite are instead simply goethite.

Rosasite: a dissemination in pale brown siltstone is instead nickeliferous chrysocolla.

Tremolite: fibrous white crystals on joints in unaltered limestone are instead aragonite.

Turanite: apple-green platy crystals associated with malachite, carbonate-fluorapatite and barite have been shown by XRD to be volborthite.

Woodhouseite: purplish pink crystalline masses have been shown microchemically to be very impure alunite.

CONCLUSION

Although the current study and discussion of the Gold Quarry mineralogy and the mineral assemblages may seem comprehensive and thorough, there is no question that the work is incomplete. In a mining operation of this size, where more than 200,000 tons of rock are moved daily, additional mineral occurrences will continue to be exposed. It is also possible for entire occurrences to be mined away in a single day. Based on the variety of mineral species and the diversity of chemical elements present at Gold Quarry, the potential for future interesting discoveries seems quite good. It is truly an exciting time in Nevada to be a mineralogist.

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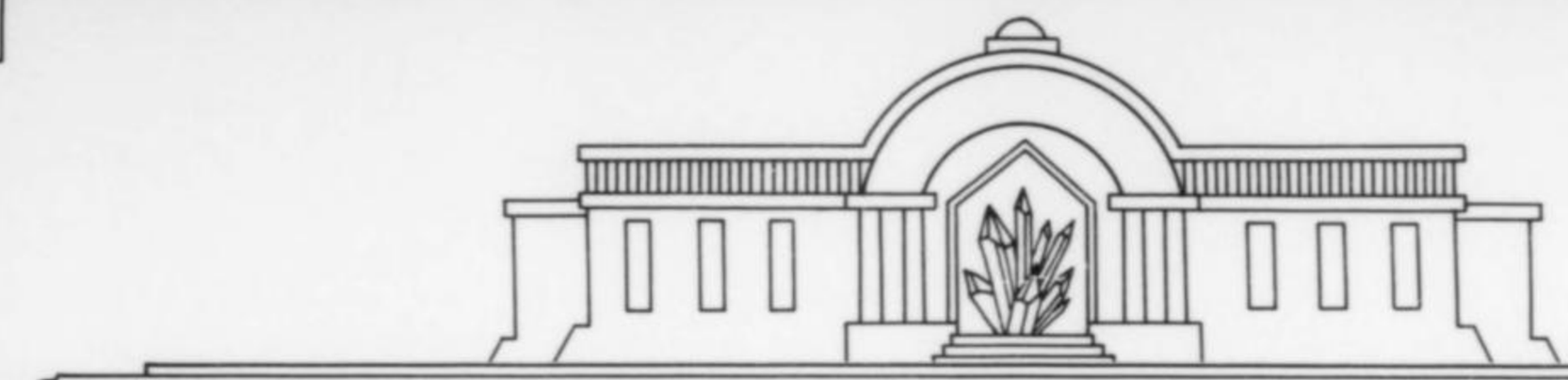

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Dept. of Earth Sciences
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Denver, CO 80205
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Specialties: Colorado minerals

Geology Museum Colorado School of Mines

Curator: Virginia A. Mast
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Golden, Colorado 80401
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Specialty: Michigan minerals, copper minerals & worldwide minerals

Houston Museum of Natural Science

Curator (mineralogy):
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University of Delaware
Newark, DE 19716
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Specialty: Worldwide minerals

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Collection Manager: Marc L. Wilson
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Pittsburgh, PA 15213
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Musée de géologie de l'Universite Laval
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Geology Dept., 4th floor
Adrien-Pouliot Building
Québec, Que., Canada G1K 7P4
Hours: 8:30–5 M–F
Specialties: Quebec and worldwide minerals and fossils; Miguasha fishes

Museum of Geology
Director: Philip R. Bjork
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South Dakota School of Mines & Technology
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Rapid City, SD 57701-3995
Hours: 8–5 M–F, 9–4 Sat., 1–4 Sun.
Specialty: Black Hills minerals, esp. pegmatites

Penn State Earth & Mineral Sciences Museum
Curator: Andrew Sicree
Tel: (814) 865-6427
Steidle Building
University Park
State College, PA 16802
Hours: 9–5 M–F & by Appt. (closed holidays)
Specialties: Mineral properties exhibits; "velvet" malachite; old Penna. minerals, mining art

M. Y. Williams Geological Museum
Curator: Joe Nagel
Tel: 604) 822-5586
University of British Columbia
6339 Stores Road
Vancouver, B.C., Canada V6T 1Z4
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Fax: (702) 847-9543
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Virginia City, NV 89440
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Germantown, WI 53022
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Specialty: Midwest minerals

Museo Mineralógico M. Romero
Director: Miguel Romero
Tel: (238) 3-00-07
Fax: (238) 3-35-02
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Tehuacán Puebla, México 75700
Hours: 10–12 noon M–Sat. 4–6 p.m. M–F & by Appt.
Specialty: Mexican minerals

Europe

Setesdal Mineral Park
Curator: Ole Fritjof Frigstad Arnar Hansson
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Fax: (011) 47-38-19-90-10
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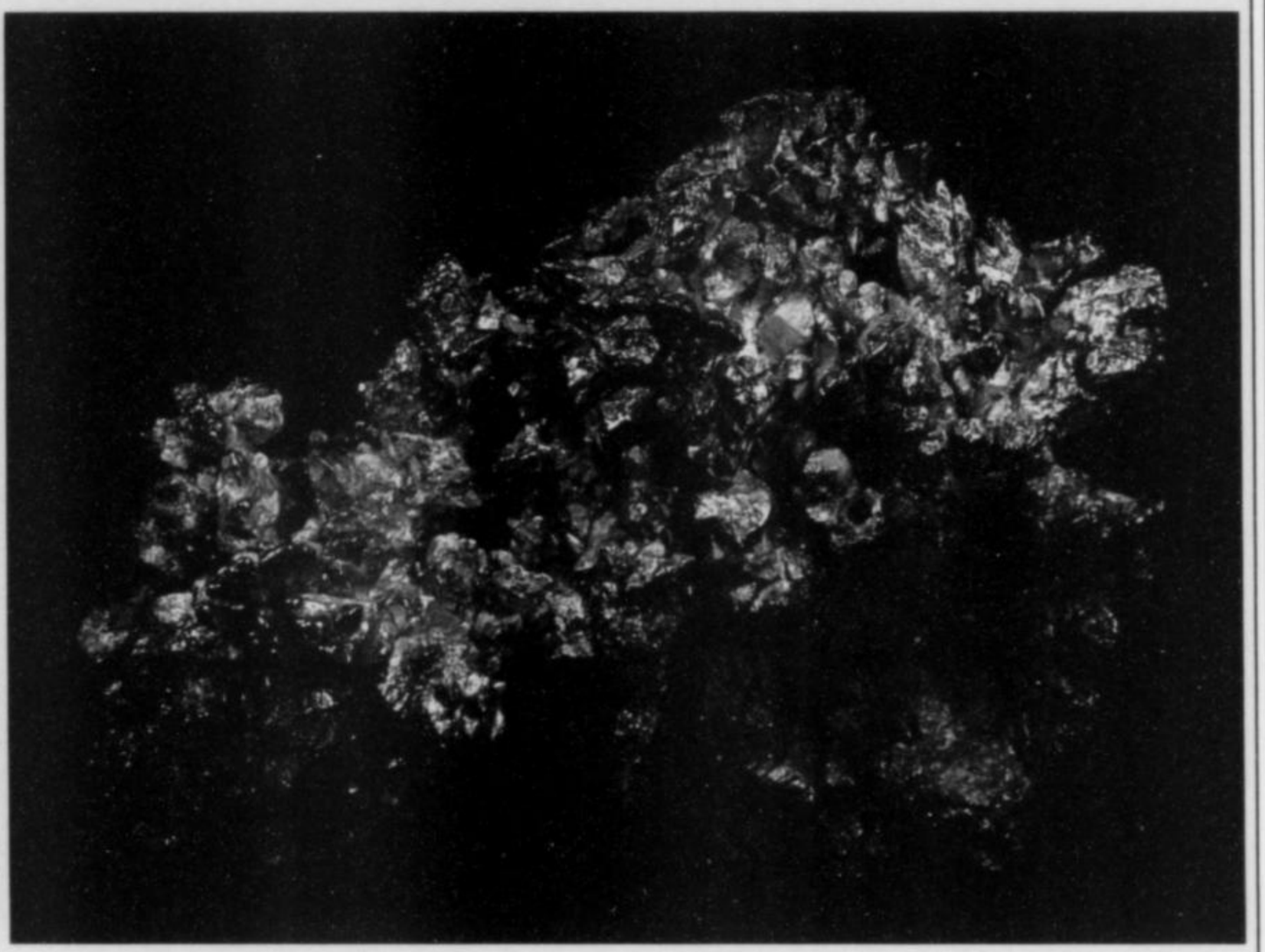

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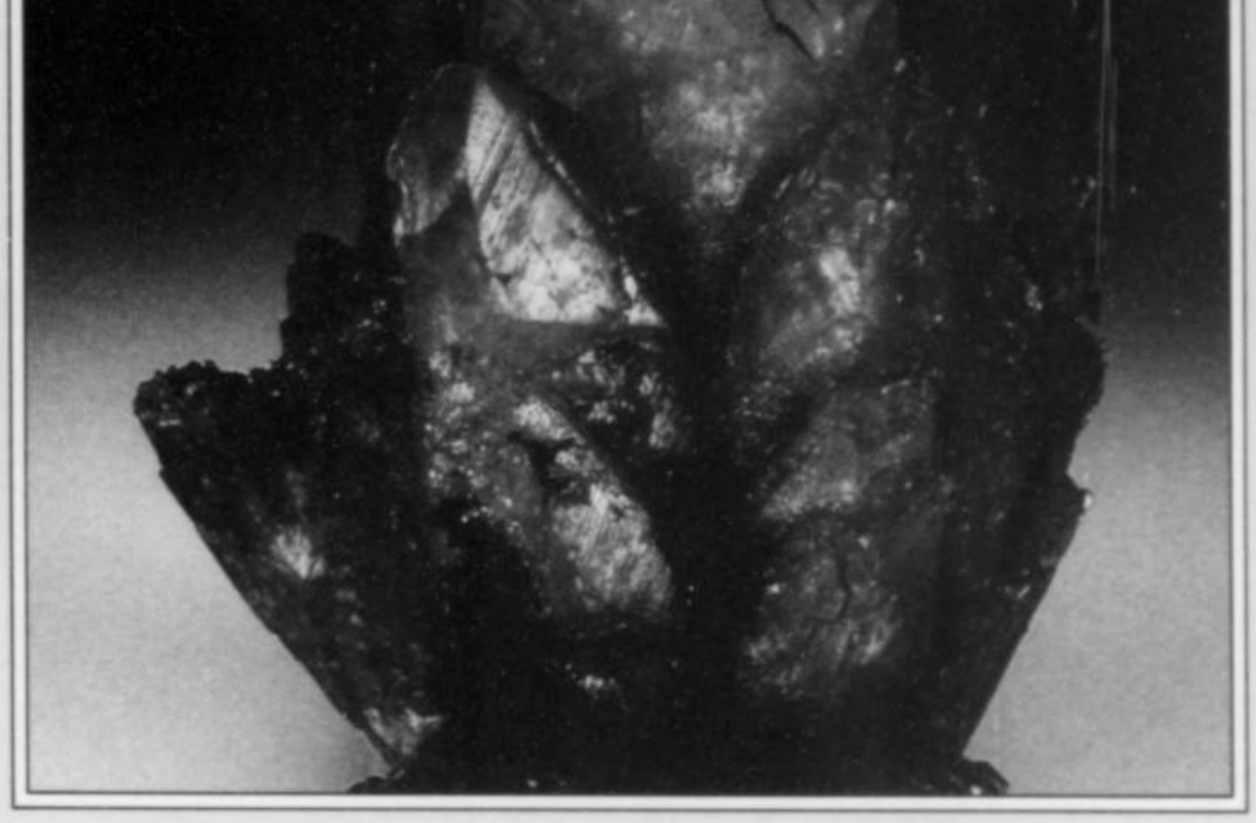

FEB. 8–11, 1996

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PHOTO: Calcite with copper, Franklin mine, Michigan; 8.5 cm; Seaman Mineral Museum collection (WEW)

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World Review of Mineral Discoveries

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1993–1994

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The following report is a summary of the *What's New in Minerals?* programs that were presented at the 21st and 22nd annual Rochester Mineralogical Symposia in April of 1994 and 1995. Although normally published annually, the review could not be completed by the usual deadline in 1994, so it was held back and has been merged with the 1995 report. The current review therefore covers a two-year period from April 1993 to April 1995. For the most part, only discoveries made during this period are discussed. For the sake of completeness, these will include discoveries already described in published show reports of that time. As in past years, the information is presented geographically, with emphasis placed on truly new finds rather than on continuing supplies of previously known materials. Addresses are given for most of the dealers who are not advertisers in the *Mineralogical Record*.

A continuing supply of world-class pegmatite minerals from Pakistan, Afghanistan and Brazil, fabulous rhodochrosite crystals from the Sweet Home mine in Colorado, zeolites from India, and a wealth of minerals from the former Soviet Union have fueled the marketplace with a multitude of spectacular specimens over the past two years. Additional numbers of other interesting specimens, rare species, microminerals, and several new species have also appeared. Many of these were brought to our attention by the collectors and dealers named herein, and it is to them that we owe our thanks for sharing information.

Part I: United States

ALABAMA

David and Celia Lare (*Jeffrey Mining Company*, Rt. 1, box C-20-A1, Salisbury, TN 38067) collected a large quantity of red-brown **almandine** crystals to 3 cm in schist from near Lake Martin, Old Town.

Beau Gordon (*Jendon Minerals*) found some excellent phosphate microcrystals at the Red Ball mine, Calhoun County, including golden yellow **cacoxenite**, gray-green botryoidal **kidwellite**, pink **strengite** and colorless, transparent **wavellite**. Beau also enjoyed similar success collecting at the Fault Line prospect and Indian Mountain.

ARIZONA

Many a mineral collector has long awaited a chance to own a large, classic red **wulfenite** from the famous Red Cloud mine, Yuma County. That chance may soon be here. Wayne and Laura Thompson (1723 E. Winter Dr., Phoenix, AZ 85020) have recently acquired this property, and plans to reopen the mine are in the making. It is rumored that a limited number of specimens have already been found!

George Godas (6304 S. Clark Dr., Tempe, AZ 85283) has recently mined some new specimens of brilliant red **vanadinite** crystals from the Pure Potential mine (originally called the North Geronimo mine), north of the Red Cloud mine in La Paz County. The lustrous, hexagonal crystals average 5–7 mm across and thickly cover plates of rock matrix up to 25 cm. Many of the finest specimens are smaller, but with hopper-growth crystals up to 1.5 cm. Some crystals coat dark gray, etched rhombohedral crystals of calcite. Specimens are available from George Godas and Dan and Susan Whitcomb (*Gangues Khan Minerals*, P.O. Box 663, Manchester, MO 63011).

David Shannon has made a number of new finds. Among these are granular dark blue **diaboleite** with orange **mimetite** from the Rowley mine, Maricopa County, and pale blue acicular **chrysocolla** pseudomorphs (to 4 mm) coating brecciated rock fragments from Eagle Eye mine, La Paz County. Species collectors rejoiced at Dave's having a new supply of the formerly extremely rare new mineral **maricopaite** from the Moon Anchor mine, Maricopa County. Here, the mineral occurs rather abundantly as white, splintery-to-acicular crystals, sometimes in plumose bundles, on brecciated rock fragments. Another of Dave's unique finds is **orthoserpierite** from an unusual locality at the Childs Aldwinkle mine, Copper Creek district, Pinal County. The occurrence is unusual in that it formed in a geologically short period of time, probably over the course of a few days or weeks, by the action of surface water draining over a mine dump containing soluble copper minerals. The ephemeral occurrence was last reported by Dave as having blown away in the wind. So much for the million-year hypothesis!

Other interesting new finds include pale olive-to-yellow-green **vesignieite** in irregular patches to several mm, from a prospect pit 6 km south of Mercer Ranch, Pinal County, available from Steve Pullman (*Whole Earth Minerals*, P.O. Box 50008, Reno, NV 89513); attractive green botryoidal **smithsonite** from the 79 mine, near Hayden, Gila County, available from *George Stevens Minerals* (P.O. Box 44313, Tucson, AZ 85733); well-formed crystals of olive-green **conichalcite** to 2 mm on a quartz-rich gossan matrix from Copper Creek, Galiuro Mountains, Pinal County, available from Jim McGlasson (*Collector's Stope,* 7387 S. Flower St., Littleton, CO 80123); **quartz** pseudomorphs after anhydrite from the Agua Fria River, near New River, available from *Rose's Rocks* (631 E. Puente, Covina, CA 91722); and **calcite** crystals from the Holbrook mine, Bisbee, and copper-stained **calcite** pseudomorphs after glauberite from Camp Verde, both available from Howard Van Iderstein (*Cardinal Minerals*, 2 Tulip Lane, Huntington, CT 06484).

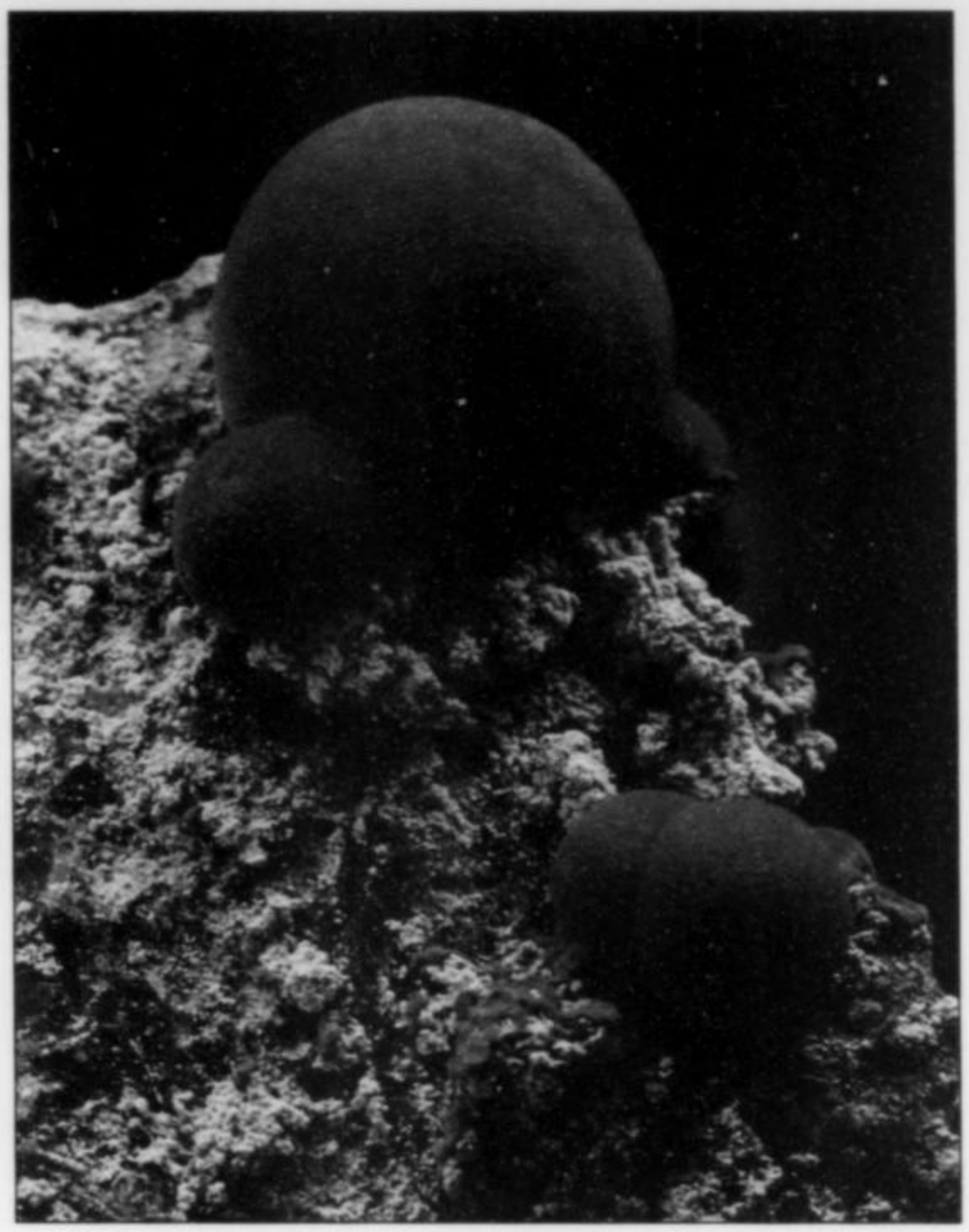


Figure 1. **Malachite spheres to 1.4 cm on matrix, from Morenci, Arizona. J. Scovil collection and photo.**

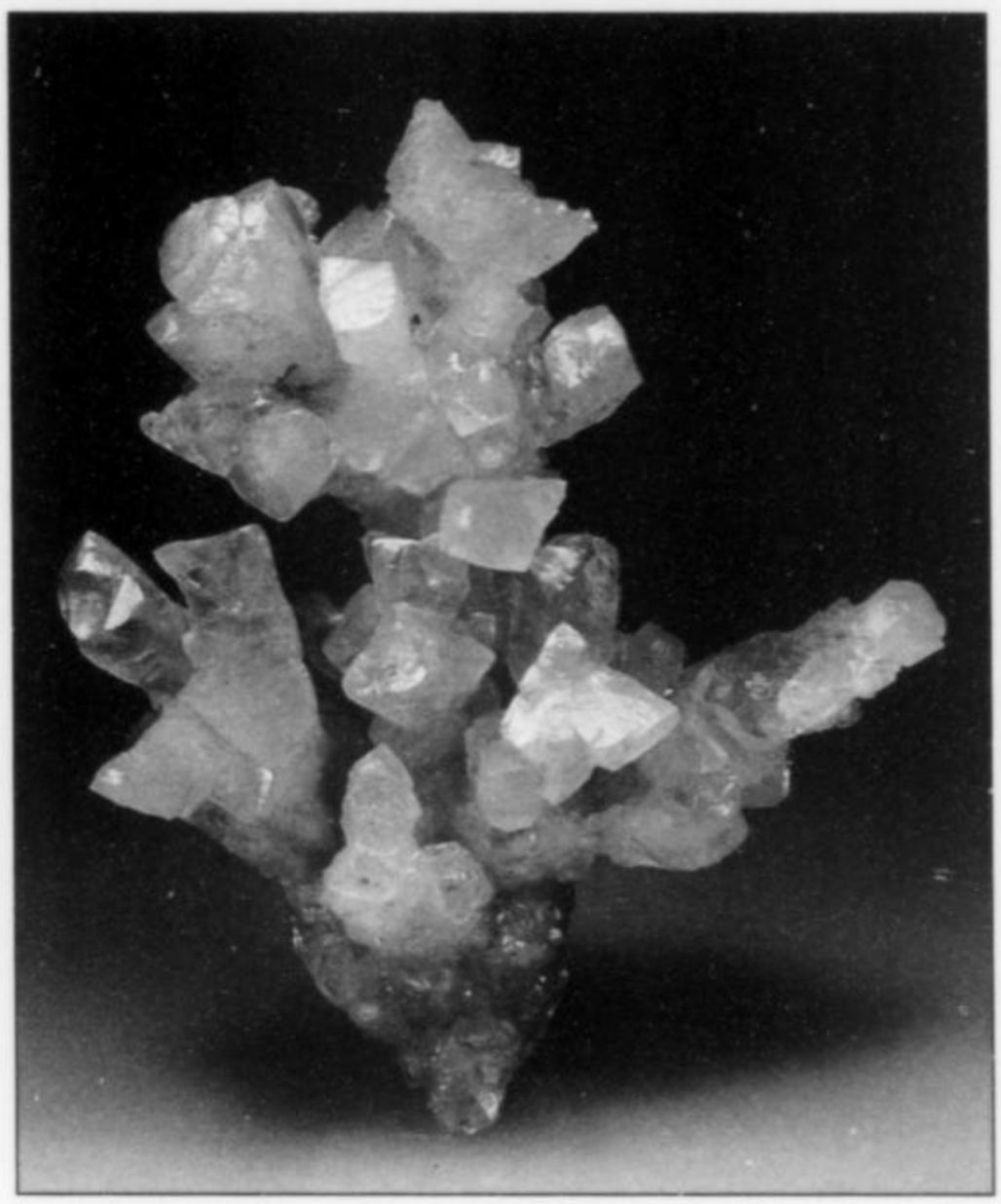


Figure 2. **Calcite crystal cluster, 11.5 cm, from the 100-foot level of the Holbrook mine, Bisbee, Arizona. Keith Williams specimen; J. Scovil photo.**

Figure 3. Quartz pseudomorphs after anhydrite, 9.6 cm across, from New River, Arizona. *Rose's Rocks* specimen; J. Scovil photo.

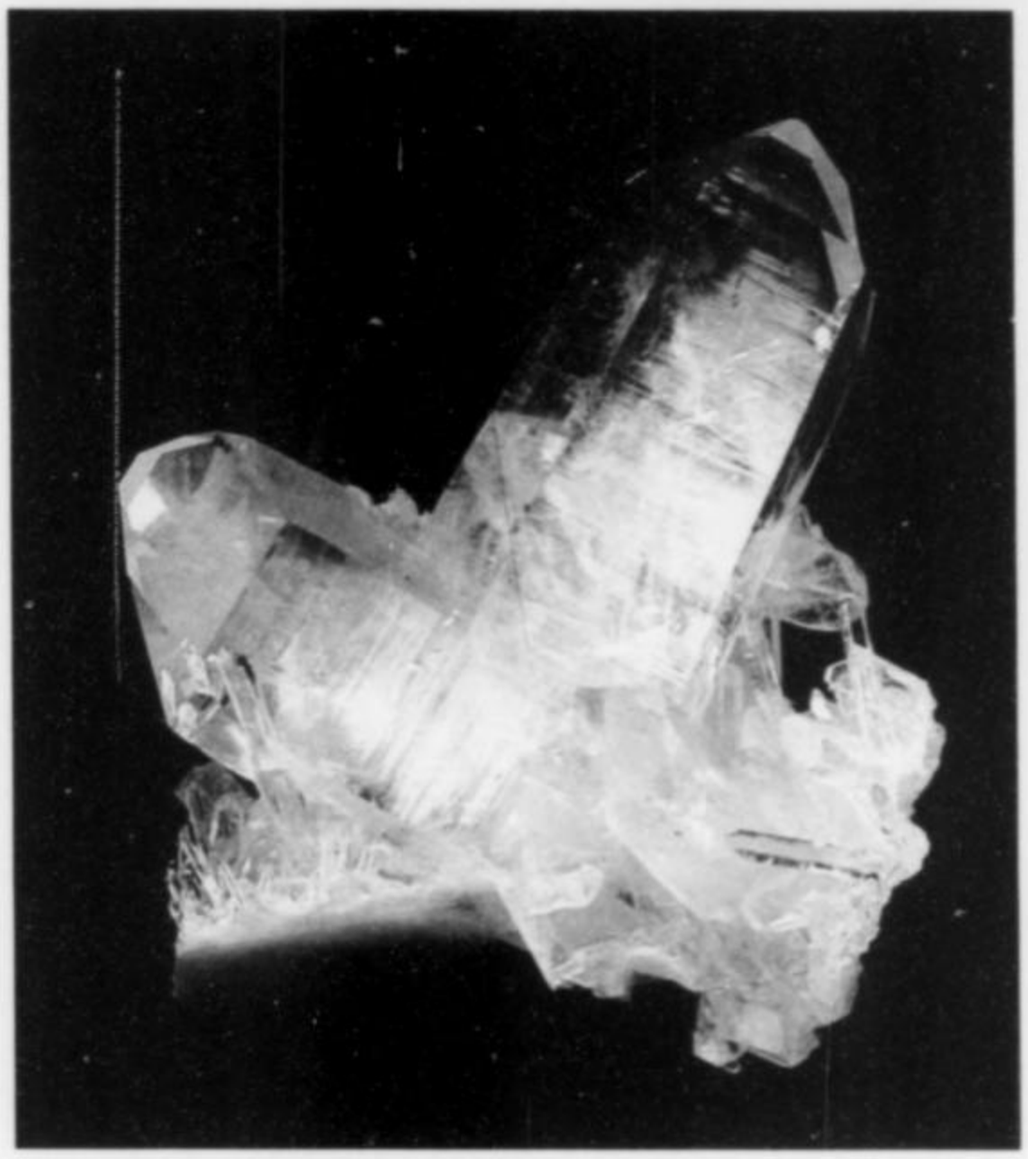


Figure 4. Quartz (Japan-law twin), 10.4 cm, from the Collier mine, Montgomery County, Arkansas. Houston Museum of Natural Science collection; J. Scovil photo.

ARKANSAS

Clive Queit (Box 1014, Fourways 2055, Sandton, Johannesburg, South Africa) has acquired some rather astounding **quartz** crystals from Mount Ida, containing three-dimensional dendritic inclusions of **galena** crystals. The galena shows a macroscopic habit of cubes in offset patterns, reminiscent of some microscopic cuprite dendrites.

A new Fe-Zr phosphate species, **mahlmoodite**, has recently been described from the Union Carbide V mine at Wilson Springs, Garland County, where it occurs as microscopic, cream-white balls on sodic pyroxene (see *American Mineralogist,* **78**, 437–440). Specimens of mahlmoodite are available from Sharon Cisneros (*Mineralogical Research Company*) and the *Excalibur-Cureton Mineral Company*. New Jersey collector Jack Troy reports that some of the material is associated with tiny (less than 1 mm) yellow octahedral crystals of strontian **pyrochlore**.

CALIFORNIA

Inesite from the Hale Creek mine, Trinity County, has been a familiar sight at mineral shows for many years, but an apparently new strike has recently put hundreds of specimens on the market. Most of these are matrix specimens, with crystals generally under 1 cm, and most less than 5 mm.

Another familiar California mineral is the famous bicolored **elbaite** from the Himalaya mine, Mesa Grande. Early in 1994 a series of pockets were encountered at the mine which yielded quantities of richly colored pink and green crystals, both as singles and on **cleavelandite** (albite) matrix. The largest crystal is doubly terminated and 23 cm in length. Specimens from the find are available from *The Collector*.

Ken Gochenour, of Tustin, California, has found some exceptional **schorl** crystals (to 10 cm) at the Mile Down pegmatite, Little Cahuilla Mountain, Riverside County. The brilliant crystals are very complex, with at least three prism forms and two pyramid forms. A few doubly terminated crystals are known. Ken has also collected some very odd **microcline** crystals from the Fano Simmons mine, Riverside County. These occur as nearly spherical clusters (to 5 cm) of curved crystals (to 5 mm) with pale smoky **quartz** crystals (to 2 cm) in parallel growths.

Dry Creek Minerals (Rancho Cordova, California) has been operating a claim near Frenchman's Reservoir, Lassen County, for "orchid" and rose **quartz**. The pale lilac to rose quartz is typically milky, but can show strong color and asterism. Most specimens have been cobbed from milky quartz which is marked by an abrupt transition to the colorful gem material. Other finds reported by *Dry Creek Minerals* include **gold** in quartz from the Yellowjacket Extension of the Alhambra mine, El Dorado County, and **dolomite** crystals from Carson Hill gold mine, Carson Hill,

Calaveras County. The white frosted dolomite crystals (to 1+ cm) are composed of closely spaced rhombohedra slightly offset from each other, producing a flat, nearly tabular habit. Minor malachite is associated with the dolomite on some specimens.

When it comes to rare species, the Golden State has shared much of the spotlight over the past two years. Wolfgang Mueller has found what he believes are the best **mandarinoite** crystals (to 1 mm) from the Defiance workings of the Darwin mine, at Darwin. Additionally, the mine has produced native *selenium* that does not appear to have formed by a mine fire or some other post-mining process. The selenium occurs as thick, sooty mats (to 1 x 10 x 20 cm) coating ore. Wolfgang has also identified **naumannite** from the location.

While it may lack the aesthetic appeal of the Queen mine's famous "blue-caps," a far rarer species of tourmaline, **foitite**, has recently been described from southern California (see *American Mineralogist*, **78**, 1299–1303). Named for Franklin F. Foit, Jr., foitite is an alkali-deficient, iron-rich tourmaline that is visibly indistinguishable from schorl or dark-colored elbaite. While presently only the type material is known, foitite may ultimately prove not to be such a rare species after more "schorl" specimens have been better characterized.

A new copper tellurite, **mcalpineite**, has been discovered and named for the McAlpine mine in Tuolumne County (*Mineralogical Magazine,* in press). Mcalpineite occurs with **keystoneite**, **choloalite** and a number of unknowns on **quartz**, **hessite** and **electrum**. There are presently only four specimens known from the occurrence, but fortunately the mineral has also been found at the Centennial Eureka mine, Juab County, Utah (see "unknown no. 1," *Rocks and Minerals*, **68**, 414–415). There it occurs with **xocomecatlite**, **quetzalcoatlite**, **gartrellite**, **segnitite** and several unknowns presently under investigation at the Geological Survey of Canada.

A third new mineral from California is **ferrisurite**, a Pb-Ca-Fe^{3+} carbonate-silicate, which occurs as fibrous, crystalline, olive-green masses associated with various lead and copper oxides from the Shirley Ann claim, Inyo County (*American Mineralogist,* **77**, 1107–1111).

Lastly, Andy Roberts (Geological Survey of Canada) is currently working on a group of **mercury-bearing minerals** from the Clear Creek claim, San Benito County. There may be as many as *eleven* new minerals from this location: to date edoylerite, edgarbaileyite, wattersite, szymanskiite, deansmithite and peterbaylissite have been described, and several others will likely soon follow (see *Mineralogical Record*, **24**, 471–475; **21**, 215–220; **22**, 269–272; *Canadian Mineralogist*, **28**, 703–707; **31**, 787–793; *Canadian Mineralogist*, in press). *Mineralogical Research Company* and *Excalibur-Cureton Mineral Company* both have some of these minerals.

COLORADO

Larry and Carmen Piekenbrock (1180 York, Cañon City, CO 81212) found some **euclase** microcrystals at the Boomer mine, Badger Flats, Park County. The clear, equant crystals (to 2 mm) are tightly clustered with white **fluorite** crystals (to 3 mm) with dark purple corners.

The Rock Farm (P.O. Box 2055, Ramona, CA 92065) has marketed a large selection of new **goethite** specimens from the Lake George area. The goethite consists of bright brown-black crystals in fans and sprays (to 2 cm) on rusty smoky **quartz** crystals (to 7 cm). There have also been at least two significant finds of **amazonite** and smoky **quartz**. Joseph Dorris (Box 413, Manitou Springs, CO 80829-0413) collected a large number of specimens from the Qui-Buc claims near Florissant, and *Pegmatite Mining Specialists* excavated several large pockets at the Rocket claim, near Lake George, one of which yielded smoky **quartz** crystals over half a meter long.

Brad Bowman (P.O. Box 2, Victor, CO) has a large new supply of **sylvanite** and **calaverite** crystals and masses (to several mm) on typical felsite matrix from the Cresson mine, Cripple Creek, Teller County. The specimens were recovered as a result of mining the dump.

A number of good specimens of **epidote** were collected last spring by John Holfert and others from the well-known occurrence at the Calumet mine, near Salida, where lustrous crystal groups to 20 cm were obtained. Specimens have been available from Jim Lewis (*Diversified Minerals*, 2866 Floribunda Dr., Salt Lake City, Utah 84117) and Jim Ferguson (*Utah Minerals & Fossils*, 12215 Coit Rd. #161A, Dallas, TX 75251).

IDAHO

The Bunker Hill mine near Kellogg has recently produced more very fine **pyromorphite** and **cerussite** crystals. Specimens are available from Wayne and Laura Thompson. The pyromorphites are truly spectacular, and of size, color and quality equal to the early 1980's finds. There have also been some excellent specimens of **epidote** found at Grouse Knoll near Donnelly, Valley County. Lustrous dark green crystals to 7 cm in translucent, pale smoky **quartz** were collected by Joseph Dorris. Elsewhere, Brad Bowman collected some brilliant black **aenigmatite** microcrystals (to 1 mm) frozen in pale-colored granular matrix from the Delamar mine, Delamar, Owyhee County.

MAINE

As reported previously, specimen mining at most of Maine's better-known pegmatites has continued, and a number of significant new finds have been made. In all, nearly 35 sites are being worked, and tourists should be advised that virtually all of these localities are currently closed to outside collectors. Those wanting to visit a site thought to be open should contact local collectors and dealers for up-to-date information.

A series of pockets of pale lilac to dark Royal-purple **amethyst** crystals was excavated in 1993 at the Intergalactic pit, within a hundred meters of the Eastman prospect, Deer Hill, Stow, by Dennis Creaser of Paris, Gary Howard of Bath and Jay Windover of Dixfield. One dark purple crystal with clear outer zones is about 10 x 10 x 20 cm (weighing about 5 kg) and is nicknamed the "Grape of Maine." Some flawless faceted stones to 59 carats have been cut, and the production of specimens has already reached two and a half metric tons,

which is probably the largest find ever made during a single year on Deer Hill, although records are lacking. (The state record for a year's production of amethyst specimens is 3.5 metric tons at the Saltman prospect, Sweden.)

While large crystal bundles of **bertrandite** (to 5 cm) were discovered in Brazil in 1992, the West Hayes Ledge quarry in Greenwood has produced what may be the world's largest V-twins (to 1.5 x 2.1 x 2.3 cm) for the species. The largest twin is a doubly terminated "floater," resembling a "butterfly twin" in shape, but showing repeated cyclic twinning with a median crystal. These bertrandite crystals are also enormously thick for the species (to 3.7 mm). Duane Leavitt of Buckfield and Dennis Gross of Locke Mills had the original specimens. Additionally, some large pockets of clear-to-cloudy sceptered quartz crystals (to 15 cm) were found, which have very spindly host quartz crystals (to 7 x 1 cm).

Dennis Holden, Ronald E. Holden Jr., Mike Jacobs and Robert Hinkley have been the principal miners at the well-known Bennett quarry in Buckfield, where continued mining has provided **hydroxylherderite** crystals (to 2 cm), exceptional **cleavelandite** (albite) crystal groups (to 30 cm), attractive coatings of **cookeite** rosettes, **microlite** crystals of unusual dodecahedral form (to 2 cm), and numerous excellent **quartz** crystals, including some very attractive smoky quartz scepter growths on clear to milky quartz crystals (to 15 cm). Also found was a mass of reddish orange **pollucite** estimated to weigh about 75 kg and containing numerous flawless areas which could cut gemstones of 1 carat and more. Chemical and optical analyses by Eugene E. Foord indicate a composition of 80% pollucite with the remaining alkali portion mostly consisting of sodium. The fairly dark, rose-red pollucite is colored by manganese-bearing **montmorillonite**. Salmon-orange masses of **lithiophilite** (to several cm), and partly replaced by **rhodochrosite**, were found embedded in pollucite. The most interesting finds included bicolored and multicolored, gemmy, singly terminated **tourmaline** crystals. The best crystals (to 5 x 1.5 cm) have crimson-colored, lightly etched tips with successive zones of light olive to medium green attenuating to almost colorless, palest pink ends. The Bennett crystals superficially resemble some of the famous elbaites from the nearby (about 5 km) Mount Mica quarry finds of the 19th century. A distinctive feature of many of the Bennett quarry specimens is their being embedded in a sheaf-like mass of thinly bladed, botryoidal **cookeite** covering the "back half" of the crystals. One crystal (about 15 x 15 cm) has a thin, murky green color zone on deep red rubellite. Additionally, a white, fibrous to blocky mineral (designated unknown #8) has been collected in moderate abundance and has subsequently been found to be altered **spodumene** (E. E. Foord, personal communication).

Some new discoveries of world-class **uraninite** crystals (to 2 cm) were made at the long-idle "Swamp #1" quarry (Trebilcock occurrence), just north of the Consolidated Quarry group, near Topsham. Of special note are some large crystals collected by Jerry Van Velthuizen (*Great Canadian Mineral Company*, 53 Portneuf, Cantley Quebec, Canada J8V 3J1). The largest crystal is a multiple-growth octahedron with small cube faces, while the only slightly smaller smooth to mirror-faced crystals are cuboctahedral. Due to their being embedded in oligoclase near annite contacts, no important matrix specimens were recovered. Several dozen crystals of various sizes were found and are among the best specimens recovered in nearly forty years.

Cliff Trebilcock of Topsham, reported finding a **rhabdophane-like mineral** at the Havey quarry. The mineral consists of equant, bright yellow grains (to 1+ mm) in smoky quartz near grains of oligoclase. A visit to the area revealed that there were actually three quarries on the north side of the short School House Crossing road: the Garland quarry (near the entrance of the road at the Cathance River road) followed by two closely spaced quarries within a hundred meters to the west. For the sake of record, the eastern quarry is called the Havey #1 quarry, while the one to the west is Havey #2 quarry. Examination of both dumps did not yield any more of the rhabdophane-like mineral, but did produce another mineral in bright yellow grains: **thorogummite** (E. E. Foord, personal communication, 1993). The thorogummite occurs as 1–3 mm crude bipyramidal (?) crystals embedded in oligoclase and smoky quartz. Chemically, it is calcian and very phosphate-rich. Further study is pending. Both quarries produced a new discovery for the state: **xenotime-(Y)** in resinous, frequently distorted, low-angle bipyramids of greenish to reddish brown color, associated with the thorogummite and bright red **monazite-(Ce)** crystals (to 3 mm).

Euclase has been discovered at the west Fisher Prospect (west of the Fisher quarry) near Topsham, by Cliff Trebilcock and Dan Swenson. The crystals form sharp individuals to 2 mm and occur as drusy coatings on quartz crystals to several cm associated with cleavelandite. The euclase was identified by Al Falster.

Phil McCrillis of the *Plumbago Mining Company* (*Mt. Mica Rarities*, P.O. Box 10, Locke Mills, ME 04255) reported that several kilograms of facetable blue-green **elbaite** were mined at the Mount Mica quarry, Paris. Ray Sprague and Tony Wielkowicz (*Mongort Minerals*) have found a number of interesting specimens at their Emmons quarry in Greenwood. While only a limited amount of gem rough was located in 1994, they did find some excellent **quartz** and **muscovite**, and **cleavelandite** (albite) clusters to 30 cm. Among the more unusual minerals they found was a bonanza of **goyazite** crystals (2–4 mm) with steep rhombohedral form, a habit nearly unique to Greenwood. Additionally, some of the goyazite is coated by a smooth transparent shell of potassium feldspar, probably microcline (William B. Simmons, personal communication, 1995).

Dennis Durgin of Hebron and Victor Haverinen of Paris worked the Mount Marie quarry near Paris and found a large suite of minerals including **petalite** cleavages to 20 cm, dark mauve *cookeite* crystals (to several mm) in clusters to 5 cm, blocks of purple **lepidolite** (to 30 cm), brown color-zoned **microlite** crystals (to 5 mm), and a well-formed 7-cm **heterosite** pseudomorph after triphylite. A minor amount of gem **tourmaline** rough was also recovered, and at least one fine dark-colored rubellite and several green stones have been cut.

Lastly, two new minerals have recently been described

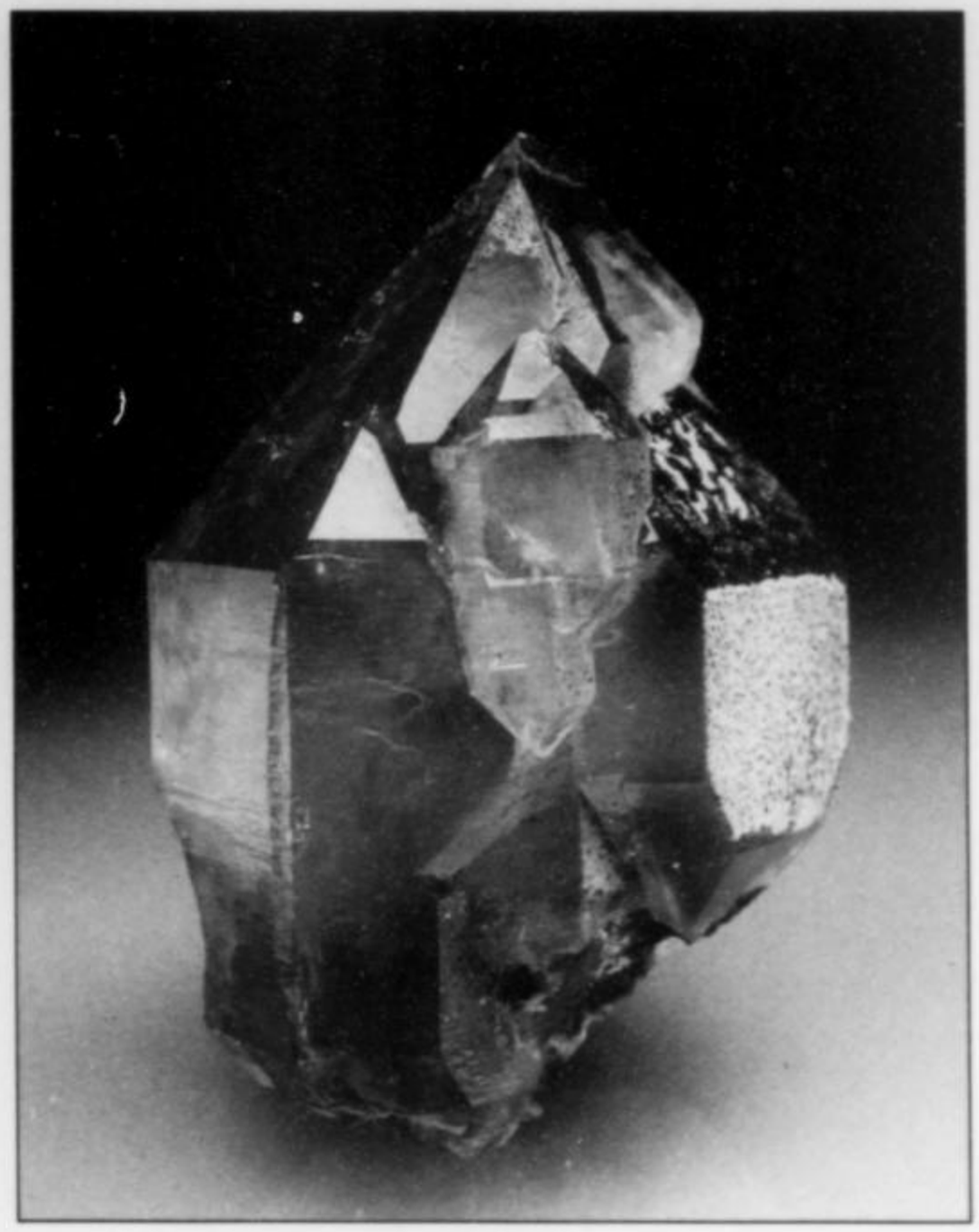


Figure 5. **Amethyst, 7.3 cm, from Deer Hill, Maine. *J. B. Minerals* specimen; J. Scovil photo.**

Figure 6. **Microcline crystal group, 20.4 cm, from the Rocket mine, Lake George, Park County, Colorado. Geffner and Martinez collection; J. Scovil photo.**

Figure 7. **Pyromorphite, 6.3 cm, from the Bunker Hill mine, Idaho. Dick Morris collection; W. E. Wilson photo.**

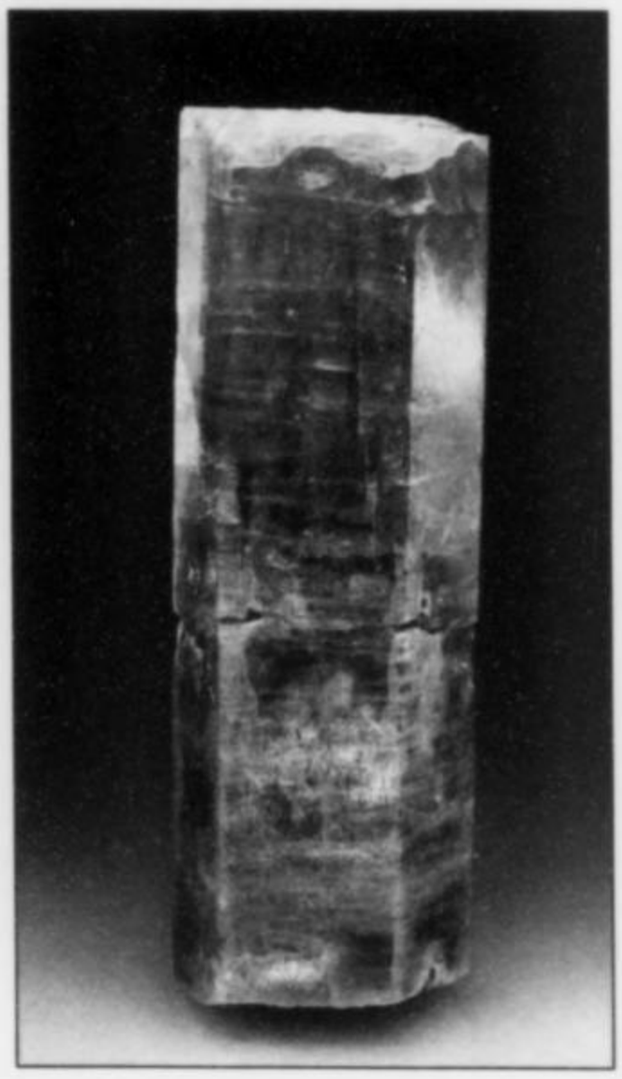
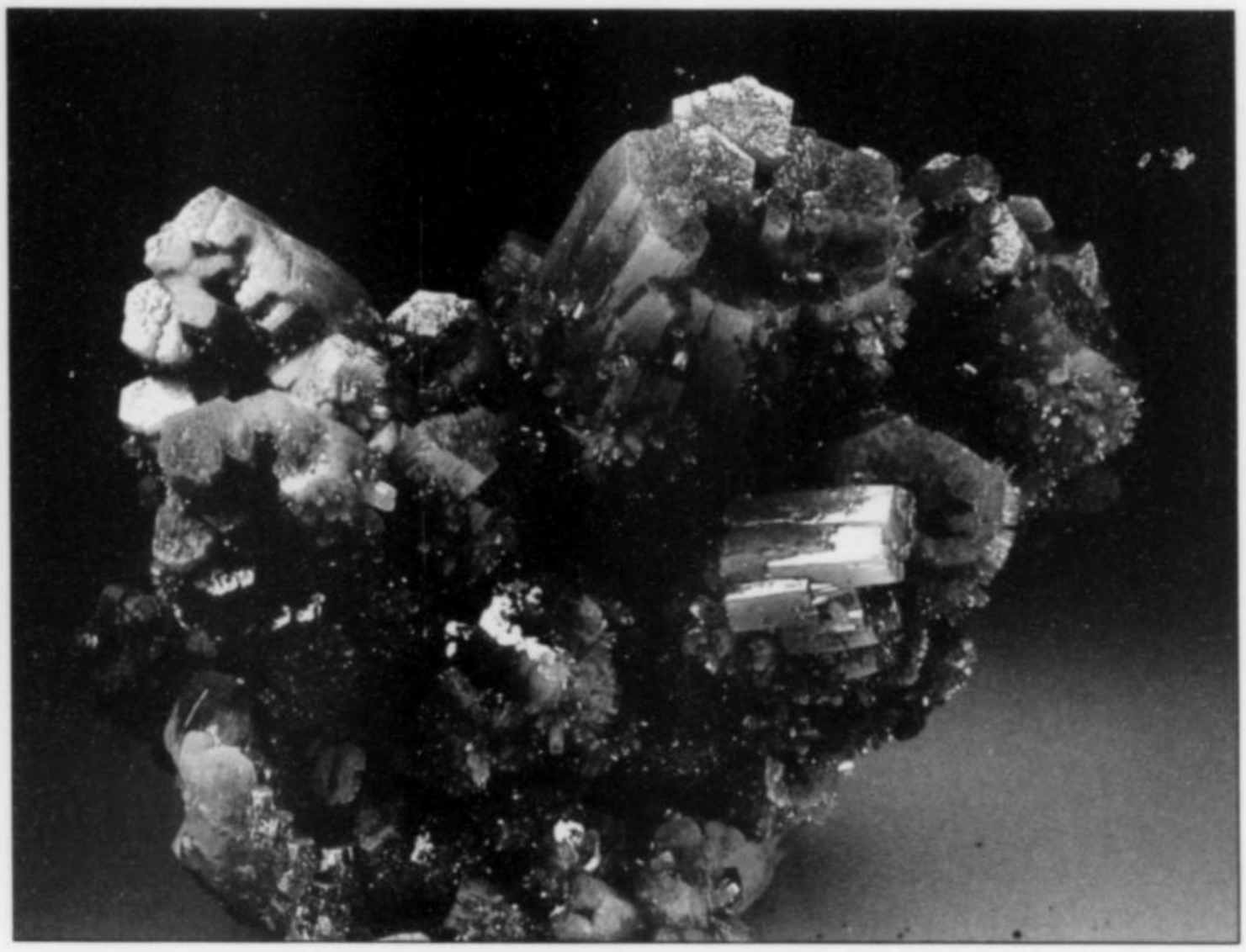


Figure 8. **Beryl crystal, 13.7 cm, from the Songo Pond mine, Bethel, Maine. *Songo Pond Gems* specimen; J. Scovil photo.**



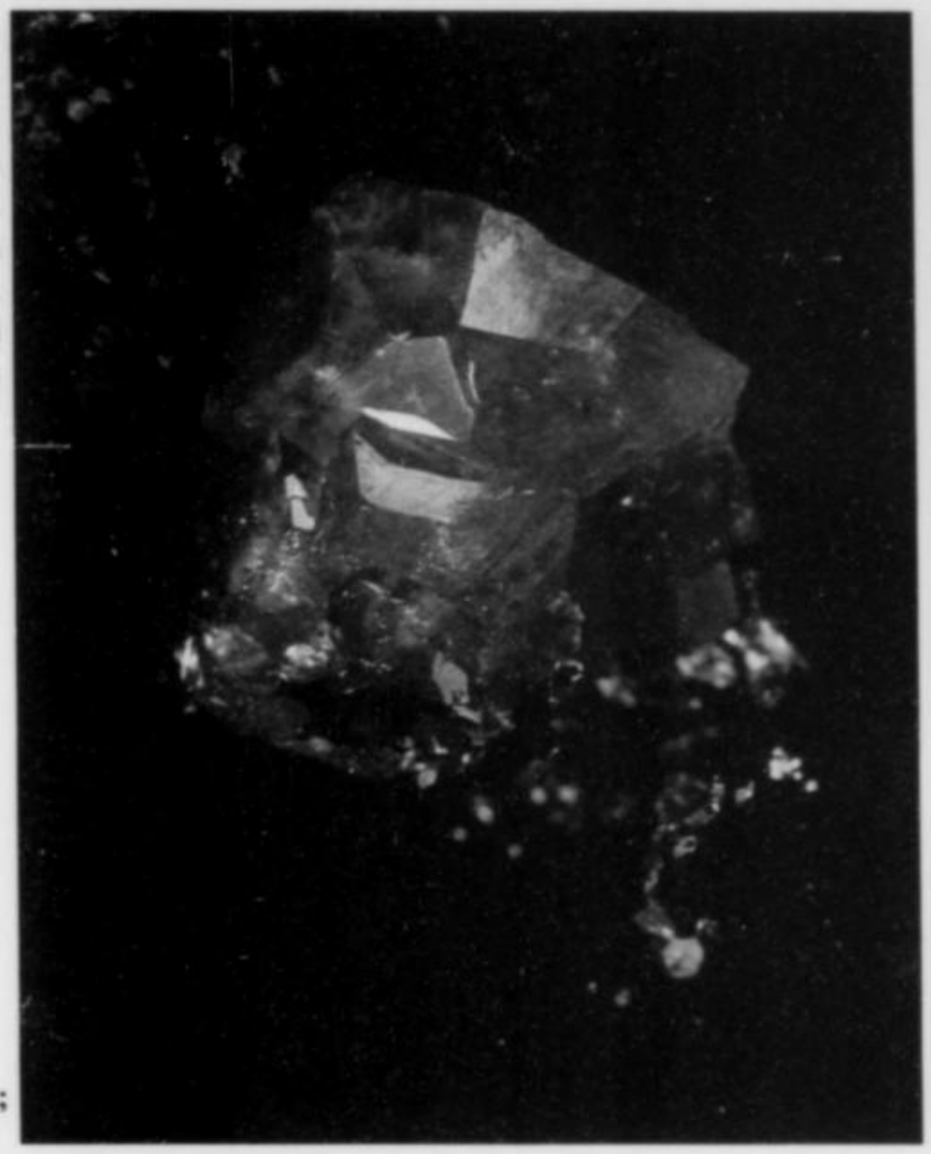


Figure 9. Calcite crystal with copper, from the Caledonia mine, Ontonogan County, Michigan. John Jaszczak photo.

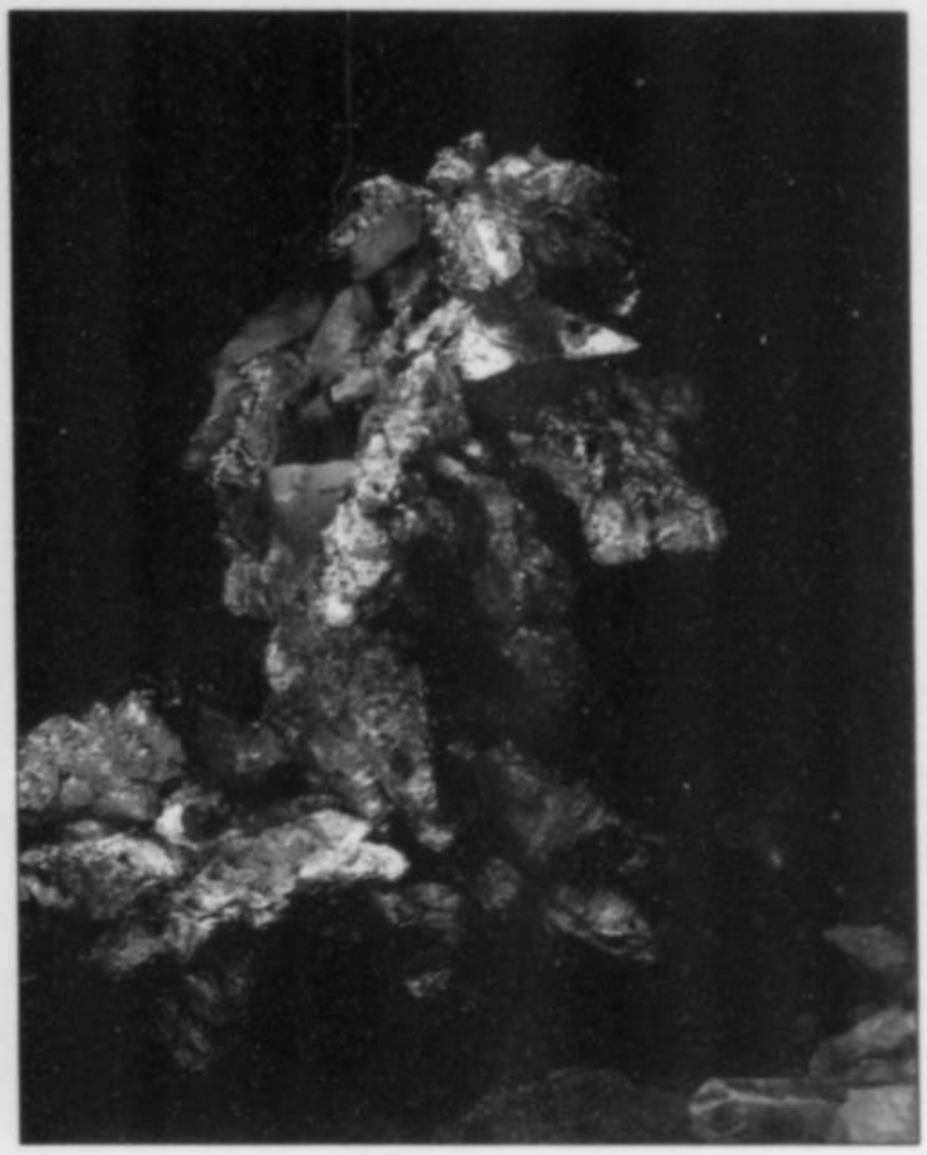


Figure 10. Quartz (Japan-law twin), 7.5 cm, from the P. C. mine, Jefferson County, Montana. Dave Bunk specimen; J. Scovil photo.

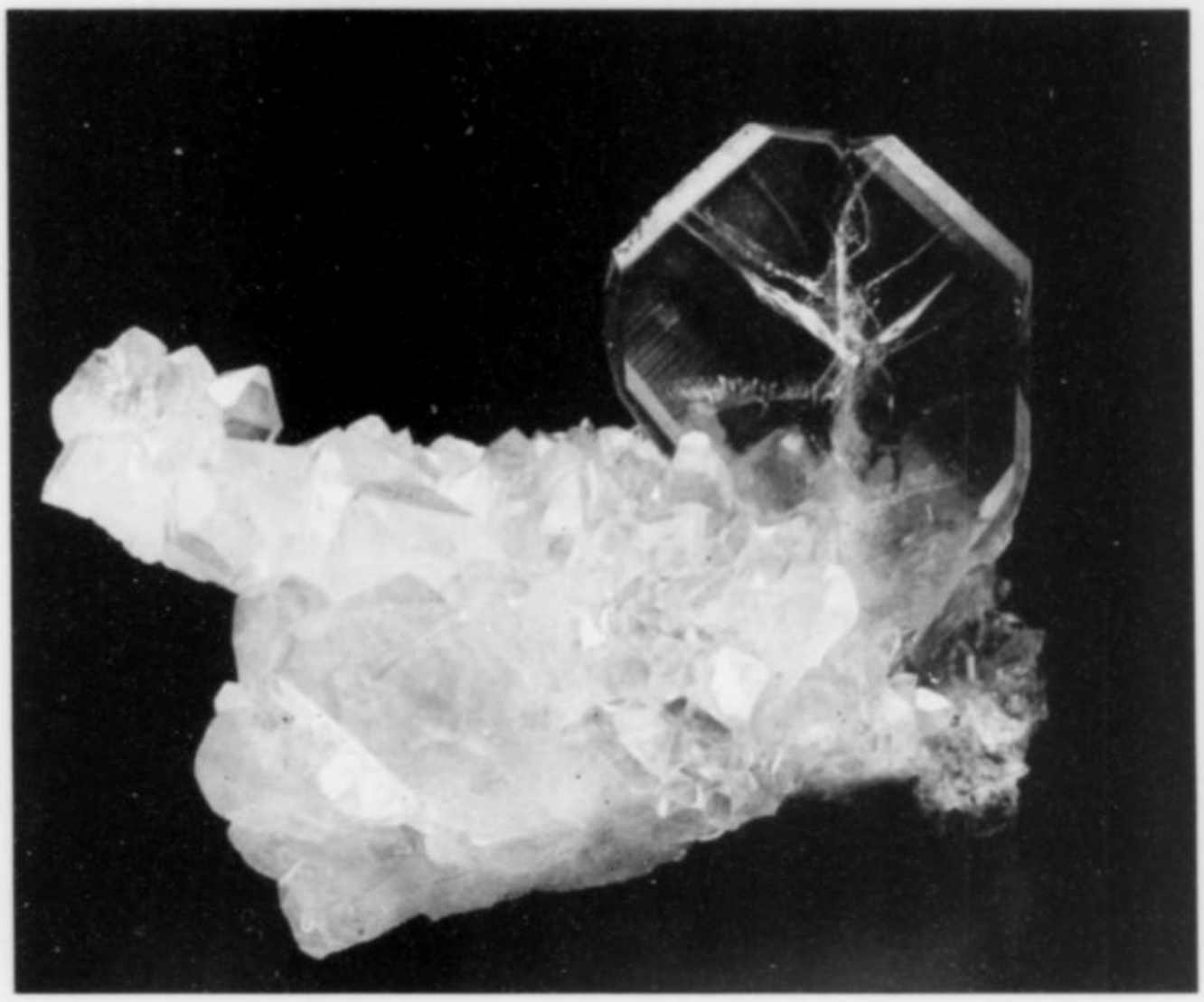


Figure 11. Silver crystal cluster, 4.7 cm, from the Caledonia mine, Ontonogan County, Michigan. Seaman Mineralogical Museum collection; J. Scovil photo.

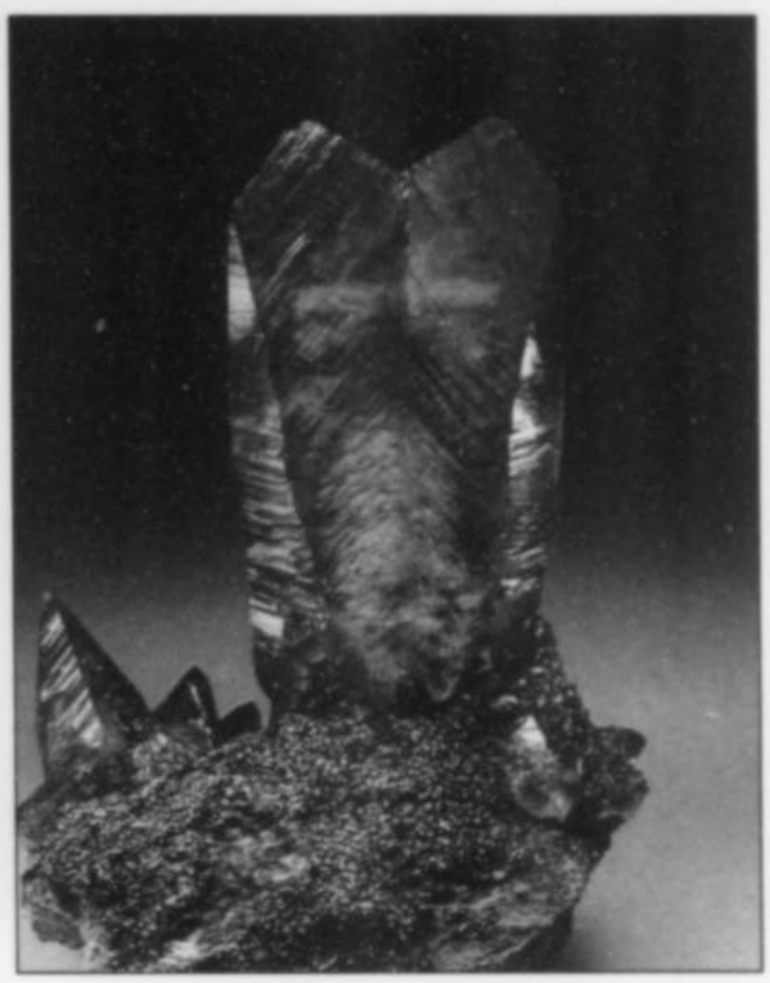


Figure 12. Calcite twin, 13.7 cm, from the Brushy Creek mine, Reynolds County, Missouri. *Top Gems* specimen; J. Scovil photo.

from Maine. The first of these, **mccrillisite**, is named for Dean and Phil McCrillis in recognition of the McCrillis family's dedication to pegmatite mining in the state of Maine. Mccrillisite is the Cs-dominant member of the gainesite group, and occurs as colorless, tetragonal bipyramids to 1 mm at Mount Mica. A complete description of the mineral, its occurrence and associated species is given in *Canadian Mineralogist*, **32**, 839–842. The second new mineral is the potassium zirconium phosphate species, **kosnarite**, which has been described from both Mount Mica and Black Mountain (*American Mineralogist*, **78**, 653–656). The mineral is named for Richard Kosnar, and occurs as colorless to pale blue-green pseudocubic rhombohedral crystals to nearly 1 mm. A limited number of specimens have been available from *Mineralogical Research Company* and *Excalibur-Cureton Mineral Company.*

MICHIGAN

Some very fine specimens have recently been mined by Richard Whiteman (*Red Metal Minerals*, P.O. Box 45, Hancock, MI 49930-0045) at the Caledonia mine in Ontonagan

County. The specimens were found on the 4th level, 850 Stope of the Knowlton lode, and consist of some exceptionally well-crystallized native **silver** in arborescent groups several centimeters across, transparent scalenohedral **calcite** crystals to 4 cm associated with crystallized native **copper** and **analcime** in specimens to 25 cm, and some very good, reddish white **datolite**. As a lot, these are some of the finest specimens found in Michigan's famous "copper country" since its heyday, when hundreds of mines were in operation.

MISSOURI

There has been a huge find (several tons of material!) of **calcite** and iridescent **marcasite** at the Brushy Creek mine, Reynolds County. Some of the calcite crystals are reported to be half a meter in length, and are being excavated from a previously productive occurrence in the mine that has been "off limits" to collecting for a number of years. Very fine specimens of this material are available from Joe Kielbaso (*Gemini Minerals*, 522 Hathaway Tr., Tipp City, OH 45371), Mike New (*Hilltop Minerals,* P.O. Box 50251, Tucson, AZ 85703) and others. Elsewhere in Missouri, transparent crystals of **barite** have recently been collected at the Lamb mine in Morgan County. Many of the crystals are doubly terminated and form aggregates on massive barite up to about 15 cm. Specimens are available from Harold Prior (P.O. Box 591605, Houston, TX 77259-1605) and Glenn Williams (549 Aqua Ridge Dr., St. Louis, MO 63129), who made the discovery. The occurrence is described in more detail in *Mineral News* (**11**, no. 1, p. 1–2).

MONTANA

The PC mine in Jefferson County is a well-known locality for Japan-law twinned **quartz** crystals. Matrix specimens with crystals to 5 cm have recently been available from *Dave Bunk Minerals* (9240 W. 49th Ave., #317, Wheat Ridge, CO 80033).

NEVADA

John Seibel (P.O. Box 95, Tehachapi, CA 93561) has recently obtained some new **anatase** and **brochantite** specimens from Nevada. The anatase consists of brilliant brown crystals to 2 mm replacing **titanite** crystals to 3 cm from Corral Canyon, Dixie Valley, Churchill County. The brochantite is from Douglas Hill, near Lugwig, Lyon County, and forms rich, colorful coatings of microcrystals on chrysocolla.

Picropharmacolite in white silky crystals (to 1 cm) in divergent sprays (to 7 x 7 cm) has been identified from the Getchell mine, Humbodlt County. The mineral occurs on realgar and calcite, though it is not immediately determinable if it is a post-mining mineral or not. David Shannon has obtained some rich specimens of **cervantite** from the White Caps mine, Nye County. These form yellow to golden brown, waxy, bladed masses in vugs, cavities and veinlets in **stibnite**, sometimes with earthy patches (to 5 mm) of cream white **stibiconite**. Dave also had orange, splintery, acicular **sideronatrite** crystals (to 1 cm) in **sulfur** from the Sulfur pit, Crescent Valley, Eureka County.

Steve Pullman has obtained **pyrostilpnite** as scales and microcrystals from the 6700 level of the Dean mine, as well as **scorodite** microcrystals from the Wilson-Independence mine, both in Lander County. Steve also has obtained millimeter-sized masses of **turanite** on matrix, from the Gold Quarry mine [sic], as well as some excellent, dark brown-to-black **jarosite** crystals (to 3 mm) on matrix from the Goldstrike mine, both in Eureka County. Additional specimens of **pyrostilpnite** from the Morey mine, Nye County, are available from Sharon Cisneros (*Mineralogical Research Company*).

NEW HAMPSHIRE

The famous green **fluorite** locality, the William Wise mine near Westmoreland, has recently been acquired by Jim Tovey and Bob Borofsky (Jolynne Associates, Inc.) and is once again being mined for specimens. Several large pockets have already been excavated, yielding a number of groups of intergrown octahedral crystals associated with **quartz**. A quantity of faceting-grade rough was also recovered, and plans for continued mining are in progress. Specimens from this venture have been available through Bryan and Kathryn Lees (*Collector's Edge*). The fluorites are not the only new find from Westmoreland. New England collector Donald Dallaire recently brought to our attention a new occurrence of **wulfenite**, as well. Small (1 mm) crystals of orange, tabular to bipyramidal wulfenite have been found on a single specimen of quartz crystals collected in October, 1990. Pale gray-green fluorite is associated with the quartz, and galena was noted in close proximity to the specimen, though none is present on it. **Molybdenite** and **ferrimolybdite** are also known from the Wise mine, and it is believed the wulfenite probably formed as a result of oxidation by downward migrating groundwater. Additional specimens may be present at the locality or on uncleaned specimens in collections, though they may not be apparent due to the orange-brown iron oxide that coats most of the quartz.

Mary Johnson of the Gemological Institute of America reports that she has found and identified tan to cream-colored **hurlbutite** grains (to several mm) as a component of the **bertrandite** pseudomorphs after beryl crystals from the Beauregard mine, near Gilsum.

NEW JERSEY

New Jersey collector Bill Butkowski reports that the Millington quarry, Bernard's Township, Somerset County, has produced a quantity of nice specimens over the past year. The traprock quarries of northern New Jersey constitute one of North America's classic localities for zeolites and related minerals, and it is particularly refreshing to learn that once again limited organized collecting trips are being made possible through the quarry owners. Excellent specimens of green **prehnite** (some as lustrous balls up to 3 cm), **natrolite**, **pectolite**, **quartz** pseudomorphs after anhydrite, **gypsum** and **sphalerite** have been recovered. Bill also reports that some very good arborescent **copper** specimens (to 15 cm) have been found at the Chimney Rock quarry, near Bridgewater.

NEW MEXICO

Ray De Mark and Brian Huntsman (*Zuni Minerals,* 530 E. Arch St., Marquette, MI 49855) mined a sizeable and very attractive lot of purple octahedral **fluorite** crystals from the Judith Lynn claim in the Pine Canyon deposit, Grant County. In addition to the fluorites, Ray and Brian also collected some rather aesthetic **chalcedony** geodes from a rhyolite flow near Lordsburg. The typically lobate and crenulate chalcedony fluoresces bright green under ultraviolet light, and is particularly attractive for the mineral. Also new from New Mexico are some excellent, dark green (nearly black) **dufrenite** crystals to 5 mm from the Santa Rita mine, Grant County, obtained by Steve Pullman; and green microcrystals of **mackayite** have been collected from a prospect near the Lone Pine mine, Catron County, by Patrick Haynes (*Virgin Mining Company*, P.O. Box 1531, Cortez, CO 81321).

Our apologies are extended to an unrecorded source who provided information on a new **scrutinyite** location: the Snake Pit mine, Hansonburg district, Socorro County, where scrutinyite occurs as elongated black crystals on quartz crystals with **caledonite**, or as encrustations on galena. Additional species from the mine include **libethenite**, **pseudomalachite**, **turquoise** crystals (to 0.5 mm), and crude tiny **phosgenite** crystals—all as microcrystals.

NEW YORK

The remaining portions of the cubic **magnetite** occurrence on the 2500-foot level of the Z.C.A. #4 mine at Balmat, St. Lawrence County, were finally mined out early in 1994. Many more excellent magnetite specimens were recovered, as well as interesting yellow and colorless **sphalerite** crystals. Additionally, some very rich specimens of **donpeacorite** and **turneaureite** were collected by the Z.C.A. geologists and staff from the New York State Museum and the Canadian Museum of Nature over the winter. Thanks to the continued cooperation of the Zinc Corporation of America, excellent specimens of these two rare minerals now reside in a number of museums. Both Steve Chamberlain and Ken Hollmann (P.O. Box 134, Center Rutland, VT 05736) report that some very fine **sphalerite**, **calcite**, **barite** and **celestine** specimens have been found at the nearby Hyatt mine, at Talcville, St. Lawrence County. Some of the golden yellow sphalerites and certainly the tabular blue celestine crystals (to 10 cm) are among the best ever recovered from the Balmat district.

Elsewhere in upstate New York, highway construction on SR30, north of Long Lake village has exposed a series of small **fluorite-calcite** veins cutting granitic gneiss. Pale blue to purplish gray octahedral fluorite crystals up to 2 cm associated with calcite, and often coated with acicular microcrystals of **epidote**, **chamosite** and rare **kainosite-(Y)**, have been collected.

Highway construction near Moon Lake, approximately 5 km northeast of Theresa, Jefferson County, uncovered a zone of brecciated marble containing numerous crystals of gray-blue **apatite**, some up to 15 cm in length. The locality is atypical of most apatite occurrences in Grenvillian rocks in that the crystals occur in what appears to be a fault breccia, cemented by crystals of calcite with occasional barite, hematite and other minerals.

Last September, John Medici (7272 Macbeth Dr., Dublin, OH 43017) was able to successfully extract two large pockets of "herkimer diamonds" (**quartz**) intact from the well-known diggings on Stone Arabia Road, near Fonda. This was accomplished with a masonry saw, much hard labor and many subsequent hours spent reconstructing a three-dimensional jigsaw puzzle of the crystal contents. One of the resulting specimens was displayed at this year's Rochester Mineralogical Symposium, with many "oohs" and "ahs" heard as visitors peered through the pocket opening into an illuminated fairyland of crystals.

NORTH CAROLINA

David and Celia Lare collected some very interesting **dolomite** crystals (to 1 cm) at the Triangle quarry, near Cary. The colorless to white crystals occur as tightly intergrown spherical clusters (to 1 cm) on drusy and clay-coated **ankerite**.

OHIO

John Medici (7272 Macbeth Dr., Dublin, OH 43017) collected some remarkable **pyrite** specimens from Ross County in 1993. Some, which resemble fulgurites, are nearly a meter long, and are believed to have formed in worm burrows in a limey sediment. Other interesting finds made by John over the past year include some complex **fluorite** crystals from the Auglaise quarry, showing tetrahexahedral and hexoctahedral faces, some good **strontianite** specimens from Lime City, and some complex **pyrite** crystals from Duff's quarry, near Huntsville.

OKLAHOMA

David London (*IXOR*, 530 Garland Court, Norman, OK 73072) reports the rediscovery of an occurrence of unusual smoky **quartz** crystals in McCurtain County. Most of these have clear, colorless cores with skeletal smoky quartz overgrowths. Approximately 25 kg of crystals are available. London also collected a quantity of unusual **calcite** specimens from the Arbuckle Mountains in southern Oklahoma. These also show a history of multiple growth, with scalenohedrons overgrown by twinned rhombs, and phantoms defined by planes of solid inclusions. Some occur with natural asphalt, suggesting they may have formed in a mixed brine-petroleum suspension. The specimens range in size from single rhombs 5 to 10 cm, to large crystal plates over 25 cm.

In addition to the quartz and calcite finds, London has also recently excavated some rather remarkable **barite** rose specimens from east of Noble, Cleaveland County. Hundreds of specimens were recovered in all size ranges, including several exceptionally large clusters over a meter across!

Figure 13. **Sphalerite crystals to 2.5 cm, from the Hyatt mine, Talcville, New York. Ken Hollmann specimen and photo.**

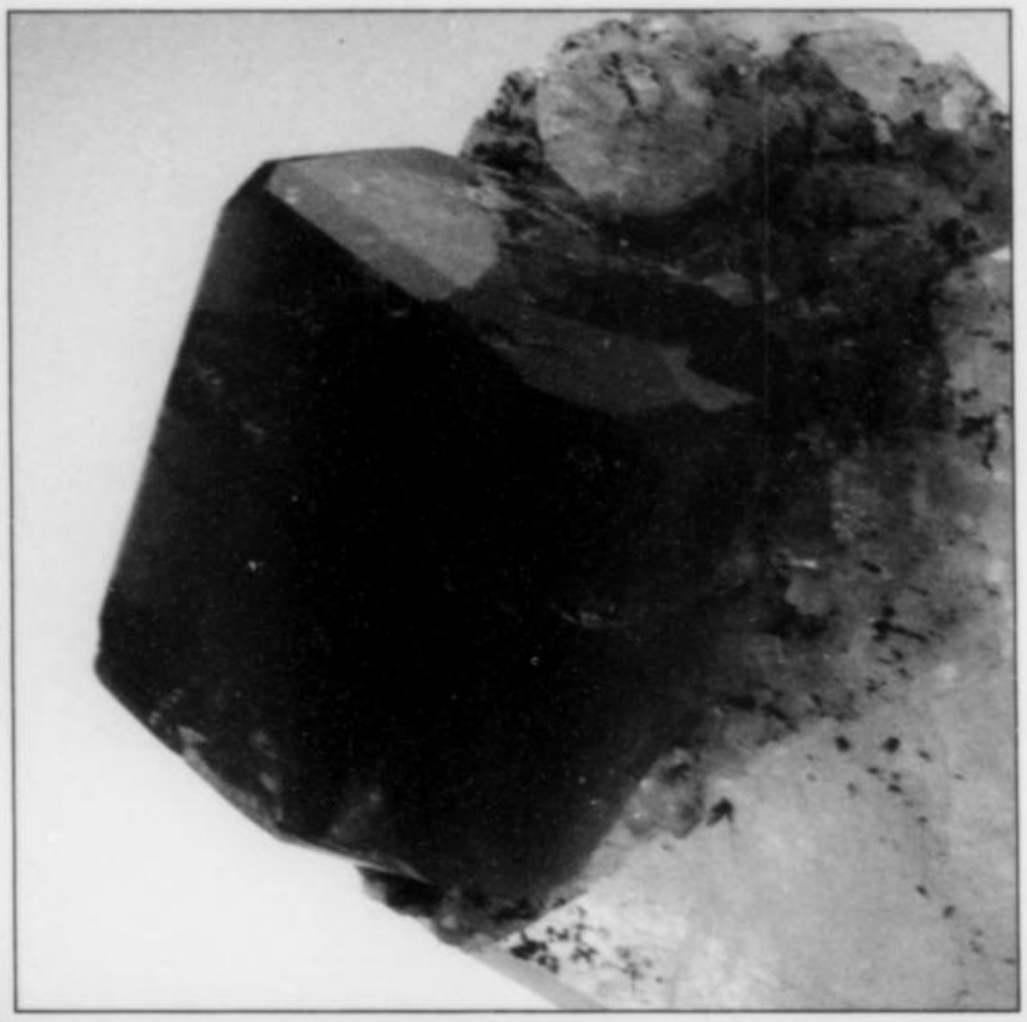


Figure 14. **Fluorapatite crystals, 1 cm, on matrix, from the Golconda mine, Governado Valadares, Minas Gerais, Brazil. Frank Melanson specimen.**

Figure 15. **Stilbite, 4 cm, from Maniwaki, Quebec. Canadian Museum of Nature collection; G. Robinson photo.**

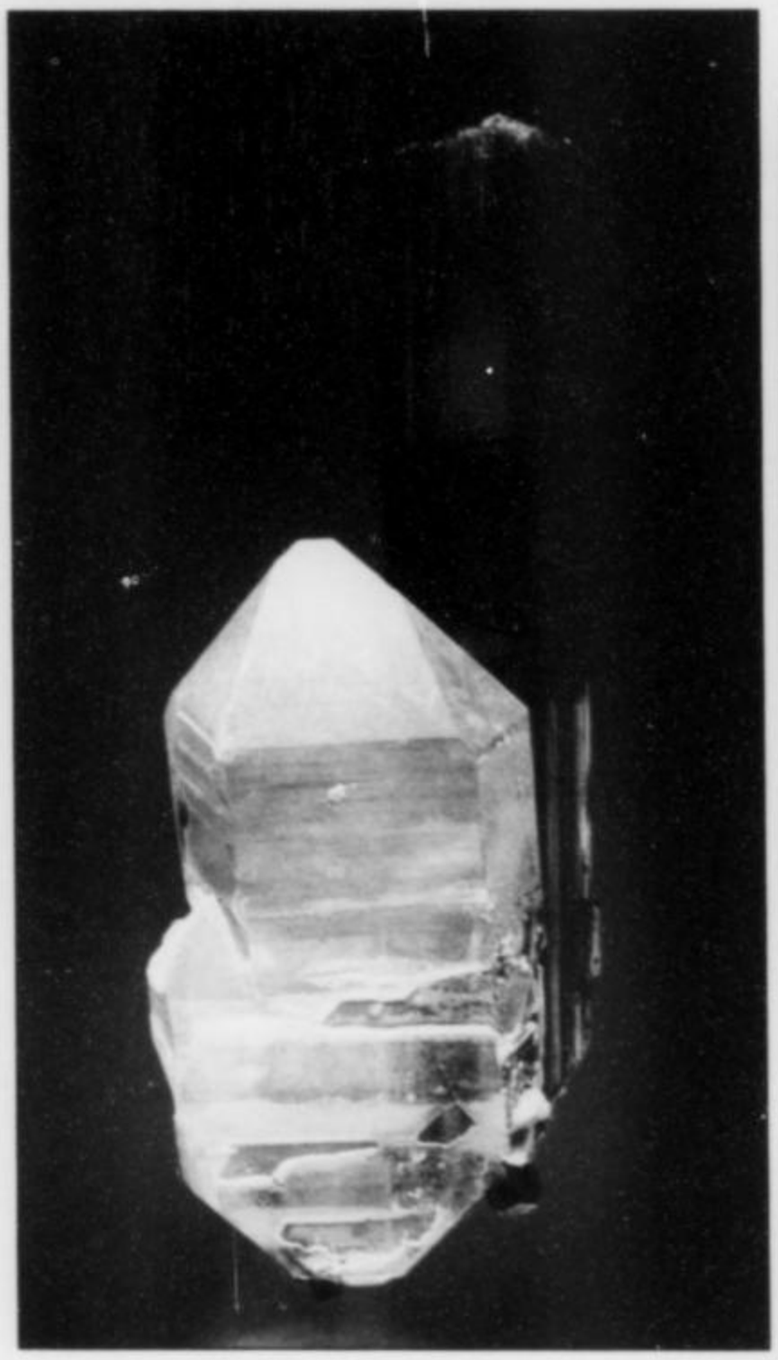


Figure 16. **Elbaite crystal on quartz, 12 cm, from the Benedito mine, Minas Gerais, Brazil. *Silverhorn* specimen; J. Scovil photo.**

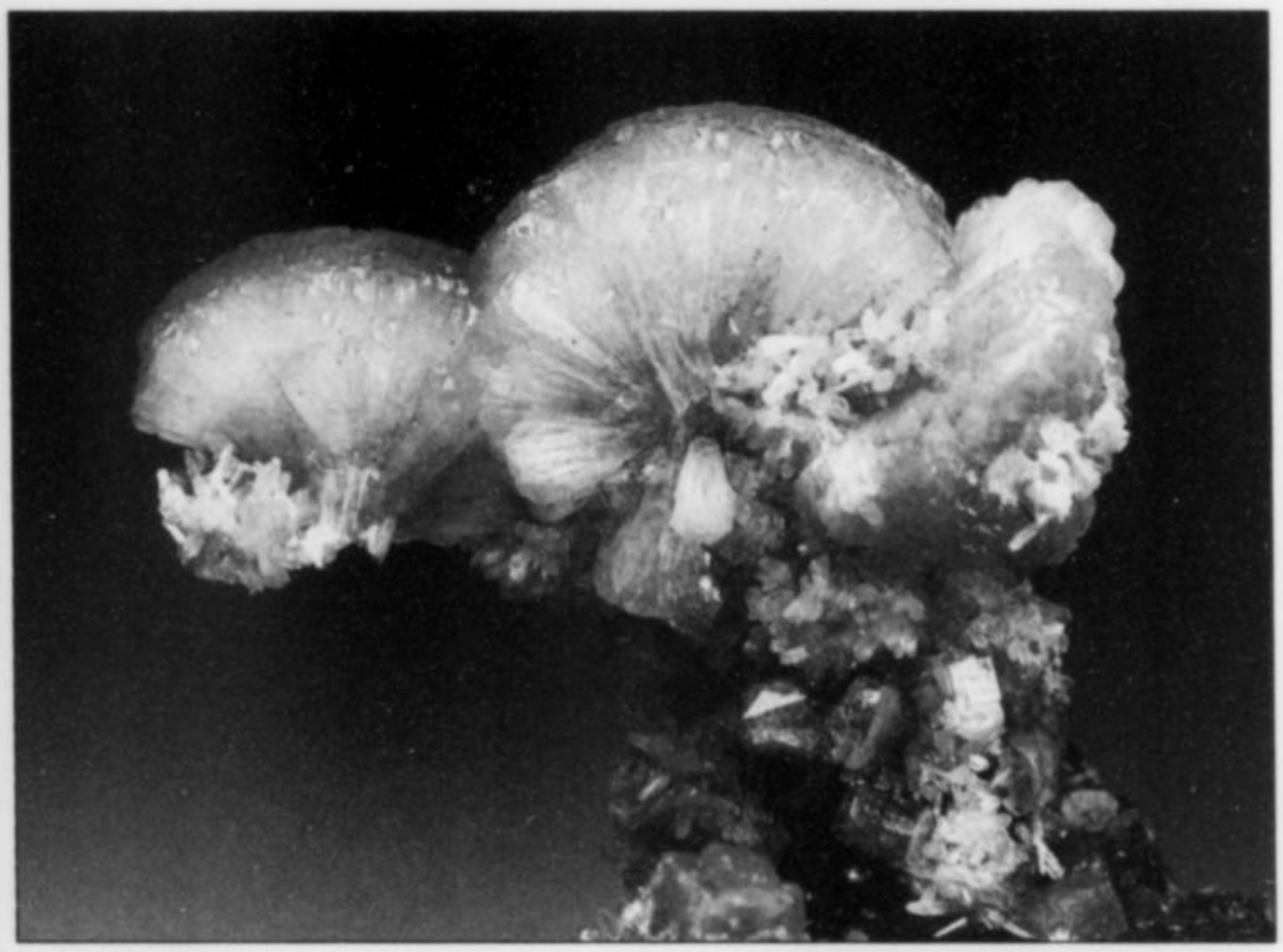


Figure 17. **Powellite crystals to 4 mm, from Tierra Amarilla, Chile. Canadian Museum of Nature collection; G. Robinson photo.**

Figure 18. **Gaidonnayite crystals to 5 mm (yellow) with natrolite, from Poco de Caldas, Brazil. Canadian Museum of Nature collection; G. Robinson photo.**

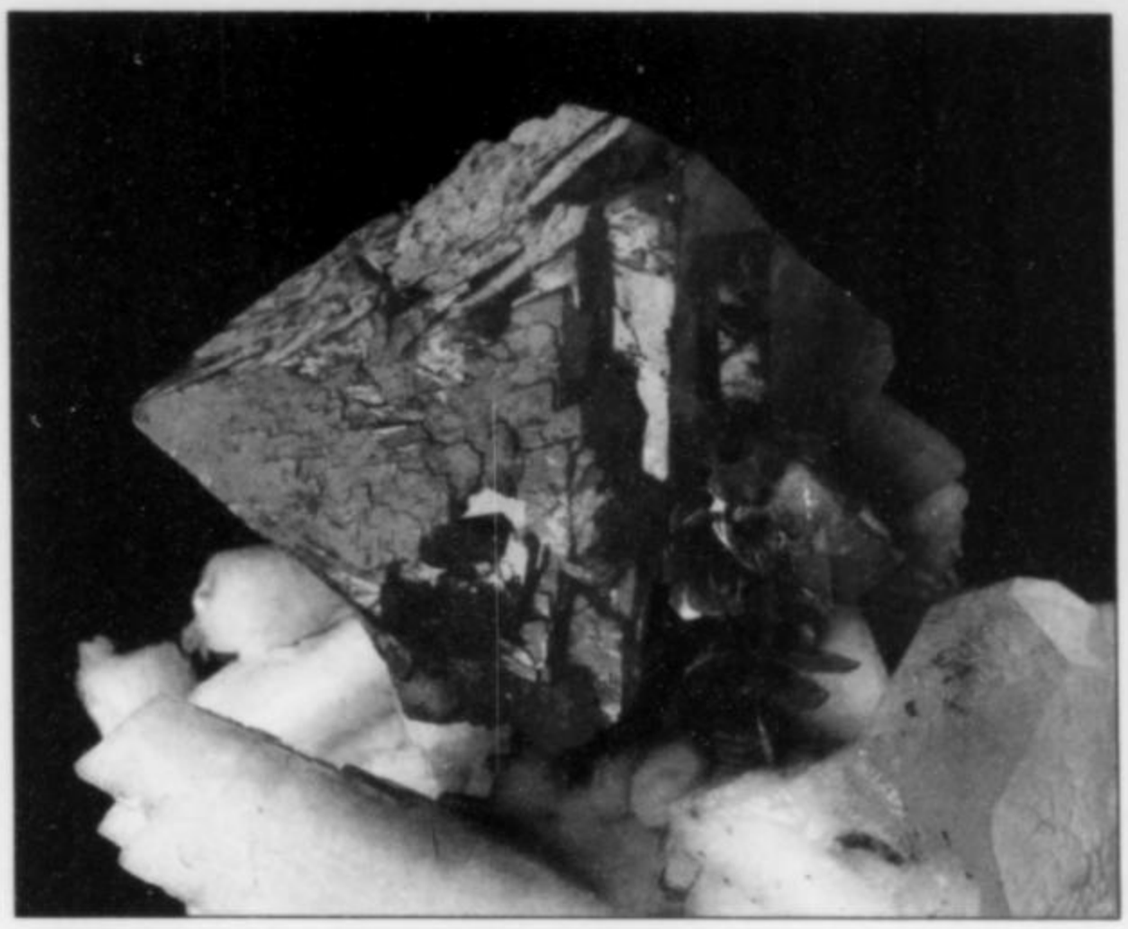


Figure 19. Scheelite crystal, 4.3 cm, with beryl and albite, from Hunan Province, China. Martin Zinn collection; J. Scovil photo.

Figure 20. Forsterite crystal, 6 cm, from the Kovdor mine, Kola Peninsula, Murmansk, Russia. William Pinch collection; G. Robinson photo.

Figure 21. Stellerite crystal group, 5.7 cm, from the Sarbayskaya quarry, near Rudniy, Kusteni Oblast, northern Kazakhstan. Pliaskov/Van Scriver specimen; W. E. Wilson photo.

Figure 22. Genthelvite crystals to 7 mm on black aegirine and polylithionite crystals, from Mont Saint-Hilaire, Quebec. Canadian Museum of Nature collection; G. Robinson photo.

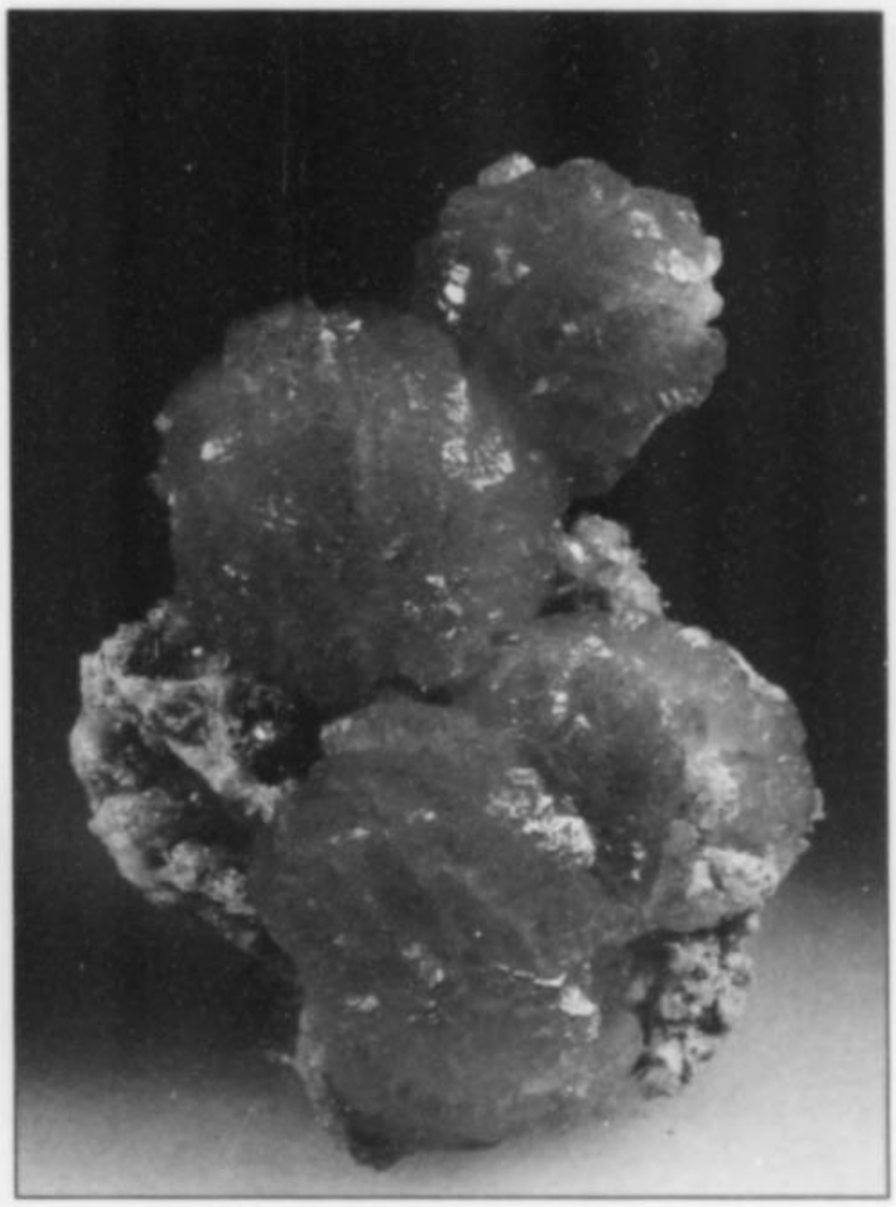


Figure 23. Eudialyte crystals, 1.4 cm, on matrix, from Mt. Eveslogchorr, central Khibiny Massif, Murmansk oblast, Russia. Pliaskov/Van Scriver specimen; W. E. Wilson photo.

OREGON

Dave Bunk Minerals has recently obtained a large quantity of very attractive **calcite** and **analcime** specimens from McMinnville, Yamhill County. The calcite crystals are pale orange in color, and occur together with the analcime in cavities in scoriaceous basalt.

PENNSYLVANIA

While we have nothing exciting to report in the way of new mineral specimens having been found in Pennsylvania, there is some very exciting news to report concerning some new **specimens on display** in this state! Dr. Robert Witkowski, Research Associate at the Carnegie Museum of

Natural History (Pittsburgh), has informed us that the museum has recently acquired an outstanding 23 x 34-cm specimen of **rhodochrosite** from the famous Sweet Home mine near Alma, Colorado, in addition to a suite of 164 fabulous mineral specimens from the former Soviet Union. Several of these are among the finest known examples of their kind, and include a magnificent 13-cm wire **silver** from Dzhezkazgan, Kazakhstan, a 9-cm **stibnite** with **barite** from Kadamdzhai. Osh Oblast, Kyrgyzstan, a 12-cm plate of **betekhtinite** crystals with 6-cm crystals partially replaced by **covellite**, superb crystals of native **copper**, **axinite**, **perovskite** and numerous other fabulous specimens. The acquisition of these minerals was made possible through the cooperative efforts of museum staff, Bryan Lees and the Hillman Foundation.

UTAH

Again, apologies are due to an unrecorded source who showed some attractive mint-green dog-tooth **calcite** crystals (to 1 cm) in "small cabinet" sized clusters (to 10 cm) from Horse Canyon, San Juan County. The green color is reportedly due to vanadium, and the specimens were found in a petrified wood log.

Recent investigations by Andy Roberts and Joe Marty have identified the rare thallium minerals **weissbergite** and **parapierrotite** from Lookout Pass, in southwestern Toole County. Specimens of the parapierrotite are available from *Mineralogical Research Company.*

Most of us are probably unaware of the great diversity of minerals that have come from Kennecott's huge copper mine at Bingham, Utah. Those fortunate enough to visit Jim Lewis's booth (*Diversified Minerals*) at last year's Denver Show could not help but be enlightened by the amazing variety of minerals he had from that locality. Among these were some very good **tetrahedrite** and **pyrite**, botryoidal **azurite** and **malachite** with **chrysocolla**, prismatic blue **vivianite** crystals to 5 cm, yellow-white hemispheres of **wavellite** on matrix, **okenite**, **gypsum**, **prehnite**, **chalcanthite** and good, rich blue **turquoise** specimens to 12 cm. Also among *Diversified's* stock was an appealing selection of **variscite** associated with abundant secondary phosphates from Clay Canyon, near Fairfield.

The famous topaz rhyolites from the Thomas Range continue to yield excellent specimens. The Maynard claim recently produced a large number of single **topaz** crystals to 4 cm, while **hematite** and topaz pseudomorphs after garnet (to 8 mm) have been collected from Pismire Wash. Additionally, a new but small supply of **bixbyite** crystals (generally 1 cm) from the Cubic claims in Topaz Valley, has also appeared.

Other new finds from Utah include thin, bladed, centimeter-size crystals of **hematite** from the Creole mine, Beaver County (*John Seibel Minerals*); pale blue botryoidal **smithsonite**, **calcite**, **rosasite**, **plattnerite** and **aurichalcite** from the Hidden Treasure mine, north of Ophir, Tooele County, available from Jim McGlasson; rich purple crusts of **cobaltomenite** on rock from the Parco mine group, Thompson District, Grand County, and microcrystals of **pharmacosiderite**, **metazeunerite** and **olivenite** from the Big Indian mine, near La Sal, San Juan County (*Virgin Mining*).

VERMONT

Mike Haritos (*S.T.D. Mineral Company*, 22 Spring Hill Rd., Hyde Park, MA 02136) has recently obtained a small lot of some very well-crystallized **clinozoisite** specimens from Eden Mills. Most specimens consist of single, terminated, green-brown crystals from 3 to 5 cm, though a few crystal groups to 10 cm were recovered. The specimens are presumed to have occurred in rodingite veins in serpentinite at the Rubberoid Asbestos mine.

VIRGINIA

Bill Baltzley of the *Powhatan Mining Company* (Route 5, box 6065, Amelia, VA 23002) reports that additional pods of rare fluoride minerals (**pachnolite**, **chiolite**, **elpasoite**, **cryolite**, **thomsenolite**, **ralstonite**) have been found during 1993 at the Morefield pegmatite, near Amelia.

WISCONSIN

Some remarkable crystals of **chalcocite** have been found on the 1000-foot level of the Flambeau mine near Ladysmith. The best of these resemble some of the specimens from Cornwall, England, which they rival in both size and crystal perfection. Some of the finest are the sharp thumbnail and small cabinet specimens, though very fine plates of crystals over a foot across have been recovered. Some of the crystals show a blue (presumably bornite) or golden (presumably chalcopyrite) patina, and certainly rank with the best of North American chalcocites. Specimens are being marketed by Casey Jones (*Burminco*, 128 S. Encinitas Ave., Monrovia, CA 91016).

In addition to the chalcocite, Wisconsin has also produced some very good specimens of **calcite** from the Vulcan quarry near Racine. The crystals are predominantly scalenohedral and gray in color, and often show good phantoms. Flat plates of crystals up to 25 cm have been available from Beau Gordon, Kevin Ponzio (*Rock-n-Record*, P.O. Box 44, Plymouth, WI 53073) and others. The crystals were apparently found in a clay-filled zone which also produced cuboctahedral crystals of **pyrite**, **marcasite**, and other minerals.

WYOMING

Larry and Carmen Piekenbrock found some remarkable **pyrite** crystals in the montmorillonite of the trona beds, Green River. The crystals (to 1 mm) form three dimensional, six-pointed aggregates of deeply striated, elongated crystals showing cube and octahedron faces.

Karen and Robert Ross (Clarion Drive, Gillette, WY) report finding colorless to cloudy **gypsum** crystals and fishtail twins (both to 5 cm) in soil near Paintbrush Drive, Gillette, Campbell County.

Part II: Other World Occurrences

AFGHANISTAN

While we have seen numerous fine crystals of **lazurite** from the lapis lazuli mines in the Kokscha Valley of Badakshan over the past decade, we seldom see other minerals from these deposits. At least one such item was available from Herb Obodda at the 1994 Denver Show, which consisted of small but well-formed crystals of **phlogopite** in marble. The crystals fluoresce orange in longwave ultraviolet light, and creamy blue-white in shortwave light. Another new find seen at the same show was some lustrous brown prismatic crystals of **vesuvianite** similar to those from Val d'Osta in Italy. The crystals, which average about 2 cm and form groups up to about 8 cm, are from Nuristan, and were available from Dudley Blauwet (*Mountain Minerals International*).

Daud Wafa (42 Elisabethenstrasse, 70197 Stuttgart, Germany) has had a number of new gem **elbaite** crystals from Afghanistan. The Gusalaka mine, near Pech, Kunar, produced some well-terminated, flawless, uniformly pale blue indicolite crystals to 5 cm. A few specimens have dark blue cores with paler blue outer zones. Another new locality, the Kligal mine, near Paprok, produced similar flawless blue-green crystals to 7 cm. A third locality also near Paprok, produced some very interesting pastel, color-zoned crystals. The terminations of these crystals are consistently blue while the other half of the crystals vary from pale pink to nearly colorless. Large crystals (5–10 cm) are usually completely translucent without facetable areas. One crystal labeled as coming from Paprok is 9 cm long and is gemmy along its length with some facetable areas. The complex termination (simple pyramid and ditrigonal pyramid) is pink, and the rest of the crystal mostly lime-green along its length.

Five Lions Gems (P.O. Box 234848, San Jose, California 95123-3848) reported that some intense mint-green gem quality **elbaite** crystals (to 5 cm) are coming from a new locality in Kunar.

ALGERIA

The large crystals of **senarmontite** from Hamimat, Constantine, are classic, and while considered by most to represent the world's finest for the species, are seldom available in good specimens today. However, some very good pieces have recently been collected from a dump several kilometers from the mine, and were available from Dr. Jochen Hintze (Im Busche 1, D 4923 Extertal-Lassbruch, Germany) at the 1994 Denver Show. The best of these consist of aggregates of gray, centimeter-sized octahedrons up to 10 cm, with surprisingly little damage, considering they were recovered from dump material.

ARGENTINA

Helvite crystals to 4 mm have been found at the Chinold mine, Cordoba Province. Specimens have been available from Steve Pullman.

AUSTRALIA

Blair Gartrell (*Westaus Mineral Museum*) had three new rare mineral species at the 1994 Tucson Show. All are from Western Australia, and include **ernienickelite** from the SM7 pit, Siberia (*Canadian Mineralogist*, **32**, 333–337), **kintoreite** from Mt. Murray, and **widgiemoolthalite** from Widgiemooltha (*American Mineralogist*, **78**, 819–821; *Mineralogical Record*, **25**, 283–291). Interestingly, the first of these minerals, ernienickelite, may also occur in the Kempirsay massif, southern Urals, Russia, where it has been described as the Ni-analog of chalcophanite (*American Mineralogist*, **79**, 388–389).

Large groups of pale green, acicular **gypsum** crystals are currently available from *Martin Rosser Minerals* (Orth Str. 13, 81245 Munich, Germany), Rod and Helen Tyson (*Tysons' Minerals*) and others. The sparkling crystals are quite attractive. They have formed in a Playa lake (Pernattys Lagoon) near Mt. Gunson, South Australia. The green color is reportedly due to effluent from a nearby copper mine.

AUSTRIA

Denis Gravier (Chemin de Ronde, 01500 Ambronay, France) frequently has micromount specimens in addition to hand-sized specimens. Among his recent offerings are some gemmy, dark green botryoidal aggregates of **hyalite opal** (to 2 mm) profusely coating matrix from Badersdorf, Burgenland.

BOLIVIA

Alfred Petrov (1728 Casilla, Cochamba, Bolivia) has visited Ahlfeld's famed Cristalmuya locality, about 200 m downhill from the San Francisco asbestos mine, and approximately 50 km from Villa Tunari, Chapare province, Cochabamba department, where he collected a quantity of milky gray doubly terminated **danburite** crystals to 4 cm. The occurrence is exposed along a stream which cuts through a metamorphosed evaporite/sandstone sequence (in the Limbo Formation), which is cut by veins of **crocidolite**. In addition to the danburite, he discovered about 20 specimens of the new tourmaline species **povondraite** (in about 25 trips to the locality!). Povondraite was previously described as ferridravite, but recent crystal structure investigation has led to the redefinition and renaming of the species (*American Mineralogist*, **78**, 433–436). Based on Alfred's field work, it is now known that povondraite formed by contact metamorphism of cold, fist-sized volcanic clasts entrained within a metamorphosed evaporite. Clasts of sedimentary rock appear to have schorl developed around their perimeters rather than povondraite. Povondraite is black with a brilliant luster, and the crystals (to several mm) are thickly intergrown and indistinct. Associated species include: drusy **microcline**, **dolomite**, **talc**, **gypsum**, **danburite**, **pyrite**, **hematite**, **magnesite** (in hexagonal prisms) and rarely **boracite**.

Another interesting discovery by Alfred Petrov is a new supply of **aheylite** from the lower vein of the huge Hunanui mine, Hunanui, Oruro Department. The aheylite occurs as pale gray, translucent spheres (to several mm) associated with

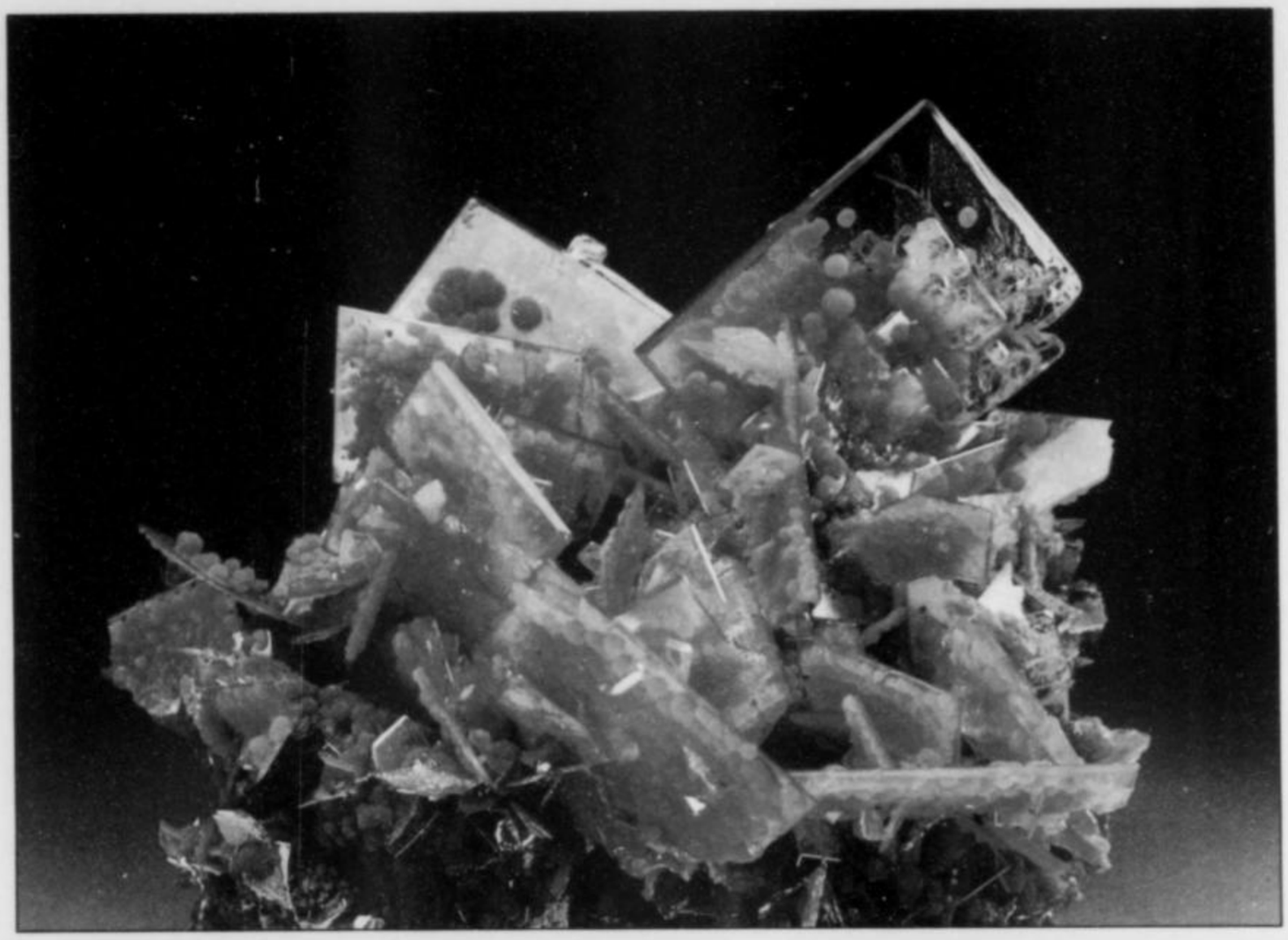


Figure 24. **Wulfenite crystals to 3.5 cm with mimetite, San Francisco mine, Sonora, Mexico. Wayne Thompson specimen; J. Scovil photo.**

Figure 25. **Ferrierite crystals in radiating aggregates to 6 mm, from Monastir, Sardinia, Italy. Canadian Museum of Nature collection; G. Robinson photo.**

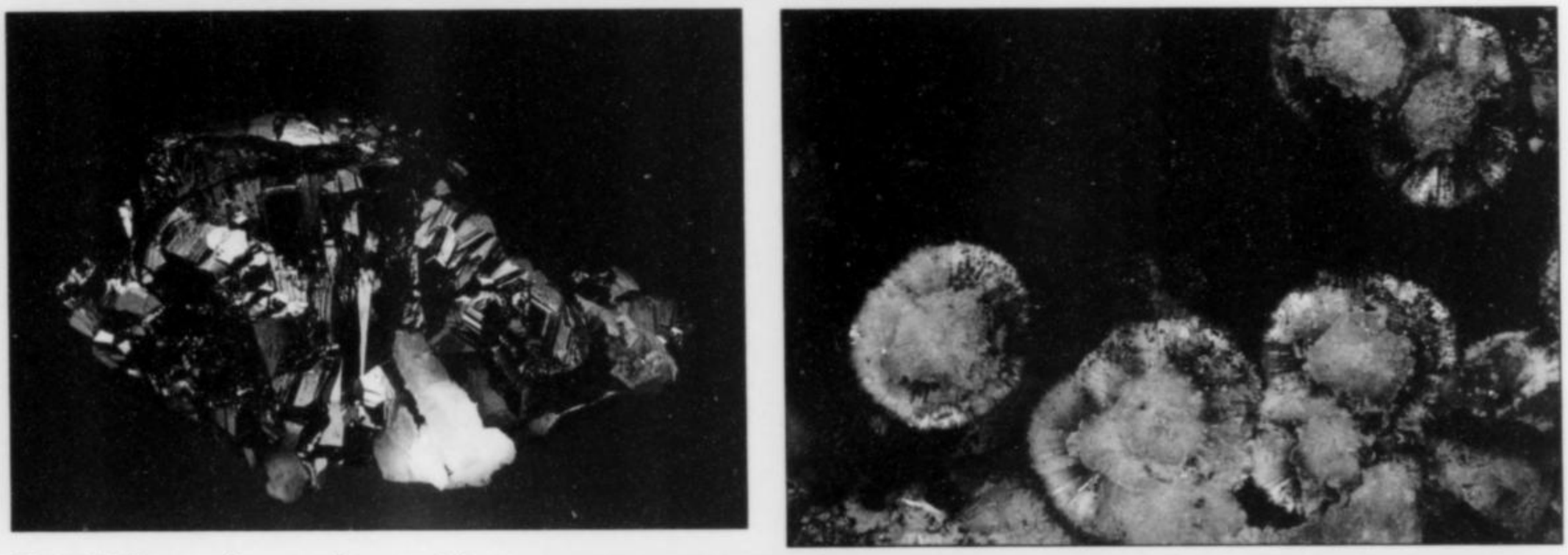


Figure 26. **Pyrargyrite crystal group, 6.1 cm, from Fresnillo, Zacatecas, Mexico. Dave Bunk specimen; J. Scovil photo.**

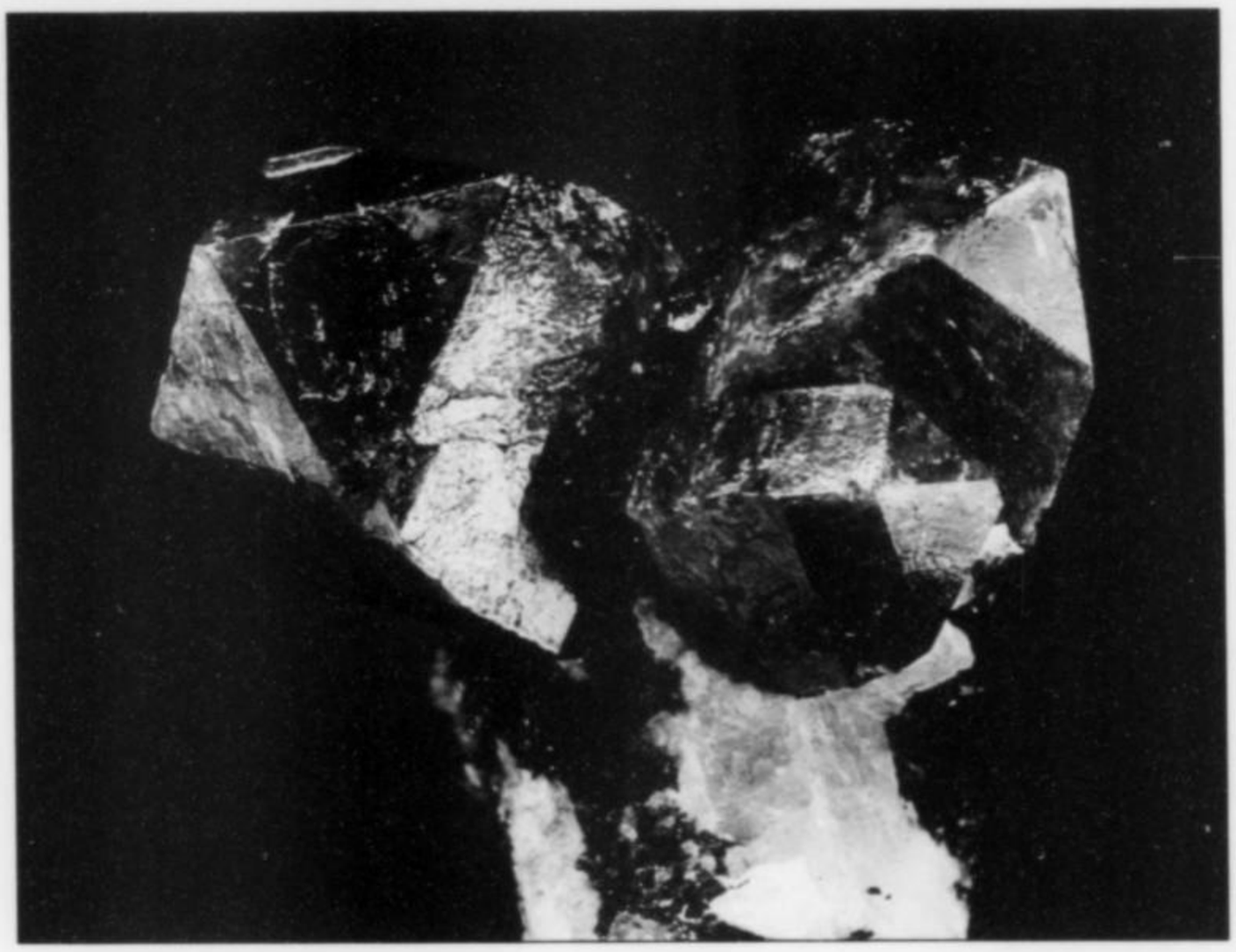


Figure 27. **Zircon crystal group, 4 cm, from the Alta Fjord, Seiland Island, Finnmark, Norway. Evan Jones collection; J. Scovil photo.**

cloudy white **variscite** and occasional colorless **wavellite** crystals (to 1 mm) in vugs in **cassiterite/quartz** matrix. Hunanui has also been the source of a number of other fine specimens, available from Alfred, Rock Currier (*Jewel Tunnel Imports*) and others: large **vivianite** crystals; superb large (to 4 x 4 cm) parallel groupings of lime green **ludlamite** crystals on **pyrite**, **siderite**, and **vivianite** matrix; lustrous **ferberite** V-twins (to 15 x 15 cm) and several specimens (to 7 x 5 cm) of openly branched **cronstedtite** crystals (to 5 mm) on matrix were also offered. "Herkimer diamond"-like **quartz** crystals to 1.5 cm from Rincon de Tigre, north of the Ani mine, in eastern Santa Cruz Department were also available. These crystals often contain three-phase fluid inclusions (to 5 mm) with small movable bubbles (to 0.5 mm) and granular to branching black unknown solids of similar size, which have been arbitrarily called "hydrocarbon." Large, cloudy to translucent brown rhombohedral **siderite** crystals (to 7 cm) studded with bright octahedral **pyrite** crystals (to 3 mm) from the Colavi mine, about 50 km from Potosí, were also noted. **Krutaite**, **chalcomenite**, **kerstenite** and other rare selenium minerals from the El Dragón mine, Potosí, continue to be available, and at the 1995 Tucson Show, both Rock Currier and Gary Nagin (*Crystal Springs Mining Company*, P.O. Box 40, Royal, AR 71968) had a large supply of new **vivianite** specimens from the famed locality at Morococala, Oruro Department.

Both Alfred Petrov and Bob Jackson (P.O. Box 2652, Renton, WA 98056) report that a new find of "**ametrine**" crystals (purple and yellow quartz) has been made at the Ani mine (also seen spelled "Anahi"), in extreme eastern Santa Cruz department. Most of the crystals, which occur up to 10 cm, are highly etched and may have prominent but irregular {0001} faces. The nearest town, Corumba, is in another country (Matto Grosso, Brazil), and has frequently appeared on collector labels, but only the locality in Bolivia, which extends over several kilometers, is known to have yielded specimens (see *Mineral News*, **10**, No. 6, 1–2).

BRAZIL

With all the gem pegmatites and numerous other working mines in Brazil, we seldom hear about minerals collected from roadcuts. At least one such new occurrence came to light at the 1995 Tucson Show, as attractive cinnamon-brown crystals of **heulandite** (*Valadares Minerals*, Rua Capote Valente, 513, Ap. 133 CEP 05409 Pinheiros, Sao Paulo, S.P., Brazil). The crystals, which range in size from 0.5 to 2 cm, occur in celadonite(?)-lined vesicles in basalt, resulting in specimens with a pleasing contrast. The occurrence is reported to be in a flood basalt similar to those found in Rio Grande do Sul, but in the State of Paraná, near Pato Branco. Also new from *Valadares Minerals* were some truly remarkable transparent **gypsum** crystals (to 30 cm) on amethyst geode sections from the Irai district, Rio Grande do Sul, and gemmy color-zoned crystals of **kyanite** from an unspecified locality in Goiás.

Dr. Reinhard Wegner (Universidade Federal Da Paraiba, Dep. de Mineração, 58.100 Campina Grande, Paraiba, Brazil) has recently obtained a quantity of **chrysoberyl** crystals in mica schist from one of the emerald occurrences near Carnaiba, Bahia. The crystals are very sharp and up to 3 cm, but have a dark charcoal-gray color, probably due to inclusions. Virtually all are textbook examples of cyclic twins, and show the alexandrite effect along their edges.

Luiz Menezes (761 Rua Andre Cavalcante, Belo Horizonte 30430-110, Brazil) has reported a number of new finds in Minas Gerais. Dark bluish green **amazonite** crystals (to 20 cm) have been found at Santa Maria de Itabira. The locality was discovered in 1990, but production really began in 1994. The amazonite, which is of lapidary grade, is mostly being recovered from a pegmatite in gneiss. Interesting accessory minerals include **phenakite** and **euclase**, as 2–3 mm crystals, and a fairly large amount or orange-brown **humboldtine**. The humboldtine is entirely natural and not the result of any chemical treatment of the specimens. The Golconda mine, near Governador Valadares, has produced a pocket of gemmy, plumose, brush-like **indicolite** crystals (to 8 x 2 cm). Green **tourmaline** crystals with small **pyrite** crystals (to 2 mm) sprinkled on their ends, as well as **schorl** crystals with fibrous terminations are being found at São Jose de Pederneira. Bara do Salinas is producing pastel bicolored **elbaite** "scepters" (to several cm) as well as pastel rubellite crystals. Some exceptional black **dravite** crystals (to 4 x 10 cm) with minor chlorite/biotite schist matrix have been coming from an outcrop near Souza. Brilliant, though small (to 1 cm), V-twinned crystals of red **rutile** are coming out of a small mine near Diamantina. The mine can only be worked in the rainy season, as the crystals require an abundant water supply for their efficient recovery from the sandy/muddy debris in which they occur. Large numbers of transparent, imperial-color **topaz** crystals (generally less than 5 cm) are being found at the Rodrigo Silva area near Ouro Preto. In addition to specimens from these finds, Luiz also has a large selection of colorless **euclase** crystals with central blue stripes to 1 cm from Ecuador, Rio Grande do Norte.

Also new are some very noteworthy specimens of secondary phosphate minerals. Excellent specimens of bright pink **hureaulite** crystals have been found at both Conselheira Pena, and at the Criminoso mine, north of São Jose da Safira, Minas Gerais. The former are associated with a well-crystallized, gray **reddingite-like mineral**, **triphylite**, **vivianite** and **frondelite**, and are available from both Luis Menezes and Carlos Barbosa (Rua Cel. Roberto Soares Ferreira 586, Bairro Vila Bretas, 35030 Governador Valaderes, Minas Gerais, Brazil). The latter are available from the *Rocksmiths* and are associated with rich **barbosalite**, **rockb~idgeite**, **vivianite** and other minerals. Both lots of hureaulite are among the best for the species we have seen in a long time.

Carlos Barbosa reports that the Brumado mine, Brumado, Bahia, has recently produced greenish gray calcian **dravite** crystals to 8 cm. These form symmetrical six-sided prisms with simple three-sided pyramids. The larger crystals are frequently intergrown in jackstraw arrangements, sprinkled with small **magnesite** crystals. Some very steep-angle **dolomite** rhombohedra to several cm have also been recovered, as have some superb centimeter-sized crystals of yellow-brown **florencite-(Ce)**. Carlos also reports that Linopolis is producing many **brazilianite** crystals (to 5 cm) as well as **eosphorite** and **triphylite** gemmy enough to be cut into

flawless 0.5 ct gems. From Divino de Laranjeiras, Linopolis, are some fascinating hollow pseudomorphs of drusy to granular white **adularia** after **eosphorite** (to 3 x 7 cm in clusters to 20 cm). A few pale pinkish tan **rhodochrosite** crystal clusters (to 2 cm) were found on silvery to bronzy **lepidolite/zinnwaldite**-coated **cleavelandite** (albite) from Agua Roa, Minas Gerais. **Xenotime-(Y)** as single gemmy crystals (to 7 mm) with acicular inclusions have been found at Piata, and subparallel groups of cloudy brown crystals (to 1 cm) have come from Ibiajara, both in the state of Bahia. There has been a considerable quantity of lilac to blue **fluorapatite** crystals available from the Golconda pegmatite, near Governador Valedares, and some transparent prismatic **phenakite** crystals with complex terminations (to 1 cm) from Carai, Minas Gerais.

Quartz is such an omnipresent species that new localities, especially prolific ones, can easily come and go without notice. Luiz Menezes has had a wide selection over the past two years. Last year his "Cathedral" quartz crystals from the Jaboti mine, São Geraldo do Baixio, Minas Gerais, went unnoticed by reporters, but not collectors. The essentially flawless crystals (to 10 cm) frequently show prisms faces sutured by multiple secondary crystals in pseudo-parallel growth. Very large *s* faces (over a cm) and occasional small *x* faces present a habit which the uninitiated would declare to be Swiss in origin. A number of the crystals are almost featureless but for the edge intersections of the faces themselves, and show the uniform delicately smoky color to which even the specialist would feel comfortable in assigning an alpine Swiss origin.

Luiz also had some interesting parallel-growth pale smoky tabular **quartz** crystals from the Macaco mine, also in Minas Gerais. These very bright, almost unstriated crystals (to 15 cm) sometimes have secondary colorless quartz overgrowths in parallel position on the edges and tips of the host crystals. Some multiply terminated, yet very smooth-faced, equant, pale, smoky quartz crystals (to 5+ cm) were also produced from the Macaco mine, a few with dark smoky stripes parallel to and next to crystal edges. Other specimens appear to have formed as overgrowths on crystal shards, yielding most unusual shapes. Rock Currier recently obtained some new faden **quartz** crystals from Diamantina, Minas Gerais. The colorless, cloudy to transparent crystals (to 10 cm) are typically tabular, sometimes with a curved habit and multiple terminations, and show irregular internal "threads" transecting the crystal where regrowth occurred.

Ely F. de Souza (Rua Pedro 1, No. 7 - Gr. 607, Rio de Janeiro) has recovered some new **beryl** crystals in jackstraw clusters from his Mimoso do Sul mine in Mimoso do Sul county, Minas Gerais. Complex rhombohedral **phenakite** crystals (to several cm) have been found in association. Additionally, more green and blue gem beryl crystals (to 7 cm) with unusual modifications and jackstraw clusters of simple hexagonal aquamarine crystals (to several cm) on **microcline** crystals (to 15 cm) have been found. The mine has also yielded some new, clear **topaz** crystals in parallel growths (to 12 cm), as well as reddish purple spheroidal **lepidolite** specimens (to 20 cm). Spheroidal lepidolite has also recently been found at Jose do Linto, Itinga, Minas Gerais.

Some very large morganite **beryl** crystals (to 25 kg!) have been found at Resplendor, a locality already famous for its huge gem spodumene crystals. Several only slightly smaller crystals (to 30 cm) on and off matrix show a pleasant peachy orange color, which is usually photosensitive and bleaches to pure pink. Morphologically, the crystals resemble those from Corrego do Urucum, though some may be more complex. Specimens are available from *Váladares Minerals*. The Resplendor mine has also produced a number of **schorl** crystals to 20 cm, many of which are completely overgrown with medium purple tourmaline.

For those interested in rare species, indium minerals are always certain to raise an eyebrow or two, especially if they are new. Geochemically, indium is often associated with tin, and the Goiás Tin Province has recently produced the eighth known indium-dominant species, **yanomamite**, a hydrated indium arsenate. The mineral occurs as yellow-green crystals and grains associated with **scorodite** in quartz-topaz greisen at the Mangabeira tin deposit in Goiás (see the *European Journal of Mineralogy*, **6**, 245–254 for a complete description). A small number of specimens have been available from Luis Menezes.

Another rarity recently available from Luiz is some exceptionally large (5–6 mm) crystals labeled as "georgechaoite" from Pocos de Caldas, Minas Gerais. This identification, which, in good faith, was based on a strong potassium peak in the qualitative EDS X-ray spectrum of the mineral, has subsequently been found to be in error. Full quantitative microprobe analyses done on these and similar specimens from the locality have shown that, while present, K never exceeds Na in the unit formula (R. A. Gault, personal communication). Therefore the species is **gaidonnayite** rather than georgechaoite. Though perhaps not as rare as georgechaoite, the gaidonnayite crystals are certainly spectacular nonetheless.

Lastly, we have noted a number of **"cookeite"** specimens from Brazil have recently reached the marketplace. Few if any of these have been positively identified. Cookeite, although micaceous, does not particularly look like a true mica, and is actually a chlorite-group mineral. It almost always forms in radial botryoids. Likewise, more and more of what are probably muscovite specimens are being sold under the seemingly more desirable name, lepidolite.

CANADA

Most of the new mineral discoveries in Canada this year seem to have been made either in the far north, the western provinces or in Québec. Certainly the most potentially interesting and economically important new find in Canada has been the new **diamond** occurrences in the Northwest Territories. Most of the activity has centered around Lac de Gras, approximately 300 km northeast of Yellowknife. To date, over 75 kimberlite pipes have been discovered, and 35 of these have been shown to contain diamonds. Most found so far have been small and of industrial grade, though several gem-quality crystals in the 2–4 carat range have been reported. While it will certainly be a few years before any

mines come into production, every indication suggests they will. Whether any diamond crystals from these mines will ever reach the collector market is, of course, another question.

One of the important new finds is the **spinel** crystals from near MacDonald Island, Northwest Territories. The lustrous black crystals are probably among the most complex large crystals of spinel known from North America. The specimens, which were collected by Brad Wilson (*Alpine Gems*, P.O. Box 352, Kingston, Ontario, Canada K7L 4W2), for the most part consist of clusters of gray-white pyroxene crystals studded with sharp, dark blue-black crystals of spinel commonly 1–3 cm (though much larger crystals have been found). The deposit lies in a skarn, and most of the specimens have been developed by acid dissolution of enclosing calcite, so that there is minimum damage to the crystals. Additional specimens are available from Gilles Haineault (2266 St-Alexandre, Longueuil, Québec J4J 3T9) and *Tysons' Minerals.*

The Tysons also have more newly collected Yukon phosphates (particularly some very fine **whiteite**, **collinsite** and **wardite**) as well as some new pale yellow-green gemmy **fluorapatite** crystals and velvety black **dravite/schorl** specimens from the Scepter claim near Emerald Lake, Hess Mountains, Yukon. This locality is well-known for its large sceptered smoky **quartz** crystals. Other new items of interest from Tysons' include some **gypsum** crystals from near Hines Creek, Alberta, which occur as simple prismatic and pinacoidal crystals and as "fishtail" twins to 20 cm long; pistachio-green **epidote** crystals (to 1 cm) on quartz crystals from Saward, British Columbia; more excellent **magnesite** and **dolomite** crystals from Mount Brussilof, near Radium, British Columbia; and more of the branching groups of stacked, white cubic **halite** crystals from Rocanville, Saskatchewan.

Mark Mauthner of the University of British Columbia reports that some good specimens of **cobaltite** from the Merry Widow mine at Benson Lake, near Port McNeil (on Vancouver Island, British Columbia) were collected in the fall of 1992 by Don Graham of Vancouver. These consist of brilliant silvery cuboctahedral crystals up to nearly a centimeter, associated with magnetite skarn. Specimens are being marketed through the *Collectable Earth* shop at UBC's Williams Geological Museum (6339 Stores Rd., Vancouver, B.C. V6T 1Z4), Tysons and others.

Elsewhere in British Columbia, Brad Wilson reports that good smoky **quartz**, **spessartine** and **beryl** specimens have been found in pegmatites in the Passmore area; gem-quality **opal** has been found near Vernon; and a small amount of gem-quality, bronze-colored and blue-gray **corundum** has been recovered from the Blu Starr mining claims in the Slocan Valley. These localities are all currently under claim, though the opal mine may be open to collectors on a fee basis (contact *Okanagan Opal Inc.*, P.O. Box 298, Vernon, B.C. V1T 6M2 for information). Brad has also recently informed us that colorless Japan-law twinned quartz crystals up to 5 cm have been coming out of the Slocan area, and large smoky **quartz**, **microcline** and **amethyst** crystals have been found on Dunn Peak, south of Clearwater, British Columbia. **Pyrostilpnite** as submetallic red scales and crystals (to 1 mm) has been found at the Van Silver claim near Whistler, and **rucklidgeite** has been found with quartz from Bear Mountain, near Harrison Lake, Hotsprings (both available from Steve Pullman).

In Québec, continued quarrying at Mont Saint-Hilaire has produced good specimens of **genthelvite**, **sodalite** (hackmanite), **catapleiite**, **natrolite**, **analcime** and **sugilite**. Perhaps the most noteworthy of these are the sodalite and sugilite, which were collected by Gilles Haineault in the spring and early summer of 1994. The sodalites consist of sharp dodecahedral crystals to 3 cm in groups up to nearly 10 cm. Most of the crystals are encrusted with drusy albite, but their interiors are glassy yellow. The sugilites were found in a marble xenolith associated with pectolite. The crystals may be the world's largest (up to 2 cm!) and look like a hexagonal bipyramid of rose quartz. Regrettably, only a few of these were found. For the species collectors, continuing research on the long list of unknowns from Mont Saint-Hilaire has resulted in the description of two more new minerals. **Gaultite**, a hydrated sodium-zinc silicate, has been named for Robert Gault, Research Assistant at the Canadian Museum of Nature, in recognition of his many years of dedicated work on the minerals of the locality. At present the holotype is the only known specimen. (For a complete description of the mineral, see *Canadian Mineralogist*, **32**, 855–863.) The second new species is **petersenite-(Ce)**, which was named for Ole Petersen, curator of minerals at the Geologisk Museum, Copenhagen, Denmark, for his many contributions to the understanding of alkaic syenite minerals (see *Canadian Mineralogist*, **32**, 405–414).

Elsewhere in Québec, some very good transparent **quartz** crystals have been mined at the Mines Cristal Kebec (formerly known as the Adams farm prospect) near Lawrenceville. The Parker mine near Notre-Dame-du-Laus has again been worked, yielding some very fine **spinel** and **forsterite** specimens. Specimens from both these finds, as well as an excellent selection of **cubanite** crystals from the Henderson mine, Chibougamau, have been available from the *Great Canadian Mineral Company.* Great Canadian has also recently collected some quite nice specimens of **"stilbite"** (presently unanalyzed) associated with **chabazite**, **heulandite** and occasional **mesolite (?)** from a series of relatively new roadcuts on the Maniwaki-Temiscamingue road approximately 24 km northwest of Maniwaki, and 2–4 km west of the entrance to the ZEC Bras-Coupé-Desert. These minerals occur in a mineralized fracture zone in Grenville metasediments, and are among the best zeolites yet found in such a paragenesis. Some of the "stilbite" bow-ties and spheres are up to 3 cm and quite aesthetic. A paragenetically similar occurrence for fluorescent **chabazite** near Bancroft, Ontario, is described by Schlachtman in *Mineral News* (**11**, no. 1, p. 4). In the eastern townships area of the province the B.C. asbestos mine at Black Lake, has produced more good chromian **grossular** specimens, while the Jeffrey mine at Asbestos has produced more small but nice **grossular** (hessonite) specimens and a few small, exceptionally dark, emerald-green chromian **vesuvianites**. A limited number of these have been available from *Tysons'*.

As if Québec didn't already have enough incredible minerals, on June 14, 1994, it was blessed with even more, as

the St-Robert **meteorite** touched down at 00:02 UT. Many people witnessed the fall both visibly and audibly, though perhaps the first to actually "find" a piece of the meteorite was a group of not-so-contented cows encircling a small impact hole in their pasture near St-Robert de Sorel east of Montréal. The first two people on the scene, Stéphane and Serge Forcier, removed a specimen about ten minutes later. It now resides in the National Meteorite Collection at the Geological Survey of Canada. Since then, about 20 more pieces have been found.

Other noteworthy discoveries in Canada include the recovery of a quantity of well-formed crystals of green **tremolite** (electron microprobe analysis gives $Trem_{.92}Act_{.08}$) from a roadcut on highway 28 near Hardwood Lake, Ontario; the occurrence of sharp, well-formed crystals of **lithiophosphate** to 2 cm at the Tanco pegmatite, Bernic Lake, Manitoba; a continuing but very limited supply of extremely lustrous, sharp **galena** crystals from the Polaris mine at Polaris, Little Cornwallis Island, Northwest Territories (available from *Tysons'* and *Alpine Minerals*); and the rare platinum mineral **insizwaite** from the Strathcona mine at Falconbridge, Ontario has been reported by Roger Poulin (3171 Romeo St., Val Caron, Ontario, Canada P3N 1G5).

Other new mineral species recently described from Canada include several new borate minerals from the Salt Springs potash deposit, Sussex, New Brunswick: **trembathite**, **pringleite** and **ruitenbergite** (*Canadian Mineralogist*, **30**, 445–448 and **31**, 795–800); and **harrisonite**, a new Ca-Fe silicate-phosphate mineral from Arcedeckne Island, Northwest Territories (*Canadian Mineralogist*, **31**, 775–780). Most of these species exist as millimeter-sized crystals and grains in thin sections, and are generally unavailable on the collector market.

CHILE

Certainly one of the highlights of 1993–1994 is the **szenicsite** from Tierra Amarilla. Overshadowed by the szenicsite, however were some remarkable **powellite** crystals (to 0.5 cm) from the same find. Habits and colors varied from very steep, pyramidal, honey-yellow crystals through low-angle pyramidal crystals with a yellowish green to olive-green color. Skip and Marissa Szenics, who collected these, also found some excellent tabular **antlerite** crystals (to 3 mm) at the Santa Catalina mine, Sierra Gorda, Antofagasta, as well as some new and very fine miniatures of dendritic **copper** crystals from the Manto Cuba mine, Inca del Oro. Another recent find by the Szenics' is an important discovery of bright yellow **seeligerite** in veinlets to several mm thick from the San Francisco (formerly Beatrix) mine, Sierra Gorda. The seeligerite, along with bright blue **lavendulan**, green **paratacamite** and blue **boleite**, was collected by Terry Szenics. Specimens of these minerals are being offered by *Aurora Minerals* (16 Niagara Avenue, Freeport, NY 11520).

Specimens of the rare iron tellurite mineral **rodalquilarite** have been available from Jim McGlasson. These are sharp, glassy, olive-green, terminated microcrystals from the Wendy pit, Tambo, Coquimbo district. Jim has also had some very good **quartz** encrustation pseudomorphs after enargite from El Indio, Coquimbo department. The groups of 4-cm crystals are quite sharp, showing well the former prismatic crystal habit of the enargite. Another new material from Chile is some very attractive drusy **quartz** on chrysocolla from Inca de Oro. The specimens, which consist of colorful vug linings in gossan, are available from Luís Leite (Ave. 25 de Abril, #50 3.º Esq., 2800 Almada, Portugal).

CHINA

Zheng Jian-Rong (*Hunan Natural Mineral & Artcrafts Shop*, 75 Renmin Rd., Changsha) has a large variety of new finds from Hunan. Most popular with customers have been the large groups of transparent, dark blue **fluorite** crystals (to 3 cm) showing a parquet-like growth of cubes. Clusters to 20 cm have been available, though most are about 7 x 10 cm. Some very large **calcite** groups were also found. The milky tan calcite crystal aggregates resemble stacks of Chinese peasant hats to 15 cm across and 30 cm high. Probably the most significant of new finds, however, are the doubly terminated **cassiterite** crystals (to 10 cm!), and gemmy orange **scheelites** associated with tabular aquamarine **beryl** crystals that are coming out of Hunan. Another new item to watch for is the **diamonds** in matrix from Mengyin, Shandong Province. Most of the crystals we have seen so far have been small (1–2 mm) but are clearly visible against the darker colored matrix. Habits vary from distorted octahedra and macle twins to somewhat rounded and flattened multifaced crystals. It is rumored that colorless to pale yellow cloudy diamonds to 1 cm have been found.

At the 1995 Tucson show, Scott Williams (211 N. Penn, Oberlin, KS 67749) had tan to pinkish brown **armstrongite** and masses of brick-red **elpidite** in matrix from Han-Bogdo in the central Gobi Desert of Mongolia; and there is still a good supply of fine **realgar**, **orpiment**, **stibnite** and other Chinese minerals available from the Rocksmiths, Doug Parsons (1119 S. Mission Rd., Suite 243, Fallbrook, CA 92028), Mike Bergmann (*Galena Rock Shop*, 713 S. Bench St., Galena, IL 61036) and others.

COMMONWEALTH OF INDEPENDENT STATES

There has been a continuing supply of interesting new minerals pouring out of the former Soviet Union, and it is nearly impossible to see and account for all that has been "new" to the western marketplace. The following descriptions include only those minerals that were brought to our attention or we happened to notice. By no means is the list exhaustive.

Among a few of the new items available from Brad Van Scriver (*Van Scriver-Pljaskov Minerals*, P.O. Box 10, 19900 Prague 9, Czech Republic) are some very attractive, spheroidal, orange **stellerite** from the Sarbayskaya quarry, near Rudniy, Kusteni Oblast, North Kazakhstan Republic; orange **scheelite** and black to yellow **cassiterite** from the Iliutin mine, Iliutin, Chukotka Region, Magada Oblast, East Siberia; superb **bornite** and **chalcocite** crystals to 2 cm on matrix from Mine no. 57, and dendritic groups of native **copper** crystals to 5 cm from the Akchiyspaskiy mine, both

in the East Dzezkazgan mining area, Dzezkazgan, Dzezkazgan Oblast, Kazakhstan; gemmy green prismatic **dravite** crystals to 4 cm from the Mikhaylovskoye mine, near Krasniy Chikoy, Chita Oblast, Russia; some remarkable, sharp *crystals* of **platinum** to 5 mm in aggregates to 1 cm from Konder, near Nelkan, Ajano-Maiskiv region, Khabarovskiy Kray, Russia; lustrous smoky **quartz** crystals to half a meter in length from the Dodo mine, near Saranpaul in the Polar Urals; 3-cm octahedral brown to reddish **pyrochlore** crystals from the Tatarka River, Tatarka Massif, Enisey region, Krasnoyarskiy Kray, Siberia; excellent **bobierrite** with **collinsite** from Kovdor, Murmansk Oblast, Kola Peninsula, northeast Russia; and groups of very lustrous octahedral **magnetite** crystals from the Sokolovsko-Sarbayskaya mine, near Tobal River, near Rudniy, Kusteni Oblast, North Kazakhstan Republic.

Lustrous, sharp **cassiterite** crystals to 2 cm on mica from Chabarovsk Prymorie, southeast Russia, were available from Rene Triebl (*Top Minerals International*, Rudolf Haweig 21, A-2700 WR Neustadt, Austria) at the Tucson Show, as were literally thousands of superb specimens from Dal'negorsk from András Lelkes (Hercegpirmás u. 11, H-1051 Budapest, Hungary) and others too numerous to mention. Volker Betz (Seifer Weg 2, D-6204 Taunusstein-Orlen, Germany) had some unusual, doubly terminated, dark brown **eosphorite** crystals (to 4 mm) sprinkled on feldspar, associated with small "pineapple" clusters (to 3 mm) of **quartz** from Urgursay, Kazakhstan; and **fraipontite** from Kugitang-Tau, Turkmenstan. From the Urals, were masses of nearly pure scaly **paragonite** from Slyudorudnik, Vyshtym; **pecoraite** from Tscheremschanskoe; **sonolite**, **alleghanyite**, **rhodonite**, and **alabandite** from Inyltschek, Kyrgy; **tobermorite**, from Bazherovskoe; **sellaite** from Suranskoe, Bashkirien; and **clintonite**, from Shishimskie Gory. Other material included massive **bavenite** (to several cm!) with **epidote** from Kalisay, Kyrgzien; **milarite** from Ermakovskoe, Buryatien; and sharp **nepheline** crystals (to 1 cm) frozen in matrix with well-formed **eudialyte** crystals and **aegirine** from Alluaiv, Lovozero massif, Kola Peninsula.

Jaroslav Hyrsl (KARP, Herverova 222, 28000 Kolin, Czech Republic) had specimens of wire silver from a new locality near Bet-Pak-Dala, Kazakhstan. The wires form curls and loops to 4 cm, with minor quartz and carbonaceous matrix different in appearance from the Dzezkazgan silvers. Some excellent **pearceite** crystals (to 5 mm) have been seen from the Sarbayskoe mine, near Rudnyi city. These typically occur as isolated crystals on fracture surfaces, and are sometimes associated with **stibnite**. Specimens of purple **scapolite**, which last year were mistakenly called "ussingite," are now being offered by several dealers as coming from Kuk-i-Lal, Tadzhikistan. Of particular interest to zeolite collectors was a find of transparent wedge-shaped and apparently twinned **amicite** crystals (to 2 mm) thickly intergrown with pale green transparent **natrolite** crystals (to 5 mm) with **aegirine** from Kukisvumchorr, Chibiny, Kola Peninsula. For wulfenite collectors, the Moscow Academy for Geological Prospecting (Mikluho Maklaya 23, 117 Moscow, Russia) had small, but very interesting orange-red **wulfenite** crystals from Sidjak, Uzbekistan.

Talnakh, Noril'sk, Siberia, is continuing to supply fine **sperrylites**, and some new complex **gold** crystals (to several mm) in clusters to nearly a cm have been found in milky **quartz** from Usnyera, Yakutia. Also new from Noril'sk is a white fibrous mineral that occurs in botryoids up to 1 cm, associated with blocky, colorless to mint-green **fluorapophyllite** crystals to 5 cm. The botryoids are a mixture of **pectolite and okenite**, and the material has been called "pectokenite," by some collectors. Other new items from Talnakh include crude columnar **wurtzite** crystals to 2 x 3 cm, embedded in **anhydrite**, orange **stilbite**, **prehnite**, and other minerals. Petr Korbel (Vysokoskolská 488/8, 165 00 Praha 6, Czech Republic) had a supply of polished and chemically analyzed ore samples from Talnakh, containing such rare species as **paolovite**, **geversite**, **talnakhite**, **froodite**, **maslovite** and **polarite** among others.

The Fersman Mineralogical Museum (18-2 Leninsky Prospect, Moscow 117071) distributed some mint-green **andradite** crystals (to 3 mm) on parallel plumes of white **diopside** crystals (to 3 mm) in veinlets in serpentinized norite from Tchukotka, Russia. Additional minerals included bright black **loparite** twins (to 8 mm) in aegirine-eudialyte syenite, and black veinlets (to 2 mm thick) of **schneiderhöhnite** in **muscovite** from the Keivy pegmatite, Kola peninsula. Of particular interest were minerals from the Saranovskii mine, Saranui, Urals. Collectors will highly prize the yellow-green chromian **titanite** crystals (to 1+ cm) on pleochroic red-green chromian **clinochlore** crystals (to 1 cm) lining fractures in chromite matrix. The bright, frequently doubly terminated clinochlore crystals are probably among the most important chlorite finds in recent memory. The clinochlore crystals occur both as rosettes and pagoda-like individual crystals with few of the typical vermiform aggregates which otherwise characterize the species. Additionally, bright lilac to purple chromian **amesite** crystals (to 4 mm) were available in nearly pure groups (to several cm), sometimes with associated **titanite** or **clinochlore**. Although most of the amesite crystals have cleaved ends, a few show tapered trigonal step-growth terminations, frequently with colorless terminal zones. Terminated sapphire-blue to blue-gray **kyanite** crystals (to 6 cm) in biotite-almandine gneiss were available from Hit-Ostrov, Karelia, as were tabular **corundum** crystals (to several cm) from Ilmankie Mountains, South Urals. Gemmy (with 1–2 carat gemstone potential) Baveno-twinned **microcline** crystals (to 6 cm) were seen from Udatcha, Kovdor massif, Magadan Region, and William Pinch acquired an exceptional 6-cm sharp **forsterite** crystal embedded in pale yellow granular apatite from the Kovdor mine, Kola Peninsula. A few dealers in addition to the Fersman Museum had specimens of terminated white **hambergite** crystals (to 2 cm), both on and off matrix, from Kukurt, eastern Pamir, Tadzhikistan. The museum reported that a selection of well-crystallized fumarole minerals are being found on the Tolbachek volcano, Kamchatka. They were also offering specimens of a new but as-yet unnamed **rhenium sulfide** mineral from a fumarolic deposit associated with the Kudriavy volcano on the northern tip of Iturup Island in the Kuril Island Arc; the material consists of brilliant metallic gray-white microcrystals and flakes on volcanic

cinder (see *Nature*, **369**, 5 May 1994, p. 51–52). A number of rare telluride minerals have also been available from the Fersman Museum, and include rich, nearly pure, massive black **coloradoite** specimens (sometimes to over 1 kg) associated with massive **hessite**, **petzite**, and occasional **calaverite** from Kochbulak, Uzbekistan. Finally, the Fersman had a unique specimen of pure black **opal**. The genuinely black opal, which resembled a hydrocarbon and was opaque on thin edges, occurred *in a pegmatite* near Volyn, Ukraine.

Rare species collectors have also enjoyed a steady flow of new material. Many of these are from the Kola peninsula, and are due to the efforts of A. Voloshin and A. Khomyakov. The list includes **bismutocolumbite**, **bystrite**, **cancrisilite**, **crawfordite**, **hydroxycancrinite**, **manganotychite**, **mega-cyclite**, **mineevite-(Y)**, **rimkorologite**, **schomiokite-(Y)**, **sitinakite**, **tiettite** and **tounkite**, among others. Collectors should be warned, however, that there are a number of other new mineral "species" being offered for sale from the C.I.S. that *have not been approved as such by the I.M.A.*, so be careful! It should probably be pointed out that much of the Russian "liddicoatite" seen on the market may be rather indiscriminately labeled. Most of the rubellites from Nertchinsk (now called Chita) that have so far been studied are calcian **elbaites**. The Malchan pegmatite field (also called Kraznoy Chikoy) apparently does produce genuine, but sodian, **liddicoatite**. It must be remembered that the tourmaline group comprises a number of complex solid-solution-series minerals, and without complete chemical and/or structural data it is impossible to know for sure which species is present.

CZECH REPUBLIC

Goldmanite occurs as 1–2 mm crystals in a silicate and sulfide matrix at Tetetice, Klatovy, and **liddicoatite** has been identified as color-zoned (pink rim/brown core) crystals to several mm at the Blizna graphite mine, Blizna, Bohemia (Jaroslav Hyrsl, unpublished data). Another uncommon mineral noted from *KARP Minerals* is **isokite** from Horni Slavkov. This occurs as white-to-pale tan, powdery coatings on stained **triphylite**, giving one the feeling that much more isokite than we realize is probably in the world masquerading as earthy "apatite."

Transparent crystals of **aragonite** have been found once again at Norenec bei Bilin, northern Bohemia. Because they are being dug from a decomposed surface vein (approximately 500 m distant from the classic occurrence), most of the crystals are etched. About 2–3 kg of partially facetable material have been recovered, and some pieces could yield stones to over 20 ct. A few well-terminated crystals were found.

FINLAND

Some very rich native **antimony** specimens consisting of coarse, granular, interlocking cleavage masses to 10 x 12 cm were available from Dr. Jochen Hintze at the 1994 Denver show. Dr. Hintze explained that these are only occasionally found, and occur as glacial boulders near Seinajöki. Also of interest, and undoubtedly of greater economic concern, is Ashton Mining's recent discovery of 21 kimberlites in eastern Finland, the majority of which are reported to contain **diamonds**.

FRANCE

Excellent snow-white to transparent **dickite** crystals (to 4 mm) have been found again in vugs in hornfels at the Raberjac mine, Lodev, Herault. Specimens are available from David Shannon. Dave also has a new supply of single and Carlsbad-twinned **orthoclase** crystals (to 5 cm) of terra cotta color from Ceihes, Herault, as well as **wurtzite** crystals from the Le Malenes mine. The wurtzite occurs as tightly spaced, dark brown to black hexagonal plates to 2 mm, interspersed with other tightly spaced, nearly black, blocky and somewhat asymmetrical **sphalerite** crystals (to 2 mm) coating carbonaceous hornfels. Denis Gravier (Chemin de Ronde, 01500 Ambronay, France) has acquired some excellent **zinkenite** specimens from the Serre farm area, Saint Pons, Haute Province. The crystals are a dull metallic gray, and form needle-like or bladed crystals to 1 cm, occasionally associated with slightly iridescent metallic black **chalcostibite** crystals to 1 cm on brown **siderite** crystals.

Also new from France are the new uranium minerals, **rabejacite** and **seelite**, the latter of which was named for Paul and Hilde Seel (see *Mineralogical Abstracts*, **45**, 240, and *Mineralogical Record*, **24**, 463–467). Both come from Rabejac, Herault, and are available from the *Excalibur-Cureton Company.*

GREAT BRITAIN

The Boulby mine, Loftus, Cleaveland, Yorkshire, has continued to produce more of the remarkable pale blue-green **boracite** crystals. Jim Walker and Mary Fong-Walker (*Ikon Minerals*, P.O. Box 2620, Fallbrook, CA 92088-2620) have had some excellent specimens available. The classic locality for crystallized **gold** at Hope's Nose, Toquay, Devon, has reportedly produced a limited number of new specimens, some of which have been available from Don Edwards (*Tideswell Dale Rock Shop,* Commercial Road, Tideswell, Derbyshire, U.K.) and Peter Lyckberg (P.O. Box 25147, S-40031 Göteborg, Sweden). In Wales, large, lightly etched scalenohedral **calcite** crystals composed of stacked rhombohedrons have been found at Taffs Wells quarry, near Cardiff. Specimens are available from *Tideswell Dale Rock Shop.*

GREECE

Among numerous other beautiful specimens that were available from Victor Yount (Route 3, Box 250, Warrenton VA 22186) over the past year, were some new **aragonites** from Soúnion, south of Lavrion (Laurium), Greece. These consist of pale blue on white coralloid growths ("flos ferri"), and are extremely aesthetic specimens. Greece has also recently produced some exceptional amber-colored and deeply striated pyramidal crystals of **wurtzite** (to 3 mm) in vuggy wurtzite matrix from Agios, Philippos. These are available from Mathias Rheinländer (*Mikon Mineralien*, Mathilden Str. 12, D-63065 Offenbach/Main, Germany).

INDIA

In spite of decades of activity, the quarries of the Deccan traps in and around Bombay still continue to produce new and beautiful minerals. Among these are two new lots of **prehnite** pseudomorphs: one after **laumontite** with **fluorapophyllite**, and the other after tabular poker chip-shaped **calcite** crystals. Both are from Malad, and were seen at Rock Currier's booth during the 1994 Denver Show. Both pseudomorphs consist of pale green **prehnite**, encrusting large crystals (to 10 cm) of the earlier-formed minerals, and occur as large, attractive specimens up to 30 cm. Rock has also recently acquired some outstanding green **fluorapophyllite** (in clusters to 15 cm) which is very striking in appearance, consisting of brilliant clear external overgrowths on dark green cores. Superb specimens of the more traditionally colored green fluorapophyllite crystals (groups to 7 cm on matrix) and large white **mesolite** sprays (to 20 cm) from

Ahmadnagar, are available from Gary Nagin. Also new this year are more very fine **cavansites** from the Wagholi quarry near Pune, which are available from Dr. Arvind Bhale (*Earth Science International,* Yasham' 166/1-3, Aundh Gaon, Pune 411 007, Maharashtra, India) and others. Some of the finest specimens ever seen were for sale at the 1995 Tucson Show. Some new and interesting **hematite** roses to 2 cm on drusy **quartz** have been found at the Dahisar quarry, Bombay, and clusters of green **heulandite** crystals to 8 cm have been coming from Aurangabad. Both are available from *Mountain Minerals International.*

ITALY

On a recent trip to Sardinia, Claude Begin (749 Union St., Laval, Québec H7X 1X7) obtained some very fine **gmelinite** crystals associated with **natrolite** from Ittiri, Sassari, and some world-class specimens of **ferrierite** from near Monastir, Cagliari.

Italy has also produced a number of new minerals, including **gravegliaite**, **namansilite** and **reppiaite**, which are manganese-rich minerals from Val Graveglia, Liguria (see *American Mineralogist*, **77**, 672; and **78**, 452). The namansilite (second world occurrence?) and reppiaite are available from the *Excalibur-Cureton Mineral Company.* The volcanic rocks at Grosseto have yielded another new species, **pitiglianoite**, which occurs in a single specimen as white microcrystals with **afghanite** crystals, and is not readily available (*American Mineralogist,* **76**, 2003–2008); and from Sacrofano, Campagnano, Latium, is the new species, **peprossite-(Ce)**, a Ce-La-Al borate (*American Mineralogist*, **78**, 1109), which occurs as microscopic, platy yellow crystals on rock.

JAPAN

Hidemichi Hori (P.O. Box 50, Nerima, Tokyo 176) has informed us of some interesting new finds in Japan. **Gobbinsite**, **cowlesite**, **levyne**, **stilbite**, and **chabazite** have been found on Ikezuki island, as well as Chojabaru, Iki island, both part of Nagasaki prefecture, Kyushu. **Poughite** has been found at the Kobetsuzawa gold mine, Sapporo, Hokkaido. The mineral forms pale yellow, intergranular fillings (~1 mm) in quartz ore that carries some tellurides. SEM studies have shown that the poughite forms flat prismatic crystals. **Frohbergite** (to 100 microns) has been found in the ore as well. The first discovery of **carminite** in Japan has been made nearly simultaneously at two localities: the Tsuzura mine, Miyazaki prefecture and the Kiura mine district, Ohita prefecture, both in Kyushu. The carminite occurs as microscopic crystal aggregates in veins 3–5 mm-wide in quartz and limonite. The well-known Japan-law twin **quartz** crystal locality "Narushima," Nagasaki prefecture, Kyushu, has been closed by local officials. Mr. Hori also reported that transparent **yugawaralite** crystals up to 1 cm have been found at the Kawazu zeolite location, a coastal outcropping on the Izu peninsula, near Kawazu, Shizoka prefecture. Also found at the location are **mordenite** needles in 5-cm groups and **heulandite** crystals up to 1 cm.

Well-crystallized specimens of two rare calcium borate minerals, **nifontovite** and **olshanskyite**, have been found in a skarn at Fuka, Okayama prefecture (see *Mineralogical Magazine*, **58**, 279–284). The olshanskyite occurs as pure, glassy-white, twinned microcrystals to 1 cm in length on **spurrite**, and the nifontovite as rich, gray, glassy translucent masses with rare pockets of millimeter-sized crystals. Specimens of both these minerals are available from the *Excalibur-Cureton Mineral Company.*

MALAGASY REPUBLIC

The mineral-rich island of Madagascar has always been a source of interesting specimens. Larry Venezia (115 Coleridge St., East Boston, MA 02128) has recently obtained a lot of lustrous, gemmy, equant crystals of colorless **orthoclase** from South Betroka, and a new supply of **manandonite** is available from *KARP Minerals.* The latter occurs in cavities in a pink tourmaline-quartz matrix at Antadrokomby, Sahatany, and superficially resembles rosettes of white cookeite. Recent study, however, has shown manandonite to be closely related to amesite and the kaolinite-serpentine group.

MALI

Large yellow-green to brown **grossular-andradite** crystals up to 14 cm in diameter have been found near Sandare, Nioro du Sahel, Mali. Most show good dodecahedral and trapezohedal faces, with glassy interiors that might cut small gemstones. Dark green prismatic crystals of **vesuvianite** (somewhat resembling those from the Wilui River, Siberia) and **epidote** up to 5 cm have also been found. Specimens are available from *Dave Bunk Minerals* (9240 W. 49th Ave., #317, Wheat Ridge, CO 80033).

MEXICO

If there's any truth to the old adage "it never rains but it pours," Mexico must have had a long, wet year. Maybe it's NAFTA kicking in; whatever the reason, no one can deny there seems to be a wealth of new and interesting Mexican minerals on the market. A good number of these were either found or reported by Peter Megaw (5800 N. Camino Escalante, Tucson, AZ 85718), who has many specimens available. Development work at the famous **fluorapatite**

locality in Cerro de Mercado, Durango, has resulted in the recovery of a number of interesting specimens, including octahedral crystals of **"martite"** (hematite pseudomorphs after magnetite) to 10 cm on an edge, in groups to 30 cm. Other species include dark green prisms of sodic **augite** to 3 cm, and 3–4 mm sprays of mordenite. In all, about 450 kg of specimens have been collected. At Santa Eulalia, Chihuahua, spectacular large groups of ram's horn **gypsum** to 15 cm were collected from the Bustillos mine in the west camp. Elsewhere in the district, 7-cm crystals of **arsenopyrite** in groups up to nearly half a meter, attractive plates of **amethyst**, and sharp, spinel-law twinned **galena** crystals partially replaced by **anglesite** have been found. The latter occur as crystals up to 10 cm and are from level 4 of the Purisima workings in the west camp.

Other new finds also available from Peter include sheets of native **silver** up to 40 cm, coated with purplish **bornite**, from the 16th level of the San Martín mine, Sombrerete, Zacatecas; dozens of attractive specimens showing various combinations of **quartz**, **amethyst** and **calcite** from the Valenciana mine, Veta Madre, Guanajuato; and some nice **acanthite** and chalcopyrite-coated **polybasite** crystals from the Reyes mine, Guanajuato, Guanajuato. Additional new finds of silver minerals include fine crystals of **pyrargyrite** to 2 cm in groups to 6 x 8 cm from Santa Elena and lustrous **acanthite** crystals in groups to 3 x 4 cm from Fresnillo, Zacatecas, both available from Ernesto Ossola (8, Rue du Luxembourg, 30140 Anduze, France). **Polybasite** pseudomorphs after pyrargyrite crystals (to 1.5 cm) from Guanajuato, and sharp **stephanite** crystals (to 1 cm) from San Luis Cristobal, are available from Leslie Kunzler and Tony Jones (*California Rock and Mineral*, P.O. Box 318, Royal, AR 71968).

Certainly one of the most colorful recent finds in Mexico is the bright yellow **wulfenite** and orange **mimetite** from the San Francisco mine, Cucurpe, Sonora. Specimens from the current production are virtually identical to the older ones for which the locality is justly famous, and consist of paper-thin transparent yellow crystals up to 3 cm on matrix, occasionally associated with platy crystals of barite. Regrettably, the heyday appears to be over due to water problems, but fine selections of specimens in all size ranges are currently available from Wayne and Laura Thompson and Stan Esbenshade (*Midwest Minerals and Mining*, 1501 W. Kilburn, Tucson, AZ 85705).

The Sierra de la Cruz, east of Lake Jaco, Sierra Mojada, Coahuila, has long been known for its fine specimens of **vesuvianite** and **grossular**. Benny and Elva Fenn (*Fenn's Gems and Minerals*, P.O. Box 16285, Las Cruces, NM 88004) have a new supply of these, but in colors thus far atypical for the locality. Most grossulars from the area are usually pale gray to yellow or pale pink, and the vesuvianites are yellowish brown. The new grossulars vary in color from orange-red to a "hot" rosy pink, and the vesuvianites appear zoned with gray-brown central regions and noticeably orange terminations. The cause of these unusual colors is presently unknown. Another uncommon item offered by the Fenn's were sharp, blocky crystals of labradorescent **anorthoclase** from the Pili mine, Camarco, Chihuahua.

Other Mexican minerals noted over the past year include large, sharp, lustrous dodecahedrons of black **andradite** from the Ojos Espanoles mine, Lazaro Cardenas, Chihuahua (available from *Jendon Minerals*) and some good specimens of **schorl-dravite** from Santa Cruz, Sonora, available from Daniel Belsher (*Blue Sky Minerals,* 8890 N. Federal Blvd. #52-D, Denver, CO 80221).

MOROCCO

Superbly crystallized **hematite** has been found at Segangan, near Nador. The tabular, sometimes skeletal crystals are extremely lustrous and occur up to about 8 cm across. Except for some minor associated **calcite**, they are nearly indistinguishable from those found a number of years ago at Mt. Calvario, Etna, Sicily. Some excellent specimens have been available from Ken and Rosemary Roberts (*Roberts Minerals*, P.O. Box 1267, Twain Harte, CA 95383).

MYANMAR (BURMA)

Some very fine crystals of **peridot** (forsterite) have been found in Pyaung Gaung, though little is known about their occurrence. A limited number of these have been available from *The Collector*. Another bright green mineral seen on the market in 1993 is the "chrome" **tourmaline**, usually labeled only as coming from "Burma." Most specimens are single crystals in the 1–3 cm range, and, except for their bright green color, resemble the classic uvite tourmaline crystals from Pierrepont, New York. Chris Wright (*Wright's Rock Shop*, Route 4, Box 462, Hot Springs, AR 71913) kindly supplied one of us (GWR) with a half dozen randomly selected crystals showing a range of colors from pale to dark emerald-green. Quantitative (WDS) electron microprobe analyses (by R. A. Gault) of these crystals indicate they are all **uvite** (with Ca^{2+}:Na^{+} averaging 3:1, and no detectable Fe). Furthermore, all contain vanadium (maximum detected V_2O_3 = 2.05%) and little to no chromium (maximum detected Cr_2O_3 = 0.13%). We presume the color is due to the presence of vanadium in the absence of iron, as is the case with certain natural emeralds. Vanadian uvite may be a more appropriate name.

NAMIBIA

Some of the finest large specimens of crystallized **azurite** to emerge from Tsumeb in recent history were found last Easter. Specimens have been available from Andreas Guhr (*Mineralien Zentrum*, Jungfernstieg 8, D-20354 Hamburg, Germany) among others. The find has been documented in detail by Georg Gebhard (see *Lapis,* **20**, no. 1, p. 32, 45–50). *Storm Mountain Minerals & Mining* (P.O. Box 7268, Boulder, CO 80306) has continued to supply large crystals of **rubellite** from the Otjua mine, Karibib. The crystals (to 15 cm) are frequently doubly terminated and are blackish red with candy-red highlights.

NEPAL

Mountain Minerals International has acquired some lustrous, relatively smooth faced, dark brown, doubly terminated

dravite crystals (to several cm) from Gujarkot, Bheri Zone, western Nepal.

NORTH VIETNAM

Slightly water-worn, red-green color-zoned crystals of **tourmaline** have recently been obtained from an alluvial ruby deposit near Thac Ba Lake, Yen Bai Province. Divergent, subparallel terminated crystals to nearly 20 centimeters have been found and are available from *Ikon Minerals*.

NORWAY

Torgeir Garmo (*Fossheim Steinsenter*, N-2686 Lom, Norway) and Peter Lyckberg report several new finds of minerals over the past year in Norway. These include colorless, transparent crystals of **quartz** from Namdalen and at least three different locations in Valdres. At some of these localities, **anatase** crystals from 3–8 mm also have been found, but not directly on the quartz. Clay-filled pockets containing **amethyst** crystals up to 2 kg occur in quartz veins in a roadcut near Hamar, approximately 110 km north of Oslo. Some of the crystals show fenster and scepter habits, and a few are faceting-quality. At another roadcut in Caledonian mica gneiss in Selbu, approximately 11 km northeast of Trondheim, very good specimens of blue **kyanite** crystals to 25 cm have been collected from lenses of quartz up to about a meter across. Less common associated minerals include green **fluorapatite**, **staurolite** and white feldspar, and small clear **fluorapophyllite** crystals were encountered in vugs. Unfortunately, most of the material was buried under the road during its construction. Large, sharp, dodecahedral crystals of **almandine** (up to 9 cm) have been found in mica schist near Harstad, in northern Norway, and in Tysfjord, tiny yellow grains of the rare species **okanoganite** have been found in yttrian fluorite. Lastly, the locality for yellow **barite** crystals at Styggedalen, Herre, Telemark, has again yielded specimens when the normally water-filled shaft dried out last summer.

PAKISTAN

Perhaps one of the most significant new discoveries recently seen is the large quantity of fine crystals of **forsterite** (peridot) from Kohistan, northern Pakistan. The locality is a string of six or eight prospect pits extending over a distance of 2 or 3 km, near a small, seasonally occupied camp named "Suppatt" or "Sumput" in a summer grazing area around 14,000 feet in elevation. The site may be reached from various villages in different directions, including Dasu, Kamila, Patan, Besham Village, Kagan and Naran, but the best designation for labels is "between Kamila and Naran." The best of the crystals are no less than spectacular: large (up to 14 cm!), sharp, excellent in color, and of gem quality, rivaling those from the classic St. John's Island occurrence in the Red Sea. Several crystal habits have been noted, one showing dominant {110} and {011} prisms and {010} pinacoids, modified by smaller {032}, {101} and {051}? prisms. Presently, little is known about the geology of the occurrence. The only associated minerals thus far observed are rounded magnetite crystals and a white talc-like mineral in which the peridot crystals seem to be embedded. A number of dealers currently have specimens, gem rough and faceted stones available.

In addition to the peridot crystals, an abundance of incredibly fine specimens from the pegmatite and alpine occurrences in northern Pakistan has continued to pour forth. Some of the new arrivals include pink tabular crystals of morganite **beryl** to 15 cm from Drot-Balachi, near Shengus, Gilgit-Skardu road, Northern Areas; spherical aggregates of **stellerite** to 2 cm associated with **topaz** from Dassu, Baltistan; blue **phenakite** crystals from Apaligun; **zircon** crystals that resemble those from Seiland, Norway, from Bulbin, Wazarat district (all available from *Mountain Minerals International*); pale yellow-gray, tabular **apatite** crystals up to 4 cm dusted with chlorite (and occasionally associated with yellow dolomite) in groups to 5 x 8 cm from the Tormiq Valley, north of Skardu; aesthetic groups of lustrous 3-cm **schorl** crystals to 15 cm from Basha Nala, Shigar Valley, northeast of Skardu; and from the Shengus area, Gilgit division, 3-cm trapezohedral **pollucite** crystals with small cube faces, as well as beautiful sherry-colored **topaz** crystals with "Herkimer diamond"-like quartz (all available from Herb Obodda).

PAPUA NEW GUINEA

William Forrest (P.O. Box 25001, Fresno, California) has recently obtained some slightly water-worn **gold** crystals (some with dendritic growth) from the Mount Kare area.

PERU

A limited number of very fine **acanthite**-coated wire **silver** specimens have been coming out of the Julcani mine, and have been marketed by *Harvey Gordon Minerals* (1002 S. Wells Ave., Reno, NV 89502). The acanthite is well-crystallized and forms lustrous, complex crystals up to 5 mm across.

PORTUGAL

Lustrous, mm-sized crystals of **libethenite** coating cavities in quartz gossan have been found at Estremoz. Some specimens contain associated **pseudomalachite**, and were offered by Dr. Jochen Hintze at the 1994 Denver Show.

SOUTH AFRICA

Clive Queit (P.O. Box 1014, Fourways 2055, Sandton, Johannesburg, South Africa) continues to provide fine specimens from the N'Chwaning mine, Black Rock district. **Inesite**, however, appears to be in short supply, as few new finds have been made. One species new to the locality is **shigaite**, which occurs as thin, tabular, amber-colored crystals (to 0.5 x 2 x 2 mm) included in **gypsum**, and as golden brown rosettes (to 1 cm) on matrix. Clive has also had a limited supply of a bright blue bladed **unknown mineral** (crystals to 1 cm) embedded in **sugilite** from the Wessels mine. Also evident from the N'Chwaning mine were the world-class specimens of **hausmannite** on **garnet**, available from Don and Gloria Olson (P.O. Box 858, Bonsall, CA 92003). As the species goes, these are as good as it gets!

SPAIN

Attractive pistachio-green **epidote** crystals forming bladed, radial aggregates to 1 cm associated with transparent **quartz** crystals, have been found near Alicante, Valencia. Specimens of these were available from Felix Gómez (Torrón 50, 32515 Orense, Spain) at the 1994 Denver Show. Also new from Spain are some very fine specimens of tabular blue **barite** from Cartagena, Murcia, which are available from Victor Yount. Some interesting bipyramidal smoky **quartz** crystals up to about 2 cm, resembling those from the iron mines of west Cumbria, England, have been coming from Malaga. Specimens have been available from Si and Ann Fraser (Suite 306, 6331 Fairmont Ave., El Cerrito, CA 94530).

SRI LANKA

Well-terminated crystals of **sillimanite** are rarely found, despite its being a common rock-forming mineral. *Mountain Minerals International* has a new small supply. The transparent crystals (rarely to 1 cm), which superficially resemble "rough" barite crystals, are from Rabuka, near Rakwana, Sabaragamuwa province. In addition to these, Mountain Minerals has also acquired a number of other interesting new items from Sri Lanka, including some exceptionally sharp **sapphire** crystals to 4 cm from Galbkka, near Vallivaya, Uva Province; terminated crystals of pinkish **zircon** up to 3.5 cm that resemble those from the Canadian Grenville Province occurrences from Amlilipitiya, near Kataragama; shiny black octahedral **spinel** crystals to 1 cm from Monaragala, near Badulla, Uva Province; and a 27-carat, *2-cm* crystal of **sinhalite** from Nirialla, near Ratnapura, Sabaragamuwa Province.

SWEDEN

Peter Lyckberg reports that two small pockets uncovered at the Malmberget mine over the winter have yielded interesting tabular hexagonal pseudomorphs of **magnetite** after hematite and small **hematite** eisenroses, occasionally on feldspar crystals. Some large **calcite** pockets (to 6–7 meters) are still accessible, but are now extremely dangerous to excavate, so that relatively few specimens are being recovered.

TANZANIA

Sharon Cisneros has acquired some **alumino-tschermakite** specimens from the Longido mine, Matibatu Mountains. The mineral occurs as dark green prisms (to 1 cm) embedded in chromian zoisite. Many similar specimens in the past have been labeled edenite.

ZAIRE

Gilbert Gauthier (7 Rue Alexandre III, Maisons Lafitte, France 786000) has long been the source of innumerable and exceptional museum-quality specimens from Zaire, and the past two years have been no exception. Most conspicuous are the new botryoidal **malachite** specimens obtained by collector salvage operations at the long-closed Star of the Congo mine, Lubumbashi. The specimens range up to 40 x 40 cm in

size, with smooth to crusty surfaces, and interlaminated **chrysocolla/heterogenite** matrix typical of the Shaba localities. Additional excitement was generated by a new "last there will ever be" selection of superior quality, dark gemmy green **torbernite** crystals (to 1.5 cm in 7 x 10 cm clusters) from the Musonoi mine, Kolwezi. Gilbert also had an exceptional **heterogenite** specimen (~40 x 40 cm) which had been mined during World War II at the Kabolela mine in central Shaba. The specimen consisted of large, brilliant black botryoids reminiscent of some English hematite, only better. Gilbert also had a remarkable specimen of a very rare and doubly terminated **roubaultite** crystal (3+ mm) with schoepite from the K.O.V. mine, near the Musonoi mine, and some very beautiful thumbnail-sized **quartz** crystals with orange to carmine phantom zones of dusty hematite inclusions from Katonto, Shaba.

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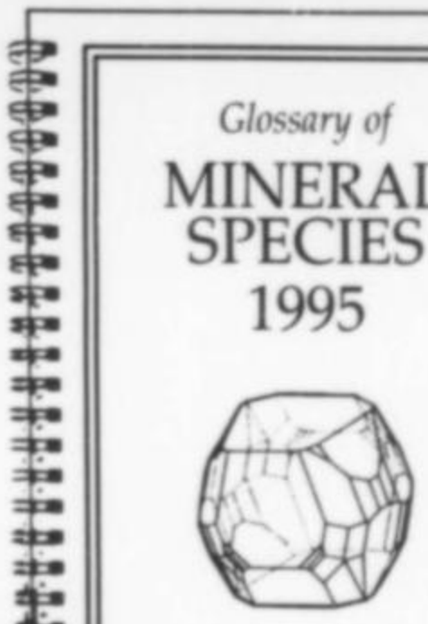

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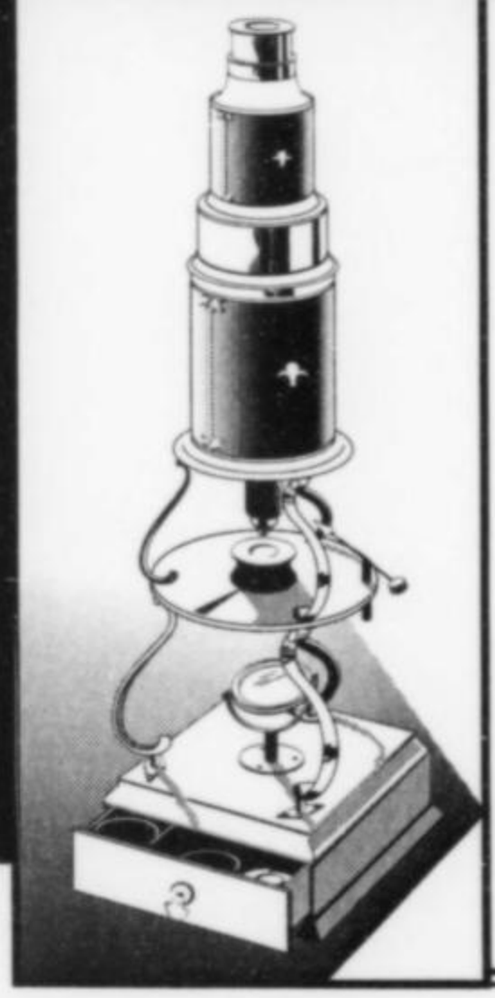

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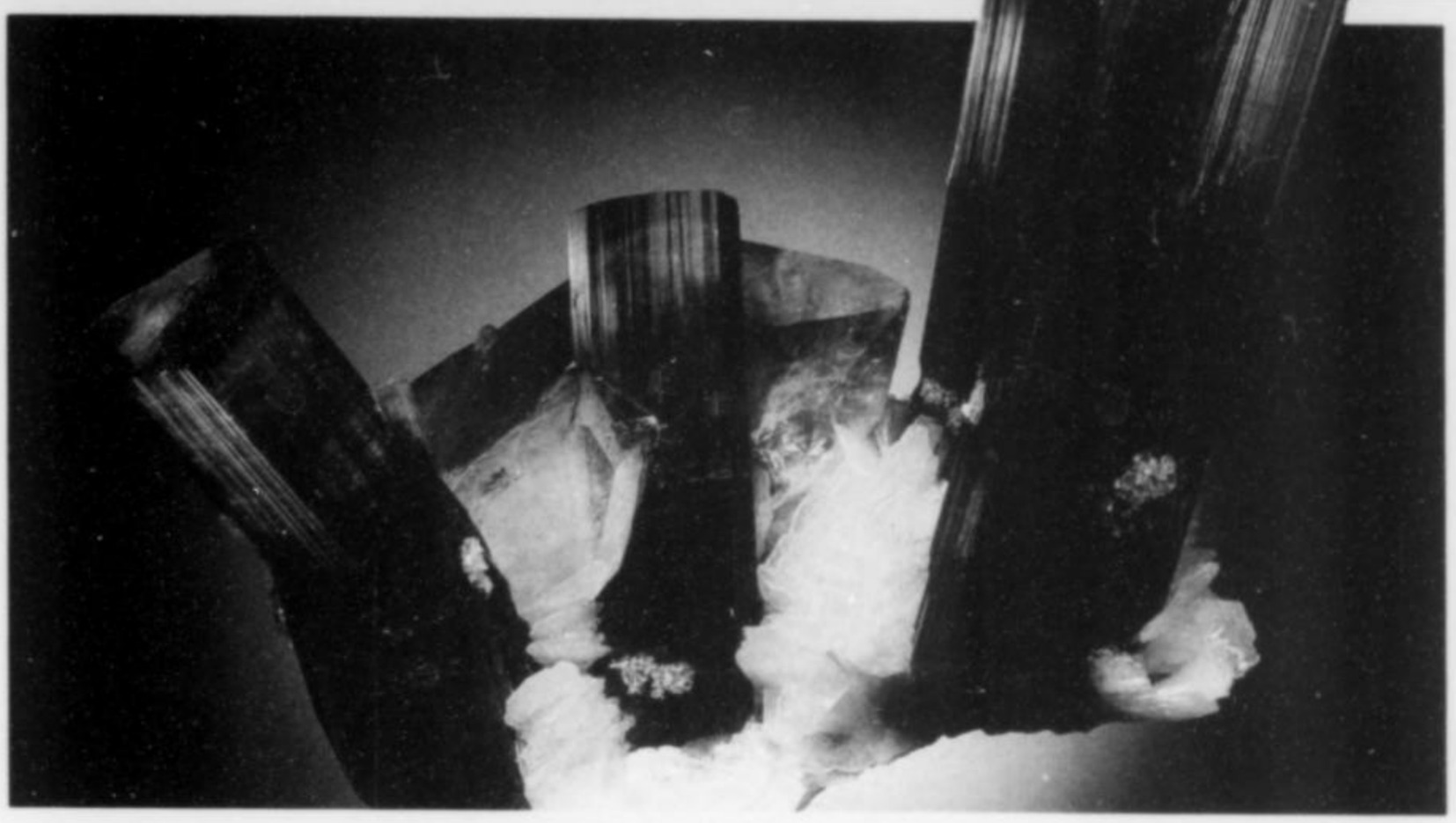

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MINERAL STORIES

Lawrence H. Conklin

Quartz Discredited

Bob Jones

I recently read one of the funniest and potentially most embarrassing brief mineral articles I've ever seen. Funny, that is, if you saw through the intended joke. Embarrassing if you read it and then scurried around trying to verify it. Even some professional mineralogists took the thing seriously, much to their chagrin later.

The article appeared in the April 1994 club bulletin *Lithosphere* of the Fallbrook (CA) Gem and Mineral Society under the by-line of Lilac A. Rugg, Mineral Information Network (4/1/94). The date is significant!

The article is entitled "Quartz Discredited." Professionally written, it explains in considerable detail research work being done at the Pine Ridge National Laboratory which discredits quartz as a mineral species and says, in effect, that there is no such thing as quartz; it is really another, even more common mineral: water, frozen so solid as to be indestructible. If you are a student of history you know the ancients proposed just such a theory based solely on observation and experience.

The article explains that researchers, while studying crystalline phase transitions that occur in ice when subjected to low temperatures and high pressures, found a gritty substance in the growth chamber of their apparatus. This turned out to be what all these decades we have been calling quartz. The obvious conclusion was, of course, that researchers had accidentally stumbled on the true nature of quartz, water that had been so cold and under such high pressure that it took on the characteristics we now credit to quartz.

Further study of the scientific record had shown that the original researchers made a calibration error in their study of the then-unknown substance we call quartz. They misidentified the two atoms of hydrogen as one atom of oxygen, and the one atom of oxygen as two atoms of silicon. As you know, quartz is SiO_2 and water H_2O.

Additional evidence is presented in the article to support the newly discovered fact that quartz is really not a separate mineral species but an unusual form of water. The Pine Ridge researchers are reported to have even checked with Bell Labs, famous for their quartz-growing techniques, and had received confirmation of their findings.

Well, club editors across the country picked up this startling article and reprinted it. In addition, the information was sent overseas and the editor of the Fallbrook bulletin began to get inquiries from Japan and elsewhere. After all, this was an amazing discovery. Every quartz specimen label would have to be revised in collections, museums, textbooks and the like. Even I got into it when I was attending a club meeting out of town to give a talk and had a copy of the news release thrust into my hand by a club member who seemed seriously concerned about this new discovery.

The obvious answer to all this, of course, lies in the published date of the original article and in the writing skill of the Fallbrook bulletin editor, Richard Busch. He very artfully created a story for their April bulletin, surely with tongue in both cheeks (if that's possible!).

The problem arose when Busch made the article so convincing, professional and accurate-sounding that unbeknownst to him, it sent serious ripples throughout the mineral collecting world.

To show you the extent to which this reached, I was a speaker at a gem and mineral club editor's breakfast in Quartzsite, Arizona, in February 1995. The organization is called SCRIBE, which stands for Special Congress Representing Involved Bulletin Editors. Clubs from as far away as South Africa were represented!

Almost immediately after the meeting began, SCRIBE's organizational secretary brought up the question of the "Quartz Discredited" article. Comments both pro and con were made. This was followed by a general introduction of the editors present. When Richard Busch introduced himself and his lovely wife and assistant, Katherine, he confessed to being the author of this marvelously written April Fool's joke. He also confessed he never realized the heights to which his creativity would go. We all had a good laugh and vowed to get the word out that, "Look, folks, where's your sense of humor?" At least share a chuckle with the folks caught up in this marvelous April Food's Day creation.

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Being Kind to the Tourists

Art Smith

My usual mineral collecting apparel and equipment I will admit is by anyone's standards, quite spartan, well-worn and very unpretentious. Old jeans, white or faded T-shirts, any

kind of hat and old boots or sneakers varying slightly to fit the weather, collecting conditions and environment. My collecting equipment likewise is well-used and adaptable, but a good stout sledge is a usual must.

In 1975 or '76 when I had already been collecting for some 20 years, I was once again working the dumps of Emperius's Commodore Number Five mine up West Willow Creek just to the north of Creede, Colorado. I was there about an hour collecting mostly microminerals when in trooped a whole family of rockhounds with spanking new boots, shiny hammers, colorful backpacks, and "logo" shirts and jackets. I could have done some serious damage in any mineral shop with the cash they had put out for their outfits. I ignored them, but glances in their direction told me they had not done much collecting before because their packs were empty and there was obviously not a scrap of wrapping material between any of them.

I got down into a crevice working a large, wedged, particularly vuggy piece of rhyolite breccia with pale amber sphalerite and tiny milky quartz crystals. Suddenly the sunlight went dim. So I looked up and found my crevice was rimmed by the family silently staring down at me.

"Howdy," I said cordially with my acquired Texas accent.

"What are we looking for?" was the retort.

I had several smart answers for that query but decided to use my standard reply.

"Anything I see I like."

However, they seemed so earnest that I mellowed and showed them what I was collecting and explained that what I hoped to find was native silver in tiny crystals and wires that is the real treasure to be found on the dump. They were only slightly impressed and resumed their search. A shiny new Chevy Blazer drove up and a man with a big movie camera got out.

"I need some footage of Colorado rock collecting for a promotional Colorado movie," he said, and placed members of the family in different poses for some action shots. I waited anxiously for my placement in the scene but it never came. So, with my feelings hurt, I slunk away down the dump and resumed collecting, ignoring what transpired.

A short time later, after the departure of the movie crew, one of the teenage sons of the family approached and asked to borrow my sledge, which to me was like asking to borrow my right arm, but I was tiring a little so I reluctantly handed it to him. It was returned in a short time with appropriate "thank yous," and he then said they were leaving without having much luck.

By late afternoon I had covered most of the dump except the area where the family had last been, and since they had found nothing I was not enthusiastic, but I decided to check it out anyway. The first thing that caught my eye were both halves of a large, elongate, pale gray boulder that had recently been split open and both halves placed side by side. Each half showed a portion of a baseball-sized green patch in the center. On closer inspection I saw the green was composed of minute spheres of a chlorite mineral, thuringite, that was loosely but completely filling both halves of the vug. I picked up one piece and gently blew the thuringite away, exposing a tangle of *silver wires!* The second half yielded the same results! This was by far my best find of the day. It filled a small box that I packed for just such treasures. Since then, I have been quite generous with my sledge when tourists ask to borrow it.

The Rare Gypsum

Pearl Freeman

I have a specimen of gypsum in my collection that is said to have been found many years ago in some old Roman pipes that were uncovered in an excavation for a large building. The site actually covers the original wall that surrounded the city of London in Roman times. The specimen measures 16 x 18 x 25 cm, and has well-formed "fishtail" crystals of an orange color. It retains a cylindrical shape due to its having been formed in a pipe.

It had been originally salvaged by a young passerby who, with the aid of his little brother's baby carriage, had hastily collected all the specimens as they were uncovered and sold them to a mineral dealer near Covent Garden. The mineral shopkeeper displayed them in his window, and the piece in my collection was bought from him that first day by a friend from whom I eventually acquired it.

During the specimens' first night in the dealer's window, a car crashed into them, destroying *every* piece and leaving the specimen under discussion here as the only survivor.

[Whereas Ms. Freeman makes no mention, your cynical editor (LHC) wonders if a fanatic mineral collector has not again gone to great lengths to make his or her specimen unique!]

Stamp of Disapproval

Jean K. McKenna

At the Rochester Mineralogical Symposium in April of 1990, Sharon Cisneros told me about a sheet of 50 different mineral stamps recently issued in Mexico. We were rather perplexed because we pay close attention to all new issues showing gems or minerals so that we can add them to our Minerals-on-Stamps collection. But Sharon's mother had called from Mexico to say she had seen the mineral sheet in the Post Office while buying stamps. She bought all she could, and when Sharon returned home she sent me a photocopy.

The copy was rather unclear, but I sent Sharon the amount she requested without scrutinizing it too closely. When they arrived, it was obvious upon brief inspection that they were not postage stamps at all, but seals (like our Christmas Seals) from the Mexican Lung or Tuberculosis Association issued for their 50th anniversary. "Semi-postals" or "charity stamps" are distributed in many countries through their local Post Offices.

I looked more closely at each picture: stibnite, crocoite, agate, jasper—these looked familiar—smithsonite, cinnabar, malachite, azurite, all superb specimens; and ludlockite. Ludlockite!? There are very few photographs of this rare mineral, so the origin of the photo used by the Mexican printer was easy to track down. It was from one of my favorite books, *The World's Finest Minerals and Crystals* by Peter Bancroft.

Dr. Bancroft had asked many curators, collectors, dealers, art buffs and rockhounds throughout the world to submit their choices of specimens they thought would qualify for the title. Various experts were then asked to judge the specimens offered for consideration. The resulting book (published in 1973) shows 78 specimens with the appropriate information: size, discoverer, locality, current home, nominator, photographer, and museums featuring other outstanding examples of the mineral.

Now Peter has had the ultimate compliment—plagiarism. The Mexican seals were ingenuously presented. Some were taken directly from the book, some were reversed, some were rotated completely around, while others were only a quarter turned. For some reason, others were augmented. About 30 of the 50 minerals pictured on the seals can be found in the book, and of course no one ever thought about asking Peter Bancroft's permission. When I brought it to his attention, it was a complete surprise to him.

This is not the first time such misappropriations have taken place. In 1988 I detected a similar plagiarism by North Korea. The previous year they had issued a set of three mineral stamps whose pictures they had taken from a German *Fotoatlas* of Minerals—all without the appropriate permission. In 1990 Wendell Wilson noticed that South West Africa's 1989 issue of ten minerals and five mining stamps looked familiar. Some of them had obviously been copied or adapted from the 1977 Tsumeb Issue of the *Mineralogical Record*.

The Grenzig Sale

Lawrence H. Conklin

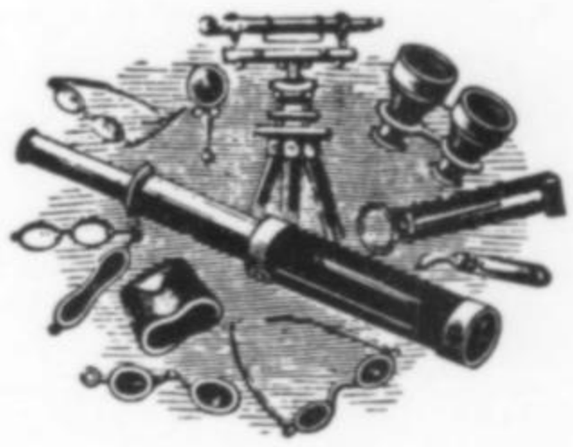
John A. Grenzig was a part-time mineral dealer in Brooklyn, New York, in the early 1940's, and my uncle, Anthony Schumacher, was one of his best customers.

According to my uncle, Grenzig's personal collection was choice (superlative quality, rare crystallizations, unusual localities, etc.), so it was with some excitement that he learned Grenzig wanted to *sell* his private collection.

Grenzig had apparently thought long and hard about how to distribute his minerals among his best customers, and came up with a method that I believe is fair.

He notified his five best customers (including my uncle) well in advance that he would be inviting them to a private sale. When everyone had arrived on the appointed date (December 19, 1942) he proceeded as follows:

The specimens had all been wrapped individually and placed in several large boxes. Grenzig withdrew a specimen at random and unwrapped it to see which one it was. After examining it briefly he proclaimed a price (non-negotiable but always very fair or even modest), and offered it to the person who was number one in the buying order. This order had been established previously by drawing lots. Buyer number one could take it or pass, in which case it would be offered to buyer number two, and so on. Once it was purchased, or at least offered to all five buyers, Grenzig would reach into the box and withdraw another specimen, price it and offer it first to customer number *two*; if he passed it would be offered to number three, and so on around. In this way the specimens were sold quickly and easily, with only a few remaining unsold at the end.



Remote Sensing

John D. Hallahan

While hunting for topaz crystals in the Thomas Range, Utah, my wife Marion and I developed a sure-fire way of spotting loose crystals that had been eroded out of matrix.

Also being birdwatchers, we always carry our binoculars with us, even on mineral trips. One morning we climbed high up on the Topaz Mountains just as the sun was rising. I found that under those conditions of low-angle lighting I could readily spot exposed crystals 200 feet away because of the brilliant reflections of sunlight off their crystal faces. When we would walk over to where we had seen the flash, however, we had great difficulty finding them because the reflections would disappear.

The solution was that I would stay put and let Marion walk to where I saw a reflection. I would direct her as I watched through the binoculars from a great distance, and signal her when to look down between her feet. She found the crystals without fail. When the flashing reflection disappeared I knew she had picked up the crystal!

We have also had success with this method in the Namib Desert, where the crystals are larger.

Everyone has a good story to tell. How about sharing yours with us? Editing and polishing for publication are cheerfully provided. Send your story to ***Lawrence H. Conklin****, 2 West 46th Street, New York, NY 10036, or c/o* ***Wendell E. Wilson****, the Mineralogical Record, 4631 Paseo Tubutama, Tucson, AZ 85750. You can FAX your story to the editorial office by calling 520-299-5702.*

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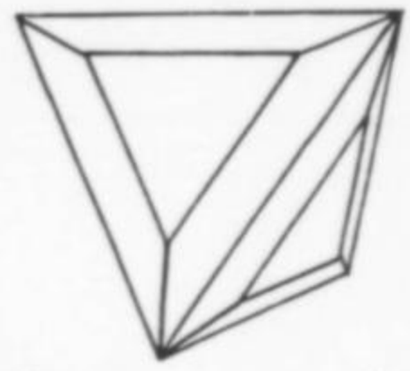

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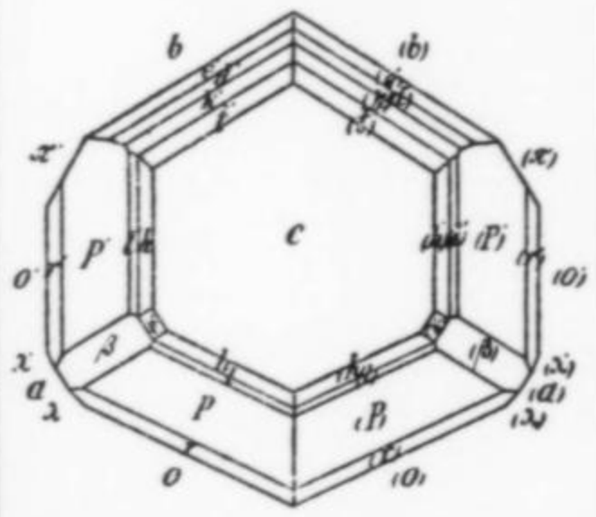

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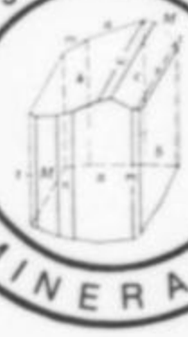

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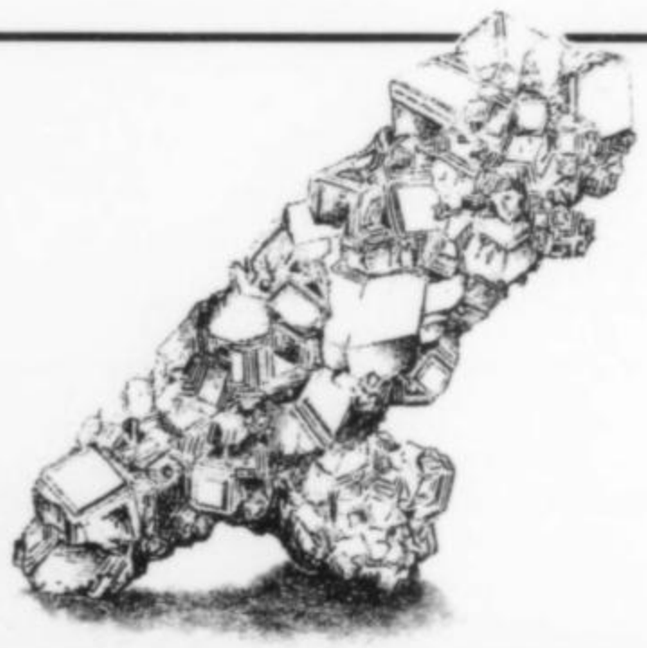

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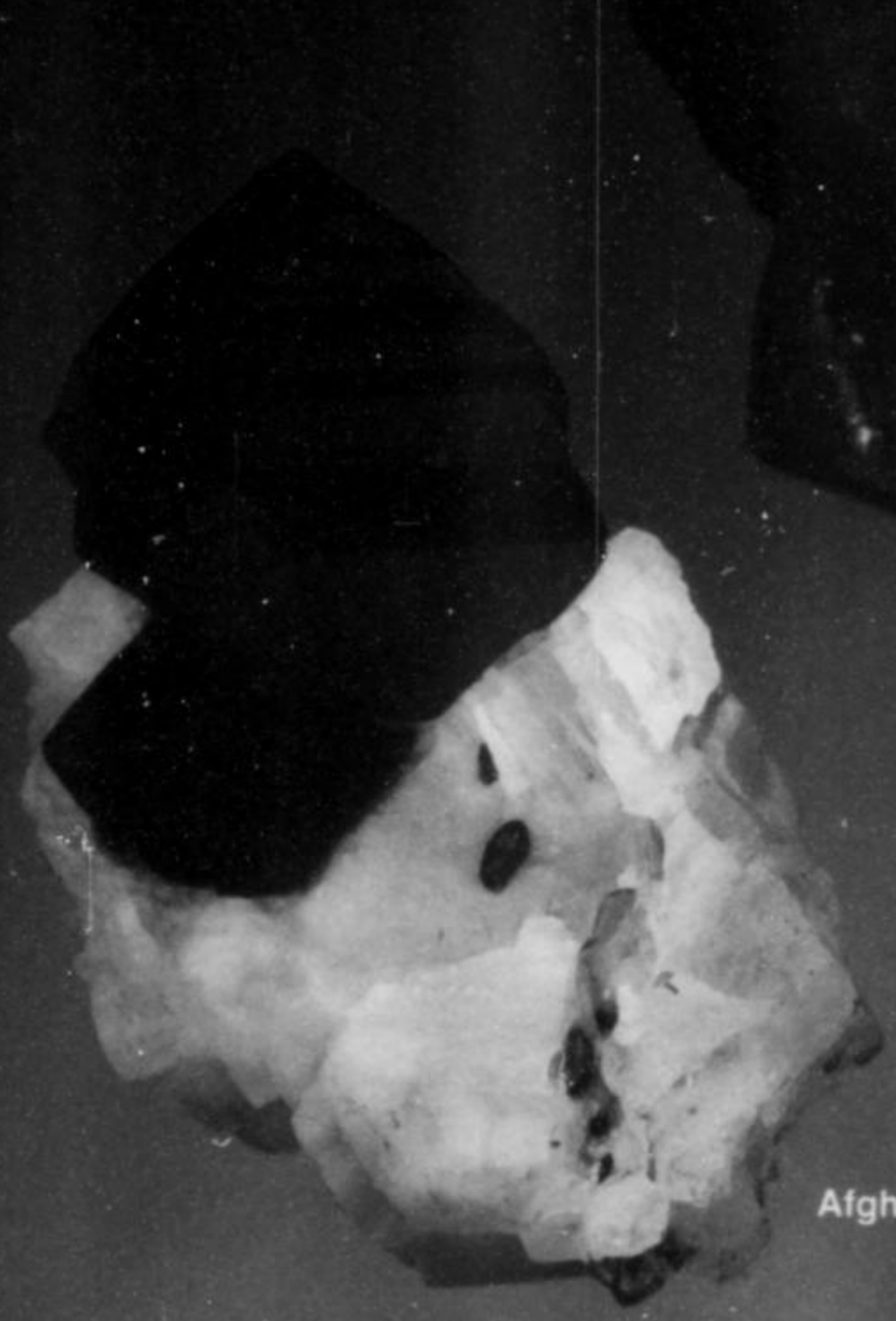

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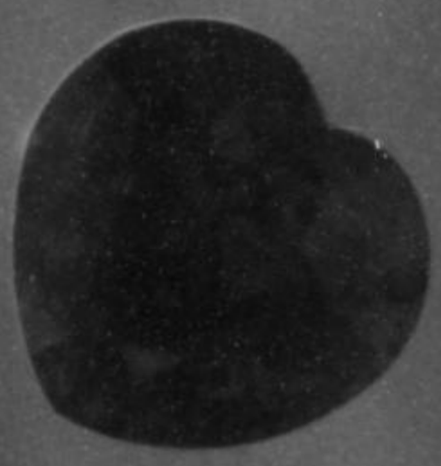

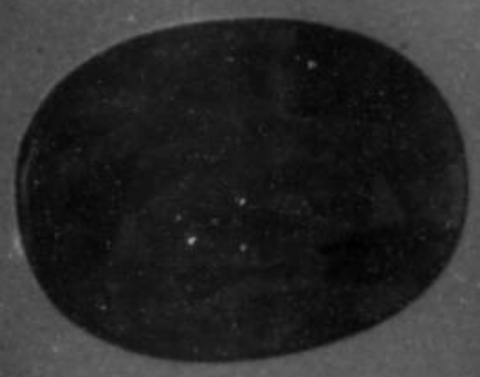

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