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Articles

Columns

COVER: CAVERNOUS QUARTZ with clay inclusions, 25 cm, from the Chia mine, Minas Gerais. Russell Behnke specimen; photo by Norm and Roz Pellman.

Guest Editorial:

WHAT IS THE FUTURE OF MINERAL EXHIBITS IN MUSEUMS?

Concern has recently been expressed as to the future of the British Museum's historic systematic mineral exhibit (vol. 23, p. 206). Many other museums are also phasing out such exhibits. Actually, the future of all systematic geology exhibits is changing. Mineralogy is not alone.

Most other systematic museum displays are gone. Systematic fossil exhibits are also endangered. Fewer museums today have substantial systematic exhibits, especially in biology, another science dependent on technically organized collections. The fact is, the entire science of systematics has fallen upon hard times.

Most readers of the *Mineralogical Record* find nothing more relaxing and enjoyable than examining shelf upon shelf of minerals. The handywork of nature is indeed remarkable! Nonetheless, we are part of the minority when it comes to today's museum visitor. For example: Two members of the local geological society (and first-rate mineral collectors) were very impressed with the Sams Collection at the Houston Museum of Natural History; but a young woman (not specifically interested in minerals) saw the very same exhibit and did not think the display was well presented.

As the world economy changes, it is reflected in financial resources available. The division of monies for scientific and public purposes have always been highly competitive. Today the fight for financial resources is more intense than ever and mineral displays are suffering as a result. Spectacular donations like those used to purchase the Sams Collection are, unfortunately, few and far between.

Like it or not, museums (even as non-profit organizations) cannot operate with fiscal indifference. Museums are competing not only for money, but for attendance. The drive between the two is inexorably connected. Museums are rarely "the only game in town." There is significant competition with theme parks, theatres, zoos, and other forms of entertainment.

To bring in the cash flow to pay salaries, develop new exhibits and facilitate daily museum functions, it is necessary to attract as many visitors as possible. A good marketing program cannot be a cover for "tired" exhibits. Ultimately, whether a museum can boost attendance is not just good marketing, but providing activities for visitors to *do*! "Doing" does not mean looking, it means participation. The end result should be an awareness on any particular subject (in other words: education).

The crux of the problem for mineral exhibits is that those classic displays to which we have become accustomed do not pull in the visitors like interactive exhibits. Museums today must be fun and exciting! The challenge for many museums today is not just presenting artifacts to visitors, but presenting experiences! The result is that many museums are switching to hands-on exhibits. One might consider this to be the byproduct of the "disneyization" of museums everywhere.

The role of curator in museums changes with a shift in the emphasis of exhibit content. A systematic or non-interactive exhibit is relatively easy to do. A hands-on exhibit is more challenging because it must be evaluated to insure that (a) it works properly, and (b) the exhibit message received by the visitor is the same one intended. Curators must become (or work very closely with) educators. Such radical shifts in exhibits will undoubtedly take time away from other mineralogical research projects. The affect is more pronounced in public museums, less so in university-managed facilities where the competition for increased visitors is not as severe.

The mineral exhibit at the Cincinnati Museum of Natural History has been distilled down to a single case. On the other hand, the Kentucky Cave and Ice Age exhibits are without question among the most dramatic and spectacular natural history exhibits in North America. These exhibits incorporate artifacts, not in the sense of the "old museum," but to strengthen the interactive component. This is going to be the look of future exhibits. Specimens in the systematic displays will be taken off exhibit and utilized in more of a "supporting" role for interactive exhibits.

At the Museum of History and Science in Louisville we will probably be changing our systematic mineral exhibit in the future. Our exhibits will become more interdisciplinary as the Kentucky Education Reform Act is fully implemented. The primary mission of our museum is public education. It is logical that we develop our exhibits using Kentucky's educational guidelines so we can draw more teachers and their students.

Are museums heading in the wrong direction? Not entirely. It will depend on how these older mineral exhibits are replaced. It is incumbent upon all of us to insure that when old mineral exhibits must be replaced they are replaced with *new* mineral exhibits. Mineral-enthusiasts do not want these to be replaced by exhibits on computer-science, physics or health. If improved mineral exhibits can be the result of such changes, then increased attendance means more visitors will be exposed to mineralogy. Mineralogy is not just minerals. It is physics, chemistry, math and, yes, even art! If we can help visitors *understand* minerals—not just admire them—all museum professionals and science in general will benefit. We should then see more potential future collectors and earth scientists as a result.

An option for museums to consider (becoming increasingly popular) is "open collections." Collection storage units can be modified to allow visitors to peruse through drawers, but without being able to actually handle specimens. (Even small portions of collections can be set aside for visitor examination.)

Do not decry the death of the systematic mineral exhibit. Our role should be to insure that mineral displays are not replaced with irrelevant exhibits. We must make the excitement of mineralogy and earth science "rub-off" onto the uninitiated museum visitor. That is our role as we rush to the 21st century!

Alan Goldstein
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Louisville, Kentucky 40202

notes from the EDITOR

At the presentation of the first Russell Medal: Dr. Robert Symes (left), recipient Dr. Robert J. King (center), and Prof. Robert Howie.

THE RUSSELL MEDAL

Britain's Russell Society celebrated its twentieth anniversary this year by establishing a new international award for outstanding services to mineralogy: The Russell Medal. The Medal will be awarded on an occasional basis to individuals judged by the Council of the Society, to have given outstanding service in the field of mineralogy. The Society is a body of amateur and professional mineralogists which encourages the study, recording and conservation of mineralogical sites and material, much of which is published in the Society's journal and newsletters.

The first award, made during the Society's conference weekend at Loughborough University, was presented to Dr. R. J. King. Bob King first became fascinated by rocks as a result of his father's interest in natural history. As a lad he took enquiry specimens to Leicester museum where he was inspired by the late H. H. Gregory, keeper of Geology, later attending his extramural classes (despite being below the stipulated age limit). Under Gregory's direction he began reading geology at London University. He joined the army in 1941, and even became involved in repatriating mineralogical specimens under fire during service in Europe! Upon returning home he returned to his farming roots, but still dealt with enquiry specimens passed to him at the local museum. Bob later joined the Department of Geology at Leicester University, playing a major part in the subsequent success and development of that institution, remaining on the staff for more than 30 years. The teaching collection he built stands today as a model for all establishments teaching geology.

For more than 50 years, Bob worked to assemble one of the finest and most extensive contemporary collections of British Minerals, which now forms the core of the collection at the National Museum of Wales in Cardiff. A protege of the late Sir Arthur Russell, he founded the Russell Society, and was the first editor of its journal. Bob is an expert on the topographic mineralogy of Britain, and on the conservation of mineral collections.

Bob is presently curator of the John Moore Countryside Museum in Tewkesbury, where he lives with his wife Sally, and their two children. He is building a second collection of minerals. He is also an active gardener and chorister

As Dr. Robert F. Symes of the Natural History Museum (London) and President of the Russell Society said when presenting the medal to Bob King, "there really could be no finer recipient in the first year of this award."

Further information about the Society and its activities may be obtained from the General Secretary, Mr. P. S. Jackman, 116 Gypsy Lane, Kettering, Northamptonshire, England NN16 8UB."

FEDERATION OF MICROMOUNTERS

In September of 1991, during the Paul Desautels Memorial Micromount Symposium (formerly the Baltimore Micromount Symposium), representatives of five societies in three countries met and organized the International Federation of Micromount Societies. To date, ten organizations in five countries have joined. Membership is open to the following:

(1) Pure micromount groups
(2) Gem and mineral groups with members who are micromounters
(3) Individual micromounters who belong to groups that choose not to join the Federation
(4) Individual micromounters who belong to no group

For further information contact either Mr. Horst Windisch, President, P.O. Box 17273, Groenkloof, 0027 South Africa or Mr. Roy I. Grim, Secretary/Treasurer, 9155-A Hitching Post Lane, Laurel, MD 20723-1531 U.S.A.

VERMONT ADOPTS GROSSULAR

Ever since Arizona (after about eight years of debate in the State Legislature) adopted the bola tie as the State's "Official Neckwear," I've had my doubts about the utility of official state anythings. However, when it comes to minerals, it never hurts to publicize the existence and legitimate value of same to the general populace. It's a form of lobbying for recognition, in a broad conceptual sense, something we tend to neglect (see Bill Smith's guest editorial in the September-October 1992 issue).

In July of last year, the State of Vermont adopted grossular (taking particular note of the famous Eden Mills occurrence) as the state's "official gem," talc as the "official mineral," and granite, slate and marble as the "official state rocks." True, the talc and the rocks are being recognized exclusively for their economic significance—20% of all talc mined in the U.S. and Canada comes from Vermont. But publicity is publicity, and anything which serves to remind people that there is a third "Kingdom of Nature" in addition to plants and animals is worthwhile.

The official symbols were adopted in a July 9 ceremony hosted by Vermont Governor Howard Dean and attended by mining industry representatives, mine owners, representatives from all of Vermont's mineralogical societies, gemologists, geologists, members of the general public, and, especially, Sue Hadden who researched and initiated the proposal. Congratulations to all.

GLOSSARY SUB-EDITION

Due to a problem at the printer, our usual press run for the latest (1991) edition of the *Glossary of Mineral Species* came out short by several hundred copies. Consequently, we ran out of copies earlier than expected, and have had to go back to press to print more. At the time we did this, the 1992 "Additions and corrections to the *Glossary of Mineral Species*" was just going to press in the May-June issue, so we also had some extra pages added to the new printing of the *Glossary* itself, which now for the first time includes additions and corrections bound in at the back. Copies are available from the Circulation Manager ($17 postpaid).

NOW TWO FAX LINES!

The Mineralogical Record now has **two** 24-hour dedicated FAX lines, one coming into the *editorial and advertising office* (**602-299-5702**), and the other coming directly into the *circulation, book sales and back issues office* (**602-544-0815**). Because the Circulation Manager and I have offices across town from each other, and not adjacent or in the same building as one might assume, it is important that messages and orders are directed to the correct office number. Otherwise unnecessary delays may result.

People wishing to leave verbal messages when we are not in our respective offices may do so on the *circulation office FAX line* (which will record a message if no FAX is transmitted) or on the *regular editorial office number* (602-299-5274) via our answering service.

RECORD PAGINATION

Some journals and magazines paginate each issue separately, always starting with page 1. This means that in bibliographies the article citations from those journals must include the issue number as well as the volume and page number. Other journals paginate each volume as a unit, with each succeeding issue in that volume picking up the page numbering where the previous issue left off. Thus bibliographic citations for those journals can be specific giving only volume and page number.

This brings us to the subject of *Mineralogical Record* special issues designed like books. We like to paginate those beginning with page 1, as a part of their stand-alone format. As long as the special book-issue is the January-February issue (which always starts with page 1 in any case), this does not disrupt the pagination of the volume as a whole. However, when a later issue in the year is paginated book-style, there will be an apparent pagination discontinuity within the volume. Whole-volume pagination in the issue *following* the book-issue will then pick up where the book-issue *would have* left off had it been paginated normally. Thus in volume 8 (1977) the page numbering goes as follows:

(1) January-February	page 1–68
(2) March-April	page 69–132
(3) May-June (Tsumeb book-issue)	page 1–128
(4) July-August	page 261–336
(5) September-October	page 337–424
(6) November-December	page 425–528

Notice that issue #4 picks up as if the Tsumeb Issue preceding it had been numbered normally (133–260) rather than independently. The last page of issue #6 therefore still indicates the total number of pages in that volume.

I bring all this up because, although independent pagination of individual issues has been a rarity for us in the past, it occurred *three times* last year: the Houston Museum supplement in #1, the Michigan Copper Country Issue (#2) and the Yukon Phosphates Issue (#4). The other issues are paginated in the normal sequential way, as if #1, #2 and #4 had been as well. Bibliographers and other authors making reference to the *Mineralogical Record* issues published in 1992 will therefore be obliged to cite *issue number* as well as volume and page number, to avoid ambiguity, and will have to designate the Houston Museum supplement separately as well.

Josephine L. Scripps
(28 June 1910–4 May 1992)

NOTICES

Died, Josephine Louise Scripps, 82. She was the daughter of James George Osbourne Scripps, and granddaughter of Edward Wyllis Scripps (1854–1926), founder of the Scripps-Howard newspaper chain and United Press International, and a co-founder of the Scripps Oceanographic Institute. She was an influential Southern California mineral collector, specializing in San Diego County and Baja California specimens through purchase and field collecting, and was a major benefactor of the San Diego Museum of Natural History.

A native of San Diego, Josephine grew up on the family's 400-acre Miramar Ranch, and later studied at the University of Washington. It was there she first discovered her affinity for minerals, through several courses in geology. Her family had wanted her to study law and ultimately work for the newspaper. But she chose instead to take over the 4,800-acre Fanita Ranch in Upper Mission Valley, raising beef and dairy cattle, and serving as the local Fire Chief. In 1956 she sold Fanita Ranch (now known as Carlton Hills), in one of the largest land transactions in the history of San Diego county, and moved to the Hi Hope Ranch near Oceanside to raise purebred Holstein dairy cows.

She became active in mineral collecting, taking many collecting trips to the deserts of California and Baja California. She was appointed an honorary (i.e. unpaid) curator of the San Diego Natural History Museum in the early 1970's, and spent several years there doing volunteer work, organizing fundraisers, and assisting in building up the Museum's collection of the San Diego County minerals. The Museum recently reopened its remodeled mineral hall under the name of The Josephine L. Scripps Hall of Minerals.

Josephine ("Josie") held an annual barbecue for up to 600 local mineral collectors, she directed the Mineral and Gem Division at the Del Mar Fair, and sponsored the Museum's Volunteers for Minerals.

She took many young mineral collectors in tow and served as their mentor.

Aside from her superb mineral collection, Josie was probably best known for her storytelling. She told about repeatedly buying more minerals than she needed from the little villages in Baja because she had noticed that the roofs of the miners' houses kept improving as a result (a typical Josie form of charity). She also told about being engaged in sweettalking the owner of the Mack mine into allowing her and her young proteges to collect there, when one of them accidentally set off a blast that put a hole in the roof of the owner's house. In her younger days she enjoyed surreptitiously transporting specimens of gold and gem tourmaline across the border from Mexico in a battle of wits with the border agents; she used an ambulance to speed by during World War II, and also hid specimens in jars under live rattlesnakes to discourage nosy customs inspectors. She used to talk about how much freedom and opportunity mineral collectors had in the old days, and figured that the same could be done today except that "people are more chicken now."

Josie was a unique soul who could laugh at almost anything that life offered. She was an avid scholar, a mystery reader, a generous free spirit, a lover of dogs and horses, and an overwhelming presence, not to mention a vicious Scrabble and Bridge player. She was one of the great characters in this hobby.

According to her wishes, her collection is being split up and disbursed to several museums, where it can be enjoyed by the public.

William Larson
Charles Short

Died, Giancarlo Brizzi, 56, in Florence, Italy. Brizzi was among the most prominent mineral collectors in Italy. Trained in pharmacy, he entered service in the Italian Army and eventually rose to Lieutenant-colonel, with promotion to General due shortly. He was in charge of the military pharmaceutical plant in Florence, served as representative for Italy at the NATO Congress for Military Medicine, and commanded the Italian Hospital in Beirut during the UN intervention.

Brizzi was, for over 25 years, a passionate collector of minerals and a specialist in the occurrences of Tuscany. He had made a name for himself as a tireless organizer of systematic investigations in collaboration with all of the museums and universities in Tuscany, and with the Italian mineralogical collectors' societies as well. In addition, he was an excellent mineral photographer, founder and director of the AMF (Florentine Friends of Mineralogy . . . among the most active mineral societies in Italy), and an active contributor of articles to a range of publications including *Mineralien-Welt, Rivista Mineralogica Italiana,* and *Mineralogical Record.*

Rainer Bode

Died, Alvin J. Cohen, 73. Alvin J. Cohen was born July 21, 1918, and died October 2, 1991, in Pittsburgh. He was educated at the University of Florida, graduating in 1940, and received his PhD in Chemistry from the University of Illinois in 1949. He began his career at the U.S. Naval Ordnance Test Station at China Lake, California (1951–1953), and later served as a researcher at the Mellon Institute in Pittsburgh (1953–1962). Professor Cohen retired from the University of Pittsburgh in 1988, after having served 25 years as Professor of Geochemistry. His major interest was spectroscopy of minerals and glasses, with particular emphasis on color centers in quartz. He was also interested in tektites and did geochemical work helping to confirm that these objects are of terrestrial, not lunar, origin. He also explored several suspected meteorite craters and worked on Apollo lunar samples. He published numerous papers, including one in the *Mineralogical Record* ("New data on the cause of smoky and amethystine color in quartz," **20**, 365–367). In addition, he was a raconteur *par excellence,* and often spent hours regaling his students with stories of his interesting experiences.

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GIANT FLUORAPATITE CRYSTALS: A QUESTION OF LOCALITY

Jerry Van Velthuizen
Canadian Museum of Nature
P.O. Box 3443, Station "D"
Ottawa, Ontario, Canada K1P 6P4

Giant euhedral crystals of fluorapatite were discovered in Quebec in the late 19th century, and made the rounds of several World's Fairs and expositions. Determining their precise locality and circumstances is today an interesting historical challenge.

INTRODUCTION

Without exception, all institutional and privately owned mineral collections house specimens with less than adequate locality information. A recently found mineral specimen can easily be given exact locality information, but gathering data on "vintage" specimens may be difficult. Too often labels identify a region without providing necessary additional information. Observing paragenetic association, morphological and other physical characteristics *may* assist in determining locality information for some species, but for fluorapatite from the Central Metasedimentary Belt (Quebec segment) of the Grenville geological province this approach is tenuous.

In the Paris Exposition report of Kunz (1900), reproduced in Wilson (1990), "great crystals of apatite" are mentioned. The locality of a specimen figured in Hogarth (1974; Canadian Museum of Nature specimen number 48541) is also subject to scrutiny. The correct locality for these is resolved here. Other large apatite specimens and occurrences of interest are also noted.

INFORMATION SOURCES

Evidence of an historical nature, extracted from mining reviews, museum catalogs and newspaper articles of the day, documents an enormous fluorapatite crystal, the most celebrated mineral specimen in Canadian history, and suggests the locality sited for the specimen is incorrect. Many times the specimen changed number and owners, notwithstanding considerable confusion generated by place name change, resolved for the moment but subject to possible change again in the near future. This case clearly demonstrates difficulties a collections specialist typically encounters during routine cataloging of a mineral specimen.

Canadian minerals, gems, rocks and ornamental stones have been displayed in several international exhibitions in the last century (Anonymous 1903), notably, the Paris Exposition 1867, Philadelphia International Exposition 1876, Paris Universal Exposition 1878, Colonial and Indian Exposition in London 1886, Chicago World's Columbian Exposition 1893, Paris Exposition 1900, and Antwerp (Anonymous 1885). Exhibits were accompanied by descriptive catalogs and handbooks which provide an interesting historical perspective on the development of Canada's National Mineral Collection during this period; they contain invaluable locality information. These are essentially annotated catalogs of the economic minerals of Canada with occasional notes on some important localities and the minerals found there, with the name and address of the exhibitor placed opposite specimen information. In catalog number 405 (Paris Universal Exposition 1878) and catalog number 406 (Paris Exposition 1900) apatite is classified under "Mineral Manures" cross referenced to the section "Minerals Applicable to Certain Chemical Manufacturers and their Products." Although a significant number of specimens housed in the collections of the Geological Survey of Canada and provincial mining bureaus were displayed at these expositions and subsequently returned, many were privately owned. CMN specimen number 48541 was displayed at the expositions of 1878, 1885, 1886, and possibly the Paris Exposition of 1900.

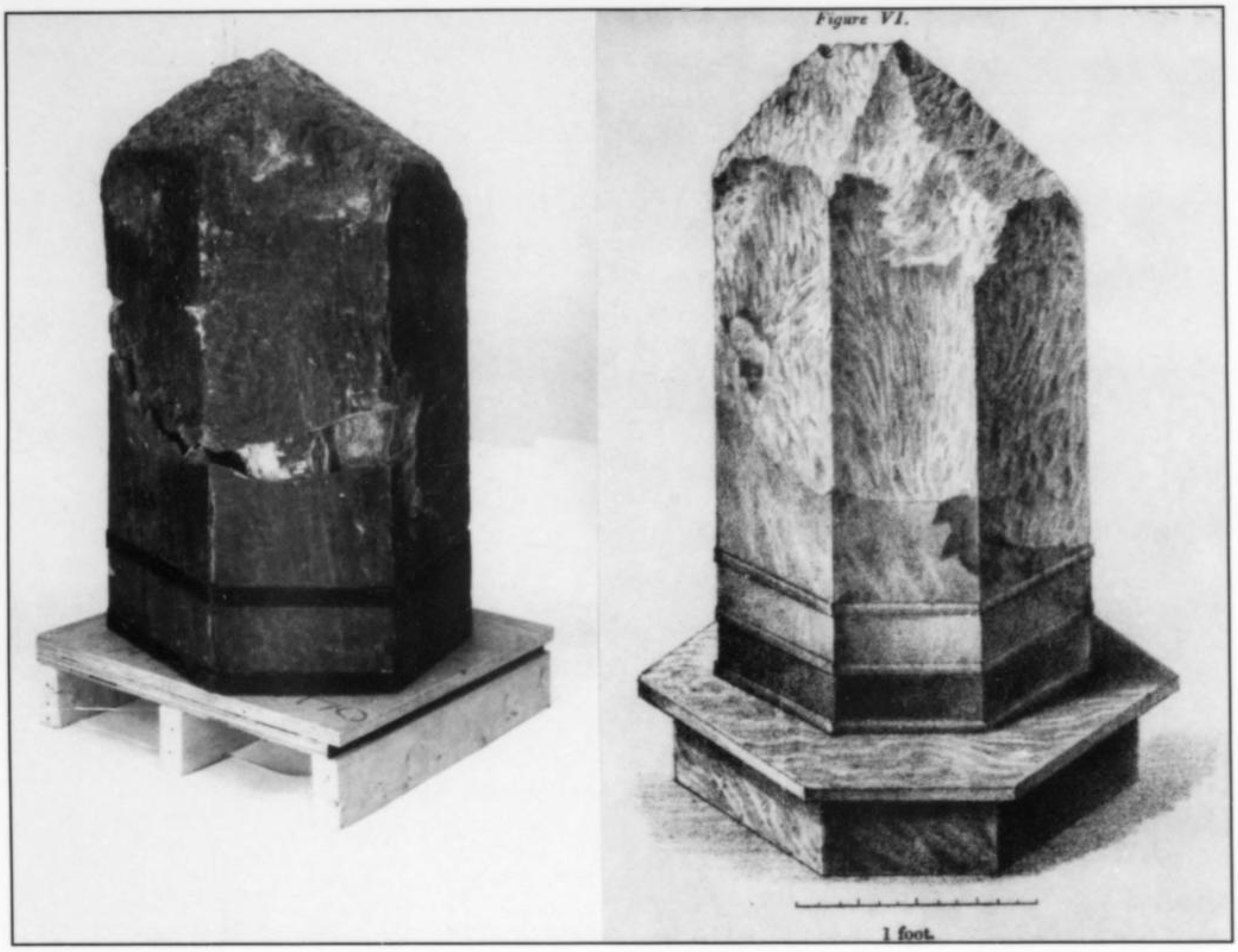
Additional sources of information required to determine an accurate locality for CMN specimen number 48541 include old maps, gazetteers, a monograph, information found in the National Archives of Canada, a public library, consultation with municipal officials, and the Quebec Department of Natural Resources (Land Surveys section).

LARGE APATITE CRYSTALS

Large euhedral crystals of fluorapatite were unearthed in apatite-phlogopite (skarn deposits) in the Central Metasedimentary Belt of Quebec and Ontario during the period 1870 to 1900. One specimen report in (1889) notes that:

> There has recently been uncovered on the Aetna lot (part and parcel of the property acquired by the Anglo-Continental Guano Co.) a monster crystal of green apatite, weighing several tons, and probably the largest in the world. Its dimensions are seven feet long by four feet wide. It is perfectly formed. An endeavor will be made to excavate this enormous crystal in its entirety.

A careful but unsuccessful attempt was made to remove the specimen intact (Hogarth 1974). This was probably the largest of several specimens that were found. A second seemingly spectacular find noted by Harrington (1878) was described as follows:



> In a vein at the latter locality (lot 17 range 9 of Templeton) a cavity lined with pyroxene crystals is said to have occurred, in the center of which there stood, like a statue in a niche, a crystal of apatite several feet in height. Part of it made up almost entirely of a confused aggregate of gigantic apatite crystals, which have grown from the walls of the crevice, and many of which are several feet in length and a foot or more in diameter. The top of one, which had the pyramidal planes entire, was eighteen inches long and eighteen and a-half inches in greatest diameter.

In the catalog of the Economic Minerals of Canada by the Geological Corps prepared for the Colonial and Indian Expositions London 1886, specimen number 381 labeled *Crystals of Apatite, Wakefield Quebec., lot 18 range 2 owned by Mr. A. H. Taylor of Ottawa Ontario,* and specimen number 76 labeled *Crystals of Apatite, Wakefield Quebec, lot 18 range 2 owned by Mr. Isaac Moore* are mentioned. A footnote which accompanied these specimens reads:

> These crystals are very abundant in the opening known as "Moores mine" either lining the walls of large cavities or imbedded in pink crystalline limestone. One large limestone vein which was opened a few years ago contained several hundred tons of them, individual crystals ranging in weight from a few ounces to several hundred pounds, and basal sections of some of them measuring as much as eighteen inches. Several hundred tons of the crystals have been exported.

A second more vivid account (1885a) of this property reads:

> In following some of the crystal beds at Moore mine, large cavernous "vugs" were struck, walled with beautiful crystals of pyroxene, phlogopite and apatite. One of these caves was 30 feet long, 6 feet wide and 8 feet high roofed with a pink crystalline limestone studded with green crystals of apatite standing out in relief on its partly dissolved surfaces.

Unfortunately this locality has been completely covered over to facilitate construction of a new road.

References to other large apatite specimens are noted in the list of exhibits in the Canadian Mineralogical Section at the Paris Universal Exposition 1878.

FIRST EVIDENCE

The first evidence that CMN fluorapatite specimen number 48541 (Fig. 1) may have originated from the Comet mine in Wakefield township appears in an article (1877a) reading as follows:

> Mineral Treasures
> Two Huge Apatite Crystals
> A Discovery of Silver In The Gatineau
> A Rich Field For Prospecting

> Messrs. Clarke and Leitch, who are mining phosphate of lime near Wilson's Corners, Hull, have struck a deposit of remarkable purity and richness. Last week they turned out two immense crystals of apatite, one of which weighs 700 lbs. This extraordinary nugget is a perfect hexagon, a deep sea green in color and almost translucent. It is four feet in length having perfect prismatic ends. The "faces" are ten and twelve inches. Notwithstanding the immense weight of the crystal it was taken from its bed with such care that only three of the angles are broken. No doubt this monster of the mine will attract the attention of scientists throughout the dominion. The phosphate taken out of this mine is very hard to get at but it is so pure that it is being put in barrels for shipment instead of being

> transported in bulk. The mine will no more than pay the expence of working it this winter. [Note that *two* crystals are mentioned in the title.]

The Comet mine, originally purchased by George Chitty of Chelsea, Hull township Quebec, in August of 1873 and worked by Messrs. Chitty and Loken for apatite, was sold in November 1876 to Captain Alexander Leach of Bryson Quebec and George Clark of Ottawa (1920).

An article titled "Phosphate Destroyed" (1877b) noted:

> It's stated that Mr. George Clark of this city shipped 100 barrels of phosphate and a crystal weighing 900 pds. on the steam barge *Como,* the latter piece, which was very extraordinary in point of size, being intended for the Paris Exhibition. The Captain of the boat, however, considered the specimen too bulky, and despite the remonstrances of a gentlemen present, broke it into several pieces. Mr. Millar of Buckingham talks of entering an action against the Captain.

John George Millar, a miner (Hogarth, 1983), was described by B. J. Harrington, Geological Survey of Canada (1878), as one "who takes a lively interest in mineralogy." The outcome of Mr. Millar's threatened legal action was not determined, but keep in mind that if a court case was pending, the specimen or its remains would be used as evidence and therefore could not be sold. This may well have been a world precedent setting case involving a mineral specimen. The question remains whether Mr. Clark sold the specimen to Mr. Millar or Mr. Allan.

THE DEALER

In 1884 a note stated that:

> A phosphate crystal weighing eight hundred pounds has been presented to Mr. W. A. Allan of this city by the owner of the famous Emerald mine. It is a rare specimen and is the largest phosphate crystal known to have been discovered in Canada. Mr. Allan has had it placed in our office, where it may be seen by those interested in such curiosities. [Note that Mr. Allan was not the original owner of this specimen.]

It is suspected that Allan placed the following advertisement which regularly appeared between 1883 and 1890:

> PHOSPHATE CRYSTALS
> Farmers, Miners, and Prospectors, having unbroken
> Phosphate Crystals for sale, can find a cash
> purchaser by applying at the Office of
> The Canadian Mining Review
> Union Chambers, 14 Metcalfe Street, Ottawa.
> Parties offering crystals for sale will please
> mention the color, length, and diameter,
> Large Ones Prefered.

International exhibitions display the culture and heritage of a country, and demonstrate products of industry interest, but perhaps more importantly, they encourage investment. Business was conducted. The mere presence of the venerable Mr. A. E. Foote of Philadelphia at the Paris Exposition of 1900 attracted interest in American and Canadian mineral specimens, likely resulting in later business transactions. This kind of activity is clearly indicated in an article entitled "Phosphate Mining" (1883):

> Many specimens were also exhibited at the Paris Exhibition in 1878, and some phosphate crystals, sent there by a gentleman of Ottawa, were eagerly bought up by English and French merchants engaged or interested in the manufacture of fertilizer and preserved by them as rare curiosities; some of these crystals weighed as much as 800 pounds.

Specimens purchased by Allan from local miners displayed at various exhibitions could only help to promote and entice investment in several phosphate properties that Allan owned.

Major damage to the specimen mentioned earlier by the Captain of the steamship *Como* in 1877 indicated the need for a securely fitting pedestal constructed to accommodate the specimen in the event of display at future exhibitions. An article entitled "Ottawa at Antwerp" (1885b) notes:

> In the industry section Mr. W. A. Allan of Ottawa exhibited some very fine specimens of apatite from his Little Rapids mine in Portland east, 36 specimens of mica from his Villeneuve mine and Pike lake mines; and a magnificent specimen of an apatite crystal mounted on a pedestal.

It was subsequently noted in (1885c):

> We have learned with much gratification that the grand jury of the Antwerp International Exhibition has awarded a silver medal to Mr. W. A. Allan, of this city, for his exhibit of Canadian apatite and mica. The official document conveying this order of merit was received by Sir Charles Tupper, High Commissioner in London and transmitted by him to the Government of Canada with his personnel congratulations upon the award.

THE EVIDENCE

Compelling evidence establishing the place of origin for CMN specimen number 48541 as the Comet mine and not the Emerald mine, is found in the article dated 1877a, which states that the crystal is four feet in length, having perfect prismatic ends, and the faces measuring "ten and twelve inches," thus defining size; (note that the specimen was euhedral). CMN specimen number 48541 was measured in the orientation shown in Fig. 1, $\{1100\}$ measured 11.5 inches, $\{10\bar{1}0\}$ 9.5 inches, and $\{01\bar{1}0\}$ 9.75 inches. It is surely not a coincidence that these dimensions compare so closely to those given in the article dated 1877a. The likelihood of the existence of two large crystals of near identical proportions from two different localities is certainly remote.

CONFUSION OF SPECIMEN NUMBERS

The use of a single number for two or more specimens is indicated in the *List of Exhibits Paris Exhibition 1878*. Specimen number 118 reads: *Apatite . . . (5 specimens) . . . Templeton, near Ottawa, Millar & Henshaw*. Specimen number 316 listed as *Large Crystals of Apatite . . . Ottawa, O. (Canadian Trophy)*. Allan and Humpreys and others are listed elsewhere. Was CMN specimen number 48541 included under specimen number 316?

Specimen number 93 in the catalog prepared for the Colonial and Indian Exhibition 1886 is cited as follows: *Crystal of Apatite . . . Emerald mine Buckingham Q., lot 18 range 12 owned by Mr. W. A. Allan of Ottawa*. This specimen is accompanied by a footnote that reads:

> This apatite crystal which weighs 550 pds. and is 62 1/2 inches in circumference is supposed to be one of the largest ever obtained in any country. The crystals occur in a pink crystalline limestone and in some places are very abundant.

An article titled "The Colonial and Indian Exhibition (1886)" confirms the presence of the specimen at the exhibition and notes it was a "magnificent apatite crystal of 500 pds."

In the catalog of "Section One of the Museum of the Geological Survey" embracing the Systematic Collection of Minerals, specimen number 93 is cataloged as Geological Survey of Canada specimen number 5155 and cited under "Polished Columns and Pedestals of limestone and of other Ornamental Stones." The precise description of specimen number 5155 reads: *Crystal of Apatite . . . Emerald* *mine, lot 18, range XII of Buckingham, Ottawa county, Q . . . Presented by W. A. Allan 1886 . . . Laurentian A. (5155).*

DEFINING WAKEFIELD TOWNSHIP

During the last 150 years what were once English place names and geographical features such as lakes and rivers in the province of Quebec have been converted to their French equivalents. County names have changed, boundaries have moved, and what were once townships a hundred years ago are now Cantons within a larger municipality. Attempts have been made to annex a part of one township by another, Cantons have been divided, municipalities have sold lands to larger urban centers, and the government has regionally incorporated whole Cantons.

From inception of the township to the present, difficulties in defining borders and the name Wakefield are common. On January 30th, 1793, Mr. Peter Savage of New York presented a petition requesting formation of the township, a proposal refused by Lord Dorchester (Lieutenant Governor) and his land commissioners. A second petition was again rejected because commissioners were less than impressed with the "character, principles, and deportment of the petitioners." Other petitions were submitted but the township was not officially recognized until 1843, the borders then defined as bounded in front by Buckingham on the Ottawa river, to the west by Masham, on the east by Portland, and the north by waste lands.

A recently imposed place name change by the local government resulted in the name "Wakefield" being included in brackets and smaller letters beneath the new name "Lapeche." Then civic administrators introduced a motion to divide the municipality into east and west halves, resulting in further name changes. Wakefield township was previously divided in half. One half is located in the Municipality de Lapeche, the other half in the Municipality de Vals des Monts. The division and renaming of counties to which Wakefield was a part is lengthy, involved and colorful but necessarily abbreviated here. Locality information gathered from geological reports, maps and catalogs reflect these changes, clearly demonstrating difficulties encountered in cataloging any specimen from this Canton.

LOCATION OF THE COMET MINE

The Comet mine is located in close proximity to the boundaries of two Cantons, three municipalities, two counties, the quadruple junction of four lots and two ranges. Le Canton Wakefield (Municipalitie Lapeche) is located on the west side, Le Canton Wakefield (Municipalitie Vals des Monts) is on the east side, and Le Canton de Hull (Municipalitie Cantley) is located 1200 meters south. The Municipality de Cantley and, for the most part, the Municipalitie Lapeche are located in the Comte de Gatineau. A small populated part of Lapeche including the Comet mine was annexed by the Comte de Papineau. Nothing will be noted concern numerical change upon division of a lot; for purposes of simplicity this point is omitted.

It is sufficient to note here that a lot measures over 500 by 1000 meters (0.5 km^2). In the vicinity of the mines, Haycock (1905) notes that:

> None of the mines are working, the roads are becoming choked with undergrowth, old mine buildings are tumbling down, yawning pits partly filled with stagnant water confront one in the bush, and a general air of desolation prevails.

It was determined, after consultation with representatives of the two municipalities, that the Comet mine is located, approximately 60 meters (measured to the easternmost pit) to the west of the "line" separating the Municipalitie Lapeche from the Municipalitie Vals des Monts, thus officially placing the mine in the Municipalitie Lapeche and within 25 meters north of the line separating range 1 from range 2 (southernmost pit).

To this point the Comet mine required several label changes. For example, it is currently minimally sufficient to state that the Comet mine is located in *Lot 15 s1/2 Range 2, Municipalitie Lapeche Canton Wakefield, Comte Papineau, Quebec Canada.* In 1916 it would have been correct to state that the property lay in *Lot 15 s1/2 Wakefield Township, Hull County, Quebec,* and in 1877 during the period of operations the property was located in *Lot 15 s1/2 range 2 Wakefield Township, Wright County Quebec* (note the three county name changes). Spence (1920) notes the Comet mine was located in Lot 15 s1/2 Range 21 of Wakefield.

THE SPECIMEN

The morphology of CMN fluorapatite specimen number 48541 is simple, as indicated by Figure 1. The specimen formed as a dark green euhedral crystal in carbonate which was subsequently dissolved by reaction with ground water in near-surface conditions, then redeposited in soft organic matter in a large solution cavity. Utilizing a Debye-Scherrer 114.6-mm powder camera (CuKa1 radiation,Ni filter), the refined unit cell is $a = 9.383$, $c = 6.885$, $v = 524.99$ (1). Results from an electron microprobe analysis gave, $Na_2O = 0.18$, $CaO = 55.79$, $SiO_2 = 0.26$, $P_2O_5 = 41.76$, $F = 3.40$, $Cl = 0.20$, $H_2O = 0.12$, sum = 100.24 weight %.

ACKNOWLEDGMENT

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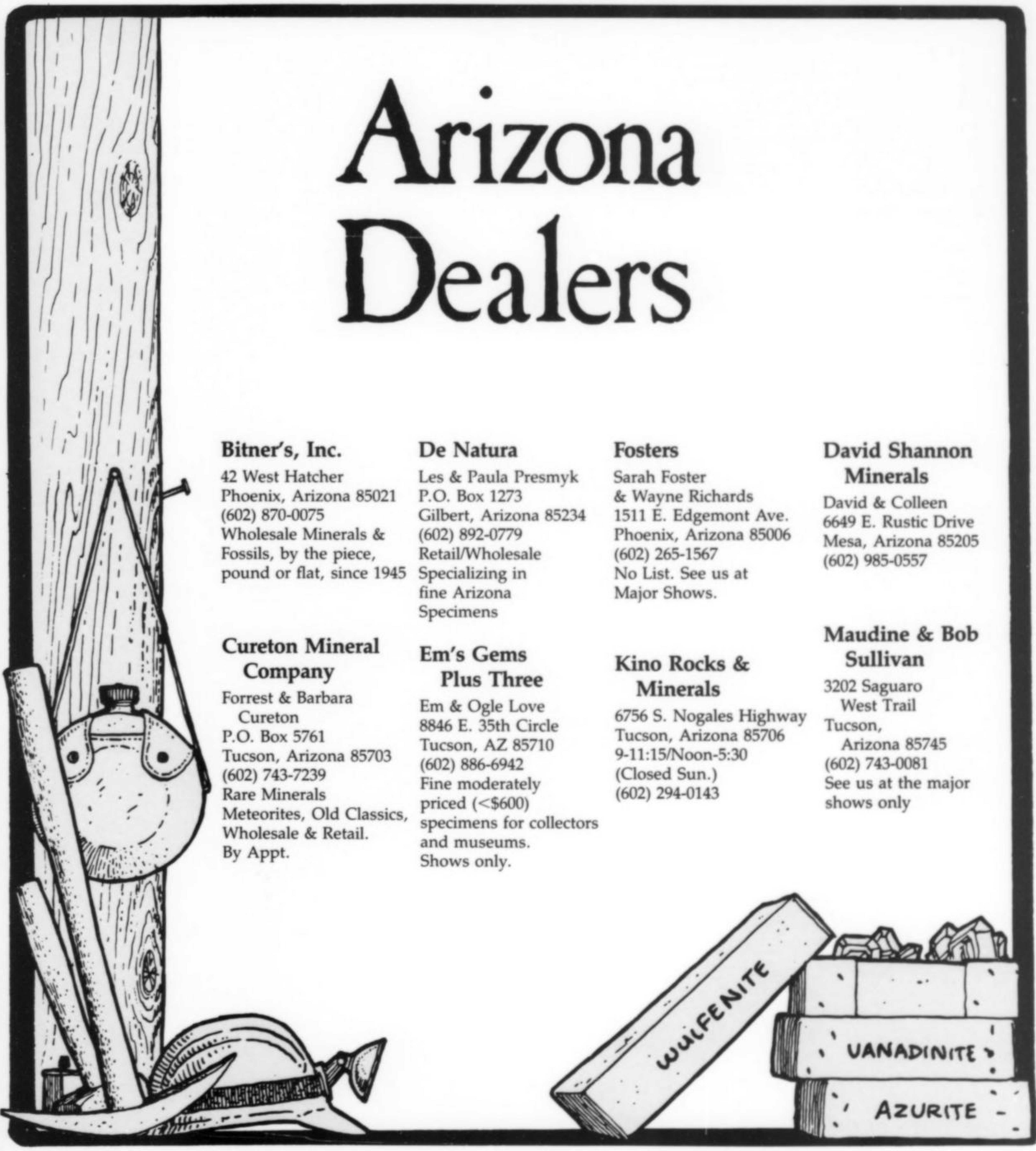

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FRANKLINPHILITE, THE MANGANESE ANALOG OF STILPNOMELANE, FROM FRANKLIN, NEW JERSEY

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ABSTRACT

Franklinphilite, the manganese analog of stilpnomelane, ideally $K_4Mn_{48}(Si,Al)_{72}(O,OH)_{216}\cdot nH_2O$ (with $n \simeq 6$), is triclinic, space group $P1$ or $P\bar{1}$; the pseudo-orthohexagonal unit cell has parameters a = 5.521(4), b = 9.560(6), and c = 36.57(5) Å, with V = 1930.2(5) Å^3, and Z = 3/8. Holotype material, with 54 mol % of the end-member, is dark brown, occurs in radial aggregates of platy crystals, has a density of 2.66 g/cm^3, and is biaxial, negative, with α = 1.545(5), β = 1.583(3), and γ = 1.583(3); pleochroism is distinct with X = pale yellow and Y = Z = deep brown. In the holotype specimen, franklinphilite occurs in a centimeter-wide vein intimately associated with friedelite, and crosscutting a breccia of aegirine, calcite, chamosite and interlayered 7-Å and 14-Å phyllosilicates. It also occurs with nelenite, rhodonite and tirodite in another assemblage. Both occurrences are from Franklin, Sussex County, New Jersey.

INTRODUCTION

During the course of an extensive investigation of layer silicates from Franklin and Sterling Hill, Sussex County, New Jersey, we noted a specimen of stilpnomelane from Franklin with an anomalously high Mn content. Manganoan stilpnomelane has been identified before, and reported previously on a sample from Franklin which was Mn-dominant (Dunn *et al.*, 1984). However, that material contained only 35 mol % of the theoretical manganese end-member, being Mn-dominant by a plurality; accordingly, we deferred naming it then. Newly discovered manganese-dominant material has now been characterized; it contains 54 mol % of the end-member and its description follows.

We have named this mineral *franklinphilite* using the locality-name root *Franklin* and the Greek word φιλός (*philos*) for "friend." The name is in allusion to its chemical composition; it contains the elements which contribute to the uniqueness of the chemical relations of Franklin and Sterling Hill. The name also honors the many geologists, mineralogists and collectors who have been *friends of Franklin* and who have contributed to our understanding of the deposit. The new species and the name have been approved by the IMA Commission on New Minerals and Mineral Names. The holotype specimen is deposited in the Smithsonian Institution under catalogue # NMNH 167390.

Parsettensite has informally been considered a possible Mn-analog of stilpnomelane and the status of this mineral has long been ambiguous. Recently, Guggenheim (1986), Ozawa *et al.* (1986), and Guggenheim and Eggleton (1987, 1988) have investigated parsettensite and found it to have a unique modulated structure, distinct from that of stilpnomelane.

OCCURRENCE

Franklinphilite is known from two distinct assemblages at Franklin, Sussex County, New Jersey. Given the large number of secondary manganese silicates at this locality, it is probable that other franklinphilite assemblages exist.

Franklinphilite was found on the Buckwheat dump; nothing is known of its original mine location or of its geological setting. Although the specimen is of anomalous appearance, it is assuredly from the Franklin mine. The original massive specimen was from a low-temperature assemblage which probably occurred as a cavity filling or vein filling; it was about 30 cm in size. Hand-specimens derived from this original specimen vary substantially in appearance and in the relative proportions of the principal minerals.

One hand-specimen obtained from the larger original specimen is the type specimen for baumite (Frondel and Ito, 1975). Baumite was discredited by Guggenheim and Bailey (1989, 1990), who reported it to be a coherent intergrowth of 7Å and 14Å phases related to greenalite-caryopilite and chlorite, respectively. They also provided information on the phases associated with baumite and the difficulty of characterizing them.

Another hand-specimen from the original specimen is the holotype

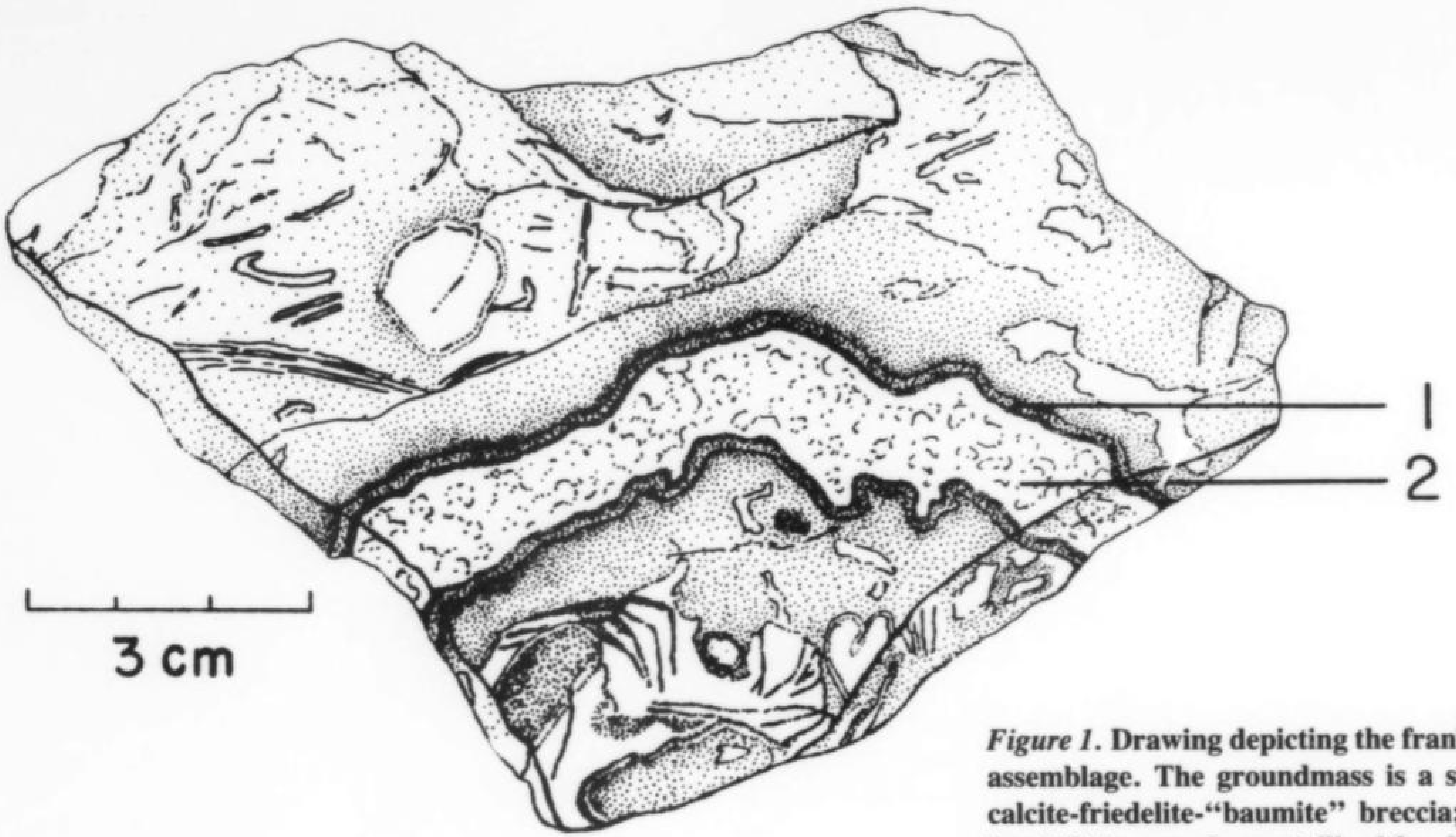

Figure 1. **Drawing depicting the franklinphilite assemblage. The groundmass is a serpentine-calcite-friedelite-"baumite" breccia; the dark band (1) is coarsely crystallized franklinphilite; the lighter-colored, wider band (2) is an impure mixture of franklinphilite and friedelite. Drawing by Mary A. Parrish.**

specimen for franklinphilite. This is a breccia consisting of abundant calcite, franklinite fragments, fine-grained friedelite, chamosite (the "brunsvigite" of Frondel and Ito, 1975), aegirine, the dense fine-grained mixture formerly known as baumite, and 1 x 3-cm broken fragments of crude willemite crystals. This breccia is crosscut by a 3-cm wide vein composed of fine-grained, medium brown, impure friedelite, which contains a central 1-cm zone of impure, fine-grained, dark brown franklinphilite (Fig. 1). This zone is composed of small radiating clusters of platy crystals; euhedral crystals were not observed, but franklinphilite is more coarsely crystallized, and darker brown at the vein margins where it is in contact with impure friedelite. Figure 2 shows an intergrowth of franklinphilite and friedelite.

Franklinphilite is also known from a second assemblage from Franklin, described by Dunn *et al.* (1984). In this assemblage, franklinphilite is black, nearly opaque, and associated with nelenite, rhodonite and tirodite. Descriptive data are given by Dunn *et al.* (1984) as an adjunct to the description of lennilenapeite and are therefore not repeated here; the specimens are in the Harvard Mineralogical Museum collection (specimens #89999, #89365 and #92791-b).

PHYSICAL AND OPTICAL PROPERTIES

The holotype franklinphilite is very dark brown with a light brown streak and a vitreous to slightly resinous luster. The hardness is approximately 4 (Mohs); cleavage on {001} is imperfect; fracture was not observed; franklinphilite is brittle. The density of fragments varies, due both to impurities and incipient cleavages; the range of observed values is 2.6 to 2.8 g/cm^3 compared with the calculated value of 2.66 g/cm^3.

Optically, franklinphilite is transparent to translucent, and biaxial with $2V$ (meas) = 10(3)°, $2V$ (calc) = 0°. The indices of refraction, measured in white light, are α = 1.545(5), β = 1.583(3), and γ = 1.583(3). Because of the poor quality of the material, orientation of the indicatrix was incompletely determined; only the angle between X and (001), approximately 6°, could be measured. Pleochroism is distinct with X = pale yellow, Y = Z = deep brown; dispersion was not detected. Franklinphilite is not discernibly fluorescent in ultraviolet radiation.

CRYSTALLOGRAPHIC DATA

Several cleavage fragments were mounted for single-crystal X-ray diffraction studies, but all specimens gave precession photographs with diffuse and broad reflections. This occurred in part because of curvature that inevitably was created during cleavage, but also was apparently caused by original defects. The unit cell and space group could therefore not be unambiguously determined using only such photographs. However, the photographs were directly compared with corresponding photographs of lennilenapeite and other stilpnomelanes; these were found to be nearly identical, insofar as could be judged given the imperfect nature of the franklinphilite photographs, implying that franklinphilite is isostructural with stilpnomelane.

Figure 2. **Back-scattered electron image of a thin-section showing blades of dark franklinphilite and light friedelite.**

In order to obtain higher quality diffraction patterns, electron diffraction patterns were obtained by spreading crushed fragments on holey carbon films, and using a Phillips CM-12 scanning transmission electron microscope (STEM) fitted with a Kevex solid state detector. Sharp, well-defined *hk*0 single-crystal patterns were preferentially obtained as grains were oriented with the {001} cleavage (indexed relative to the orthohexagonal cell; see below) normal to the electron beam. Such patterns were of two types, duplicating the examples of *hk*0 patterns of stilpnomelane and friedelite, respectively, as illustrated by Guggenheim and Eggleton (1988). Grains for which [001] was parallel to the electron beam displayed diffraction patterns typical of those obtained by Crawford *et al.* (1977) for stilpnomelane, with alternate rows of reflections parallel to the *c*-axis displaying sharp and diffuse reflections, respectively, with the diffuse streaking parallel to *c**. Qualitative energy-dispersive X-ray analyses were obtained for grains exhibiting diffraction patterns; those grains showing the typical stilpnomelane-like diffraction patterns gave data consistent with compositions identical within error to that obtained by electron microprobe analysis; those having the friedelite-like pattern contained only Mn, Si, O and Cl in amounts corresponding to friedelite.

Powder X-ray diffraction data (Table 1) were obtained using a 114.6-mm diameter Gandolfi camera, polycrystalline specimen, Fe*K*α radiation, and Si as an internal standard. Because franklinphilite is, by analogy, isostructural with stilpnomelane and thus triclinic, but pseudo-hexagonal, observed *d*-values for non 00*l* reflections may be indexed with more than one choice of pseudosymmetrically related indices. Powder diffraction data therefore cannot be used to refine the cell parameters for the triclinic cell. However, Eggleton and Chappell (1978) recommended using an orthohexagonal cell. The cell parameters were therefore refined by least-squares using such a cell, utilizing indices as given for corresponding reflections by Guggenheim and Eggleton (1988) for lennilenapeite and stilpnomelane. The resultant lattice parameters are $a = 5.521(4)$, $b = 9.560(6)$, $c = 36.57$ Å, and $V = 1930.2(5)$ Å^3. Z = 3/8 for this cell; the non-integral value derives from the fact that the pseudo-orthohexagonal cell is a subcell of the true triclinic cell, for which Z = 1. Table 1 contains a list of the powder X-ray diffraction data, with reflections indexed on the orthohexagonal cell. The lattice parameters for the pseudotrigonal cell are $a = 22.08(1)$ and $c = 12.19(2)$ Å. These compare with values of 22.05 and 12.19 Å, as reported by Guggenheim and Eggleton (1988) for lennilenapeite, and 22.11 and 12.14 Å for manganoan stilpnomelane.

CHEMICAL COMPOSITION

Because of the presence of numerous fine inclusions, franklinphilite could not be analyzed by wet-chemical methods; electron microprobe wavelength-dispersive analysis was employed. The analytical data were obtained utilizing an ARL-SEMQ electron microprobe using an operating voltage of 15 kV and a sample current of 0.025 μA, measured on brass. Standards used were hornblende (Si,Al,Fe,Mg,K,Na), ZnO (Zn), and manganite (Mn); the data were corrected using standard Bence-Albee correction factors. Due to impurities, the concentration of water could not be measured directly and it was calculated by difference; the value so obtained (8.1 weight % H_2O) compares very favorably with that (8.4 weight % H_2O) for other franklinphilite samples from Franklin (previously described as manganese-dominant stilpnomelane) for which water was directly determined (Dunn *et al.*, 1984). Franklinphilite is homogeneous. The resultant analysis yielded: SiO_2 44.0, Al_2O_3 3.6, Fe_2O_3 7.8, MgO 6.4, K_2O 1.5, Na_2O 0.4, ZnO 5.9, MnO 22.3, H_2O [8.1], total = 100%. Total iron is assumed to be ferric iron, in part based on the associated aegirine.

The empirical formula, calculated on the basis of 120 total tetrahedral plus octahedral cations, as is the convention for stilpnomelane, is $(K_{2.64}Na_{1.07})_{\Sigma 2.71}(Mn_{26.08}Mg_{13.18}Zn_{6.02}Fe^{+3}_{2.72})_{\Sigma 48}(Si_{60.77}Al_{5.86}Fe^{+3}_{5.38})_{\Sigma 72}(O_{163.23}(OH)_{52.77})_{\Sigma 216}\cdot nH_2O$, with Mn >> Mg > Zn in holotype franklinphilite. There is extensive solid solution with lennilenapeite, the Mg-analog of stilpnomelane, as shown by the data of Dunn *et al.* (1984).

Table 1. **Powder X-ray diffraction data for franklinphilite compared with data for lennilenapeite. Data for friedelite that occurs intimately intergrown with franklinphilite are also listed.**

Franklinphilite*				**Lennilenapeite†**	
I/I$_o$	***d*$_{obs}$(Å)**	***d*$_{calc}$(Å)**	***hkl*****	***I/I$_o$***	***d*$_{obs}$(Å)**
100	12.3	12.2	003	100	12.11
30	*7.27f*				
				2	6.09
5	5.54			2	5.50
20	4.79	4.78	110	5	4.76
		4.78	020		
10	4.40			2	4.39
20	4.08	4.06	009	20	4.07
2	3.83				
30	*3.61f*			5	3.67
2	3.18				
20	3.06	3.05	0,0,12	20	3.04
20	*2.881f*				
30	2.737	2.729	202	30	2.734
40	2.583	2.582	205	40	2.582
5	*2.553f*				
2	2.449	2.441	207	2	2.439
10	*2.405f*				
30	2.362	2.363	208	30	2.365
10	2.201	2.203	2,0,10	2	2.204
20	*2.120f*			10	2.125
10	*1.968f*			1	1.965
2	1.897	1.897	2,0,14		
10	*1.730f*				
5	1.694	1.697	2,0,17	1	1.695
5	*1.677f*				
2	*1.623f*				
30	1.594	1.593	060	30	1.593
30	1.580	1.580	063	30	1.578
5	1.541	1.542	066	10	1.542
2	*1.520f*				
				1	1.413
2	1.376	1.376	402	1	1.373

*Data for reflections from friedelite are listed in italics and with the letter f appended to the *d*-value.

**Indices based on orthohexagonal cell with $a = 5.521$, $b = 9.560$, $c = 36.57$ Å.

†Dunn *et al.*, 1984.

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A NOTABLE RHODONITE CRYSTAL FROM BROKEN HILL, AUSTRALIA

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In the mid-1970's an extraordinary specimen of rhodonite with manganpyrosmalite was collected in the New Broken Hill Consolidated mine. Although rhodonite has long been known from Broken Hill, this example stands out as unique.

The famous Broken Hill mine in New South Wales, Australia, has long been known among mineral collectors for its red rhodonite crystals. The species was first recognized at the locality in 1889–1890; since then Broken Hill has been found to be the richest source of rhodonite crystals in the world, producing many magnificent specimens (Bancroft, 1984; Gardner, 1980).

Broken Hill rhodonite typically occurs as attractive, bright red, tabular to blocky crystals with rounded edges, embedded in massive galena and/or sphalerite (Anderson, 1908). A few free-growing crystals have also been collected, showing sharp edges and a flat prismatic habit. [See *Mineralogical Record,* vol. 19, no. 6, page 462, and vol. 16, no. 4, page 305 for illustrated examples. Ed.]

In the mid-1970's several rhodonite crystals are said to have been found in the New Broken Hill Consolidated mine, lying loose on the floor of a stope after blasting. The crystals were coated with a thick, unsightly layer of an unknown brown substance, and were consequently largely disregarded. Fortunately at least one example, the specimen described here, was saved.

The surface coating on the crystal proved easy to remove, revealing a superb specimen underneath. The crystal (shown in Fig. 1) measures 9.5 cm (almost 4 inches) in length and 2.2 by 3.2 cm across. The prism faces are smooth and lustrous. One termination is comprised of a multitude of tiny parallel terminations giving a somewhat ragged appearance; the other end is terminated by relatively smooth, well-formed faces that are slightly etched. The crystal is translucent to nearly transparent and has a rich red color.

Small clusters of manganpyrosmalite crystals are attached to three of the prism faces. These crystals range from 2 to 8 mm across the basal pinacoid. This is an unusual association which, together with the extraordinary size and quality of the rhodonite crystal, makes this specimen unique among Broken Hill rhodonites seen by the author in over 67 years of mineral collecting.

As background to this discovery it should be explained that rhodonite [$(Mn^{+2},Fe^{+2},Mg,Ca)SiO_3$] is a relatively common gangue mineral in the primary ore at Broken Hill. Little has been found in the oxidized zone, where it has generally broken down to massive coronadite and manganiferous limonite. Primary ore of average texture contains rounded, 3 to 4-mm grains of rhodonite associated with galena, sphalerite, chalcopyrite, apatite, spessartine and blue quartz. The rhodonite ranges in grain size from microscopic inclusions to 9 or 10-cm crystals in coarsely crystalline ore.

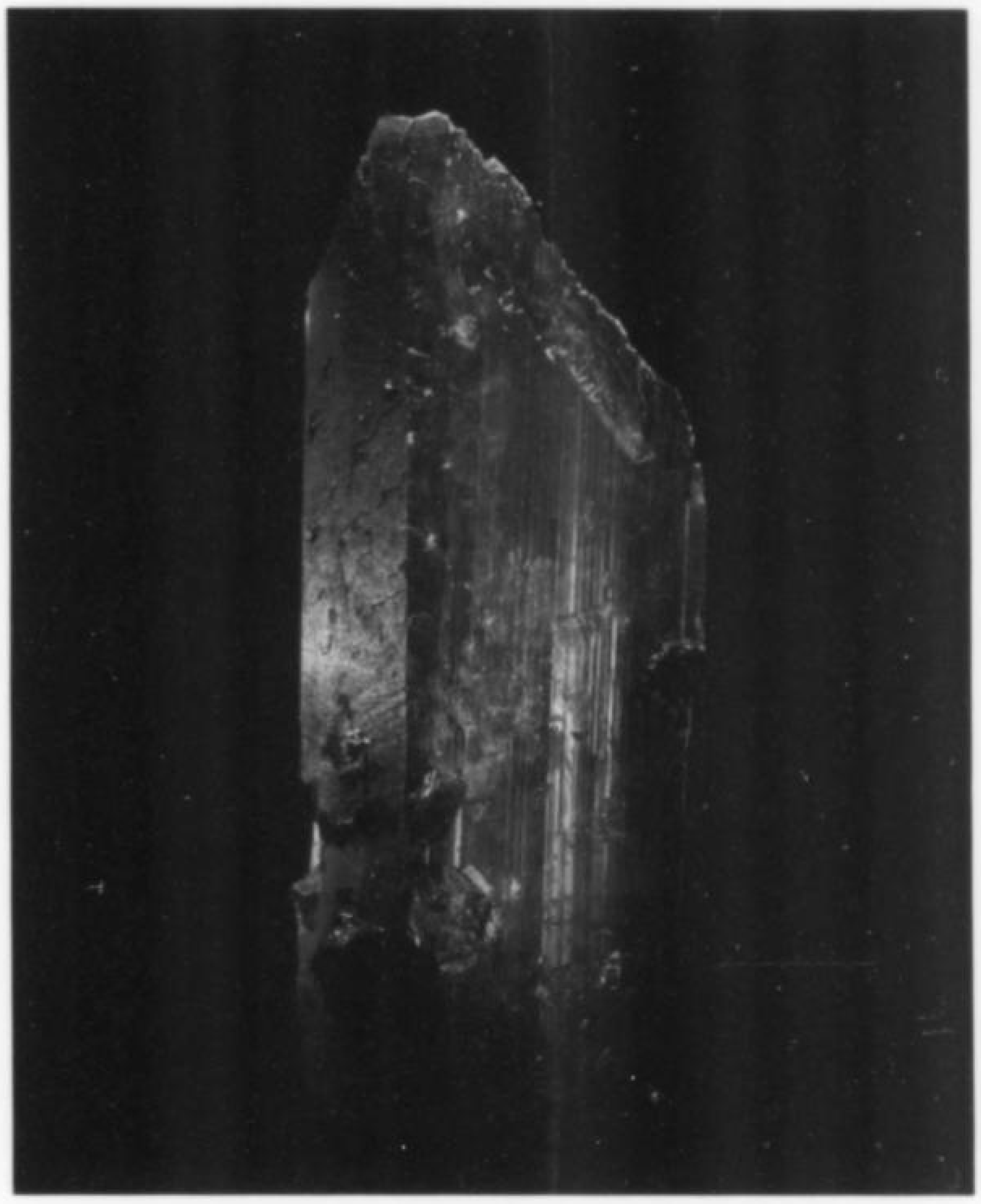

***Figure 1.* An extraordinary rhodonite crystal (shown actual size: 9.5 cm) found in the New Broken Hill Consolidated mine in the mid-1970's. The attached crystals are manganpyrosmalite. Albert H. Chapman collection; photo by David Barnes.**

The distribution of rhodonite varies along the 7.3-km trace of the lode. The rhodonite orebody actually consists of six principal lenses known as lead or zinc lodes (depending upon which metal is dominant). All six occur at the southwest end of the Broken Hill orefield, and include the Zinc Corporation mine and the New Broken Hill Consolidated mine. The main zinc-rich lodes are situated in the southwestern end, and the lead lodes continue to the northeastern end of the group, at the North Broken Hill mine. The largest rhodonite crystals (up to 10 cm) have been found to occur in the North Broken Hill no. 2 mine, particularly between the 26th and 28th levels. The crystals from this occurrence are typically imbedded in galena and sphalerite associated with spessartine, pyroxmangite and knebelite.

Rhodonite has been found only rarely at the southwest end of the lode. Crystals from the Zinc Corporation mine are beautifully transparent, rich-red crystals to several centimeters in length, typically associated with calcian bustamite (in fine crystals), calcite, fluorite and ferroan bannisterite.

Rhodonite composition varies somewhat across the orefield. Early analyses (Smith, 1926) of specimens from the North Broken Hill mine show 9.45% FeO and less than 2% CaO, whereas specimens from the Zinc Corporation mine show less than 2% FeO and 9.75% CaO.

The occurrence of pyrosmalite-group specimens is well documented at Broken Hill. Pyrosmalite was recognized by Maurice Mawby around 1943 (Warner and Mitchell, 1982), and since that time has been found throughout the orefield. Analyses show that the massive material from the northeastern end of the field is ferropyrosmalite [$(Fe^{+2},Mn^{+2})_8Si_6O_{15}(OH,Cl)_{10}$], whereas crystals from the southwestern end are manganpyrosmalite [$(Mn^{+2},Fe^{+2})_8Si_6O_{15}(OH,Cl)_{10}$]. Rhodonite is direct association with manganpyrosmalite is known only from the Broken Hill Consolidated mine.

It is at least possible that other crystals were saved from the unusual occurrence found in the New Broken Hill Consolidated mine. Perhaps the description and photo presented here will assist in bringing them to light.

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PALLADIUM AND PLATINUM FROM CÓRREGO BOM SUCESSO, MINAS GERAIS, BRAZIL

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The Córrego Bom Sucesso prospect is one of Brazil's numerous native platinum occurrences, noteworthy because of the habit of its specimens and their very high palladium content. In fact, the deposit probably provided some of the specimens from which the element palladium was first discovered in 1803.

LOCATION

The Córrego (= Creek) Bom Sucesso prospect is located east-northeast of Belo Horizonte and southeast of Diamantina in central Minas Gerais, Brazil. It is near the historic town of Serro.

Access is by way of the tarred Datas-Serro road (MG 010), from which a small unpaved road branches off to the left at an elevation of 795 meters, at a point 52.5 km from Datas (and 4.5 km before Serro). After proceeding 3 km on the unpaved road, a jeep trail branches off immediately past the Rio do Peixe bridge and leads upstream along the river for 4.3 km to the confluence with Bom Sucesso Creek. From this point (elevation 715 meters) a steep footpath proceeds upward, requiring a hard climb for over an hour before arriving at the tiered prospect (elevation from 905 to 975 meters). The trail passes houses of the Condado do Baixo farm (elevation 795 meters). Map coordinates are x = 666.5, y = 7951 on the Serro map (SE-23-Z-B-IV, 1/1000,000, IBGE, 1978).

The Rio do Peixe flows into the Rio San Antônio, left-hand tributary of the Rio Doce. The area surrounding the prospect is very uneven and densely wooded in the gulches and on the low mountain slopes, passing into open bush on the heights where quartzite outcrops form high cliffs and talus slopes.

HISTORY

As early as 1700, Brazilian miners had encountered an unusual alloy which they called "spoiled gold" because of its brittleness. Around 1780, a silver-white bar of this gold from St. Anna dos Ferros, near Itabira do Dentro in Minas Gerais, broke into several pieces under the impact of a die. In 1798 José Vieira do Couto listed a number of Brazilian localities where the silver-white metal was found; he thought it to be platinum, but it was probably palladian gold (Hussak, 1904, 1906).

The Córrego Bom Sucesso, like other creeks in the Serro area, was probably discovered to be gold-bearing sometime in the 1700's. Platinum ore from the deposit was sold to William Hyde Wollaston (1766–1828) in England, by the London mineral dealership of Adolarius Jacob Forster (1739–1806) (Frondel, 1972). In 1802 Wollaston succeeded in separating from it two new metals which he named *palladium* (1804, 1809) and *rhodium* (1805). Some of these specimens were illustrated by Sowerby in 1812. Although the exact locality is not given by Sowerby or Wollaston, the habit is unique to Bom Sucesso.

The first recorded examination of the deposit itself was made by Miguel Lisboa in 1903. Shortly afterward Hussak (1906) described the heavy minerals from Bom Sucesso Creek and gave two platinum nugget analyses. At that time, many geologists visited the deposit, but did not produce any published reports (Moraes *et al.*, 1937).

A new description of the platiniferous sand, a metallographic study of some nuggets, and three new partial analyses were given by Cassedanne and Cassedanne (1974a). Oliva and Vieira (1973) erroneously referred to the platiniferous ore mineral as "allopalladium."

The Bom Sucesso occurrence was worked until early 1991 by Geraldo Pereira de Lima (known as "Barreto"), living near the Cabeça do Bernardo farm, Serro.

A review of the various platiniferous alluvial occurrences in the

Figure 1. **Working between the blocks.**

Figure 2. **Lower area of the prospect. The mineralized gravel lies 1.2 meters under the man in the foreground.**

Serro area, and along the western edge of the Espinhaço Range in general, served as background in the preparation of this study.

THE OCCURRENCE

The Bom Sucesso Valley is narrow and deep where it runs nearly east-west at its confluence with the Rio de Peixe. Upstream, however, it widens out and turns abruptly toward the north-northwest. Middle Precambrian quartzite of the Minas Supergroup crops out as high white cliffs overlooking the creek. Many faults and diaclases cut the quartzite, resulting in the shedding of many large blocks from the cliff face which have accumulated chaotically along the foot of the cliff.

In the distant past, unsorted alluvium had been deposited on the quartzite outcrops prior to the blocks spalling off and falling in. The blocky quartzite rubble allowed the alluvium to remain between blocks, protected from erosion. The alluvium, which had sifted down between the boulders, proved to contain gold, platinum, and palladium as well as diamond.

The Bom Sucesso prospect has always been worked by hand, as evidenced by the large piles of pebbles which have accumulated irregularly along the stream. Alluvial material removed from between the large boulders is stockpiled a short distance away, then sieved to recover the diamonds and large nuggets of precious metal. The fine material is from time to time shoveled into a sluice which recovers additional gold and platinum particles.

Mining between the huge boulders becomes progressively more hazardous as the interstitial alluvium is gradually removed. A few timbers here and there serve to delay the collapse of unstable sections. One area worked at the 980-meter level is called the Serra da Pingueira ("pingo" = droplet) because of the constantly falling water from the cliff above onto the rocks.

The alluvium ore is variable in grain size but usually under 5 mm. It consists of some sharp fragments, pebbles and small boulders or cobbles plus a sand-size component. The whole is grayish in color (actually white finely spotted with black). The pebbles are primarily quartz, some rather clean looking and some stained by manganese oxides, plus mica schists and some ilmenite and magnetite.

The coarse fraction (1 to 5 mm) has been found to contain the following minerals: anatase, cassiterite, crichtonite $[(Sr,La,Ce,Y)(Ti,Fe^{+3},Mn)_{21}O_{38}]$, hematite, ilmenite, kyanite, magnetite (including "martite"), muscovite, pyrite (pseudomorphs), rutile, xenotime and zircon along with iron and titanium oxides, gold and platinum nuggets, and small diamonds. Of interest to the micromounter are magnificent, complex twins of rutile, honey-yellow prisms of xenotime, star-shaped anatase bipyramids containing golden rutile (Cassedanne and Cassedanne, 1974b), waterworm crichtonite crystals, and violet, ovoid zircon crystals. In the fine-grained heavy fraction resulting from panning the same minerals are found, along with monazite, fibrous tourmaline, a little tremolite and very rare baddeleyite, corundum, epidote, garnet, lazulite, perovskite and topaz.

PLATINUM and PLALLADIUM

Platinum occurs commonly at the Bom Sucesso prospect, as elongated grains up to 1.5 cm in size. Morphologically they are reniform, mammillary, coralloidal, dendritic and arborescent, showing no marks of abrasion. Rounded grains are very rare. The shapes are always delicate and fresh, which is remarkable for an alluvial deposit. Habits include small stick-like shapes with implanted globules along the surface and a hollow axis. These occur as singles and little groups that are fan-shaped groups or parallel to randomly disposed aggregates. The "sticks" in the aggregates may be equally or unequally developed, growing in a planar orientation or randomly oriented, sometime having the appearance of sponge spicules. Mammillary plates, nuggets with

Figure 3. ***(right)*** **Two of Wollaston's original Brazilian palladium specimens, "nearly pure," from which the new element was first described (6 mm and 5 mm); illustrated in James Sowerby's *Exotic Mineralogy* (plate 34, 1812).**

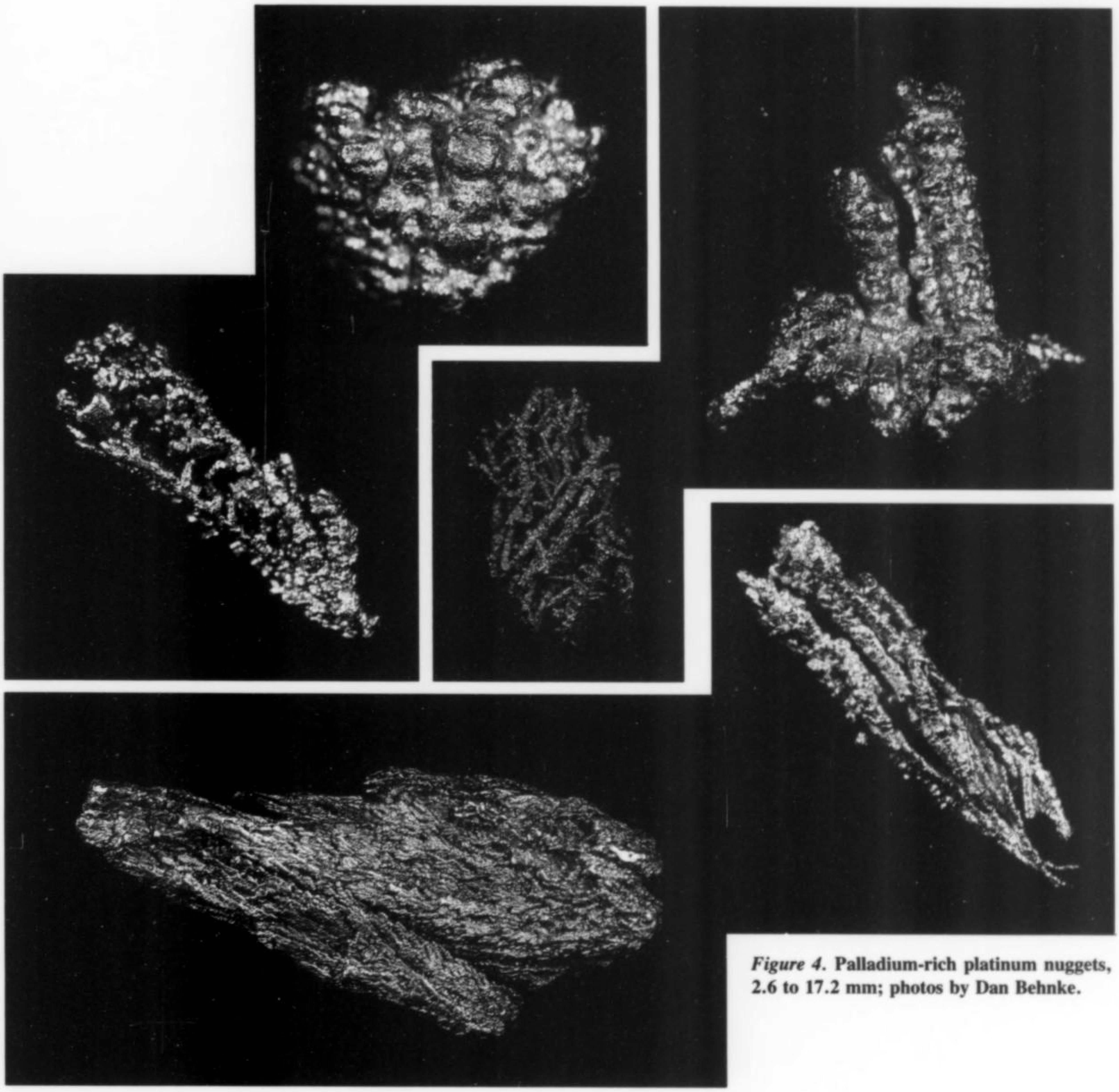

Figure 4. **Palladium-rich platinum nuggets, 2.6 to 17.2 mm; photos by Dan Behnke.**

Table 1. **Wet-chemical analyses reported for Bom Sucesso platinum nuggets.**

	1	2	3	4	5
Pt	73.99	72.96	85.2	78.1	68.0
Pd	21.77	21.82	11.7	18.6	29.3
Ir	0.08	0.88	1.2	2.1	1.4
Os	3.14	3.92	tr	—	tr
Fe	0.10	tr	1.9	tr	—
Cu	—	—	—	—	—
Insol.	0.92	0.42	—	—	—
Sum	100.00	100.00	99.1	98.8	98.7

Samples 1 and 2: Hussack (1906)
Samples 3, 4, and 5: Cassedanne and Cassedanne (1974a)

rounded protuberances, flat dendritic groups, mossy and budded branching shapes and spongy grains have also been observed. Some broken nuggets show a hollow center filled by an unidentified blackish substance.

The surface of these grains is commonly metallic in luster, grayish white, and brilliant to dull. Some are coated by iron and manganese oxides. The density, as determined on 30 nuggets, is variable, from 16.7 to 21 g/cm^3. This variance suggests a broad variation in chemical composition, although impurities lodged in the cores may have affected the measurements. Some pale yellowish specimens are probably gold-platinum alloys.

The nuggets are soft, non-magnetic, and always free of matrix and flat crystal faces. A few rare examples show striated surfaces representing contact points with other minerals during growth. Some specimens include minute quartz fragments impressed into the surface, presumably by alluvial action. Spongy platiniferous grains sometimes contain small, rounded gold nuggets stuck in their recesses.

The structure of the nuggets is interesting. They apparently nucleated around sharply crystalline dendrites, mossy and acicular crystals of palladium and platinum. The core material may be pale yellowish beige in color and a bit duller in luster than the surrounding platinum. In some of the small, irregular, sharply crystalline pieces of core palladium an axial platinum tube may be observed. The nuggets appear generally massive on the outside and are commonly cracked. In some cases the central core has been dissolved away leaving a faceted cavity.

The platinum reflectivity (in white light) is 60%; microhardness is 184.7 kg/mm^2 under a 50-gram load. Under the same conditions, the microhardness of palladium is 191.6 kg/mm^2. A partial wet-chemical analysis of five nuggets indicates the heterogeneity of the material (see Table 1). Nevertheless, the high palladium content (11.7 to 29.3 %) of the Serro nuggets is exceptional for alluvial platinum deposits (Mertie, 1969).

ORIGIN

The morphology of the platinum nuggets, delicate as it is, precludes any significant alluvial transport. This led Hussak (1906) to propose a diagenetic *in situ* recrystallization. He wrote:

> It is a matter of platinum precipitation from solutions originating from the decomposition of platiniferous pyrite or Pt-Pd alloy inclusions in sperrylite. These minerals could have proceeded from micaceous quartzites in the neighborhood, or from conglomeratic quartzites cropping out upstream.

Recent research (Wood, 1990) confirming the surficial mobility of platinum and palladium in the presence of organic compounds supports the diagenetic hypothesis. Organic acids are always present in the running waters of the Serro-Diamantina area. Cousins and Kinloch (1976) also argue that dissolution and reprecipitation are responsible for the formation of platinum-palladium nuggets in alluvial deposits.

Lack of detailed regional geologic mapping does not allow a precise determination of the original platiniferous source. Mafic and ultramafic rocks crop out locally (for instance near Serro), where they have been found to contain considerable chromite reserves and perhaps also platinum-group metals (Alves, 1952). The associated gold, as in many occurrences worldwide, originated in quartz veins (Kopf *et al.*, 1990).

ACKNOWLEDGMENTS

Geraldo Pereira de Lima graciously allowed us to visit and sample the occurrence, and sold us many platinum nuggets examined in this study. Pedro Augusto de Souza, owner of the Condado do Baixo farm, is an excellent guide for visitors to the area.

Our thanks to Dr. Wendell Wilson for supplying some historical information, for bringing the Sowerby illustrations to our attention, and for supplying photos of the relevant Sowerby plates in the Mineralogical Record Library. We are also indebted to Dan Behnke for the specimen photographs.

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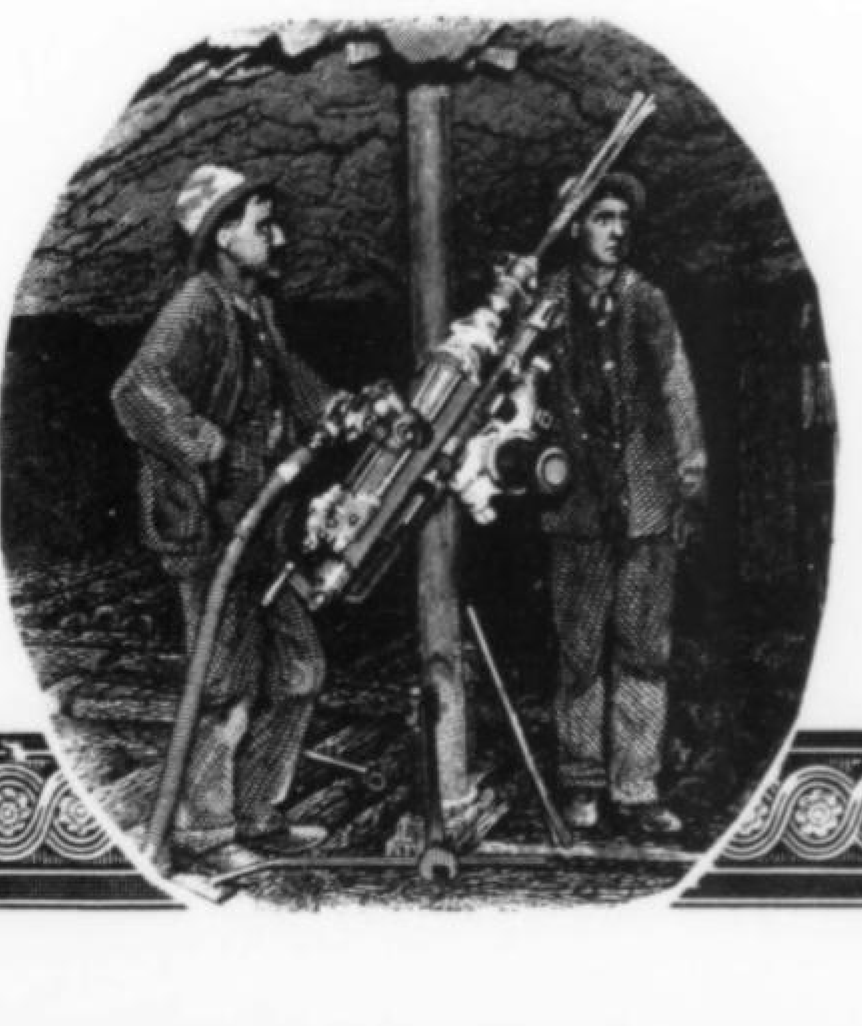

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MINERALS OF THE BLACK PINE MINE, GRANITE COUNTY, MONTANA

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The Black Pine mine has yielded numerous exotic and colorful mineral species. Discovery there of the world's largest veszelyite crystals more than a decade ago has made the Black Pine mine well-known among mineral collectors. Over 40 species have been recognized in the ore deposit, including the new mineral philipsburgite.

INTRODUCTION

The Black Pine mine has been a significant silver producer in Montana. During recent years it was the state's second largest silver producer after the Troy mine. The Black Pine mine was mined almost continuously since 1974 by the Black Pine Mining Company, a wholly owned subsidiary of Inspiration Consolidated Copper Company. The property is currently shut down.

The mine is located approximately 12 kilometers northwest of Philipsburg, Montana, in the John Long Range, within the Sapphire Mountains. Butte, Montana, is 80 km to the southeast and Missoula, Montana, is 60 km to the northwest.

Mining companies are currently exploring the region for new gold deposits. The area is also known for its abundance of placer sapphire deposits and for the rich silver mines that once produced ore in the Philipsburg mining district.

HISTORY

The Philipsburg mining district had been producing silver for nearly two decades when in 1882 ore was discovered nearby at what was to become the Black Pine mine. The deposit was originally called the Combination mine. Two milling processes, the Reese River and the Washoe Process, were combined to aid in milling the refractory ore. The mine was slow to develop, but with financial help from the Granite-Bimetallic Mining Company of Philipsburg, Charles D. McClure formed the Combination Mining and Milling Company and was able to do the first successful mining. Ore to the mill averaged 24.5 ounces of silver per ton, but the rock needed hand-sorting several times to attain this grade. The mine produced 2,135,000 ounces of silver and 1,411 ounces of gold before decreasing silver grades and the sudden fall in the price of silver in 1897 caused a long-lived shutdown.

Inspiration Development Company, the exploration group of Inspiration Consolidated Copper, became interested in the mine and purchased it in 1967. Drilling on the Combination Vein started in 1972. By 1974 production began with a new portal and development of new stopes. The mine produced ore from 1974 to March of 1983 when the mine went into a temporary shutdown. High silica content oxide ore was mined at a limited production rate and sold to the smelter for flux until March of 1988 when the mine announced a major shutdown.

Commercial collecting by D.J. Minerals of Butte, Montana, through an agreement with the company during the last few years, has resulted in many fine specimens being recovered. During this time a major pocket containing some of the finest veszelyites was discovered.

Recent forest fires have caused extensive damage to the land, but have spared nearly all buildings at the mine facility. The mine is currently for sale. Several mining companies have examined the economic feasibility of reopening the Black Pine mine, but none has entered into an agreement with the Black Pine Mining Company. The future of the Black Pine mine is uncertain.

THE MINING OPERATION

Black Pine ores were mined by the room and pillar method using rubber-tired diesel equipment. Figure 3 is a plan map of the mine openings. The difference in mining methods between the old and modern operations is immediately apparent from this map. When the mine was most recently opened it produced 1000 tons of ore per day. An incline from the surface connects all stopes in the mine and provides a haulageway for the ore trucks. The 20-ton trucks had to drive 50 round trips out of the mine each day to haul 1000 tons.

GEOLOGY

The Black Pine mine is in the northeast part of the Sapphire tectonic block (Hyndman, 1980) (Fig. 1), a large thrusted block of Precambrian sediments that was transported eastward nearly 100 km during Late Cretaceous-Early Tertiary deformation related to intrusion of the Idaho

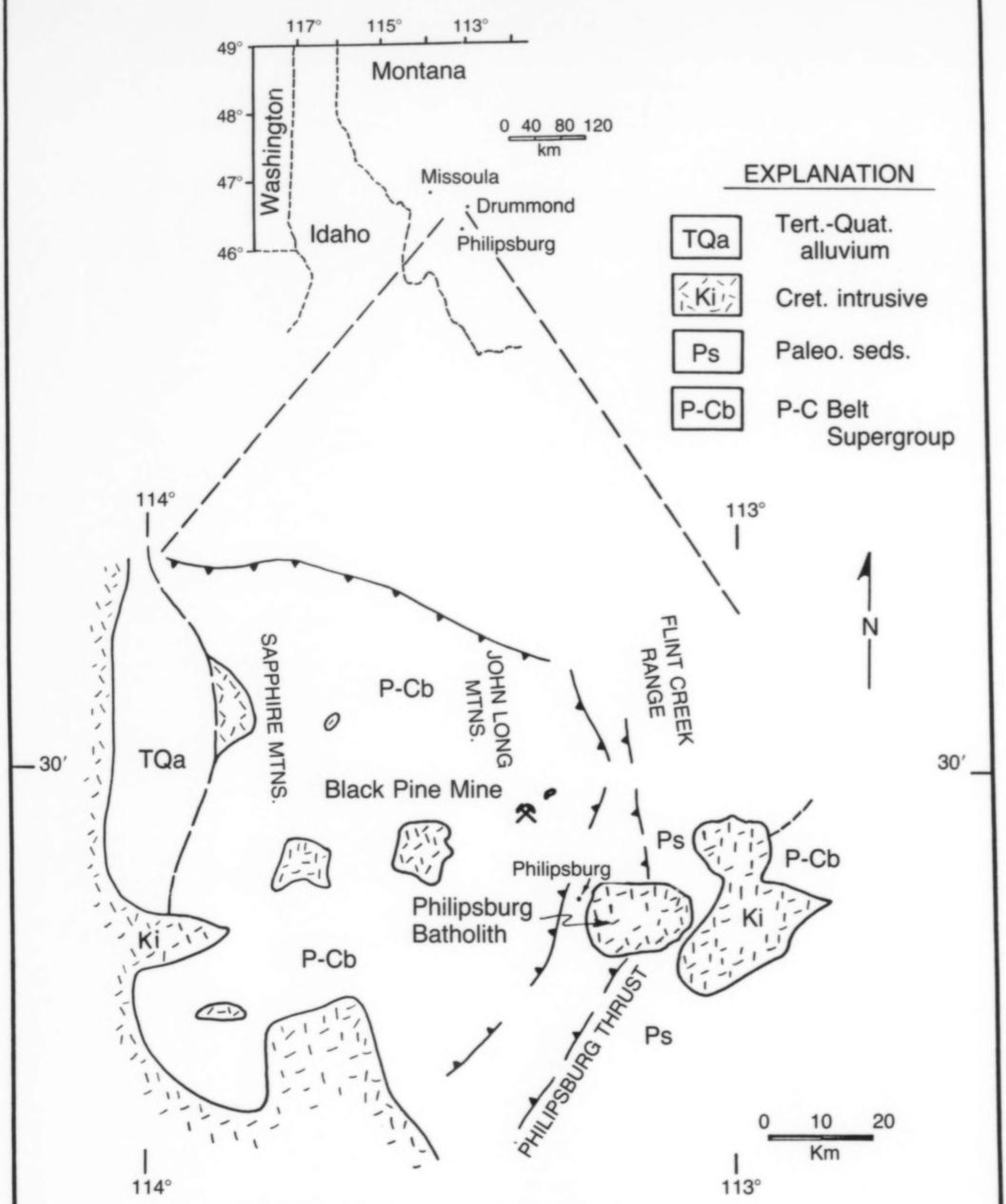

Figure 1. **Index map showing location of the Black Pine mine and general geology of the Sapphire tectonic block. (Modified after Hyndman, 1980.)**

batholith. This eastward thrusting caused numerous westward-dipping thrust faults that were receptive to subsequent mineralization. Movement on individual thrust planes may be relatively little when compared with the amount of total movement of the Sapphire block, but collectively they account for the considerable amount of eastward displacement.

Local thrusting and intrusions have been used to establish the age of the orebody. Minor low-angle thrusting confined within the Black Pine ores is evidence that at least some of the mineralization there occurred during renewed or continued movement of the thrust faults. The Philipsburg Batholith cuts and is cut by local thrust faulting, thereby dating the thrust in the area at approximately 73 million years (Ma) (Hyndman, 1980). The Henderson stock, part of a series of intrusions of the Henderson-Willow Creek intrusive trend (Fig. 2) (Hughes, 1971) about 2 km from the Black Pine mine, is emplaced along a thrust fault and is dated at 70.1 ± 2.5 Ma (Hughes, 1971),

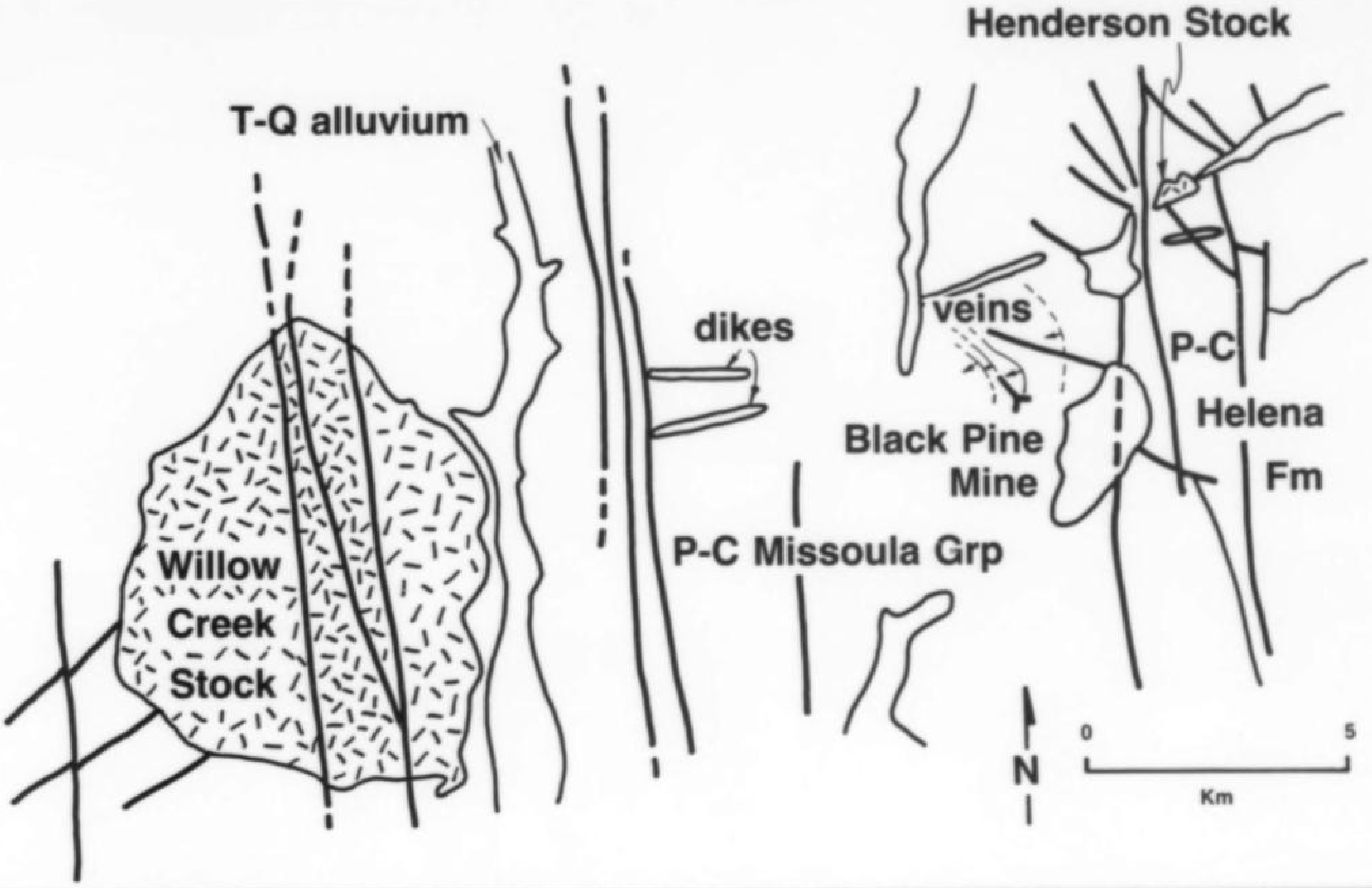

Figure 2. **General geology of the Henderson-Willow Creek intrusive trend and Black Pine mine area (after Hughes, 1970).**

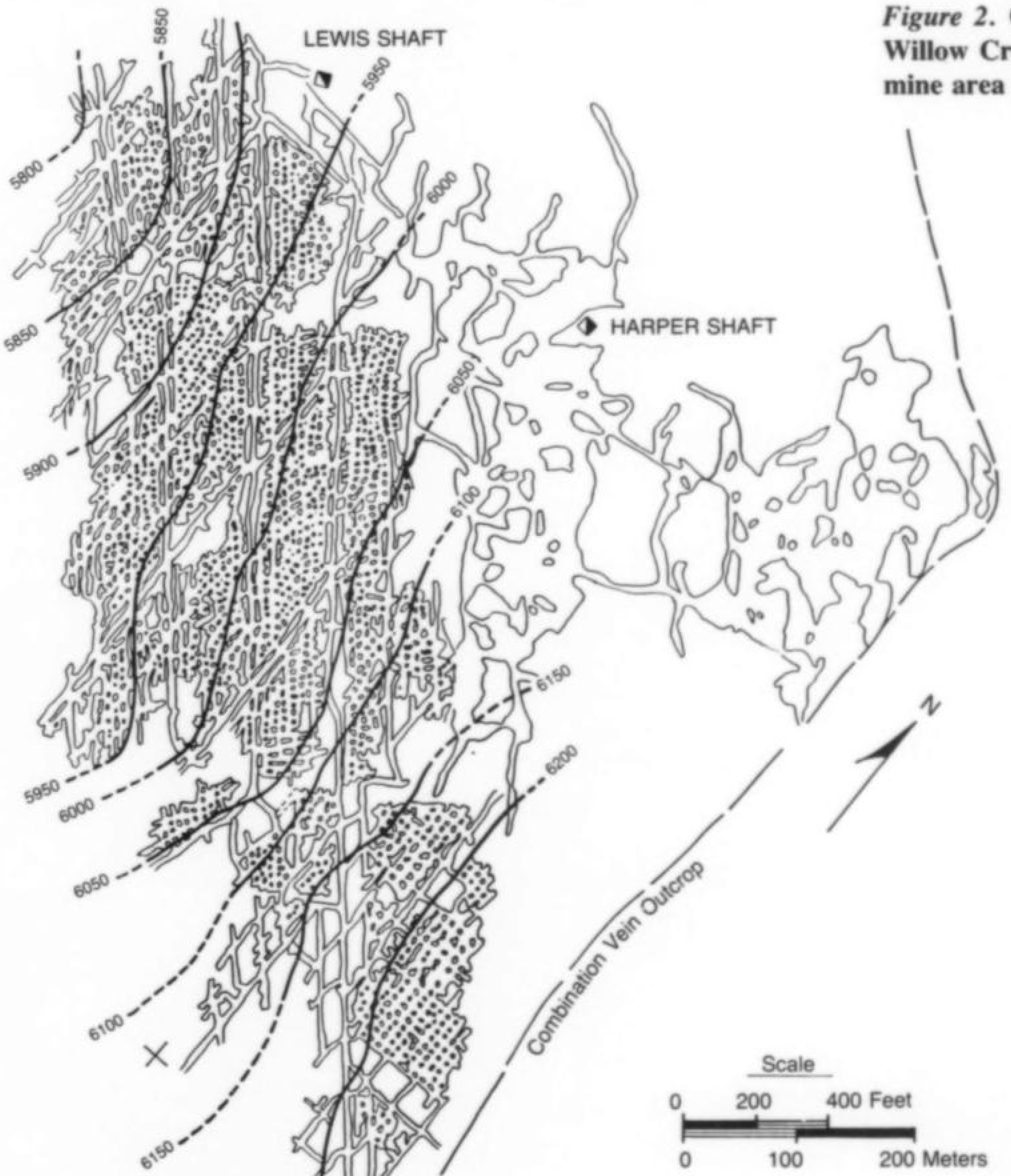

Figure 3. **Plan map of Black Pine mine showing new (left) and old (right) workings, structural contours of vein, and surface trace of the Combination vein (Waisman, 1985).**

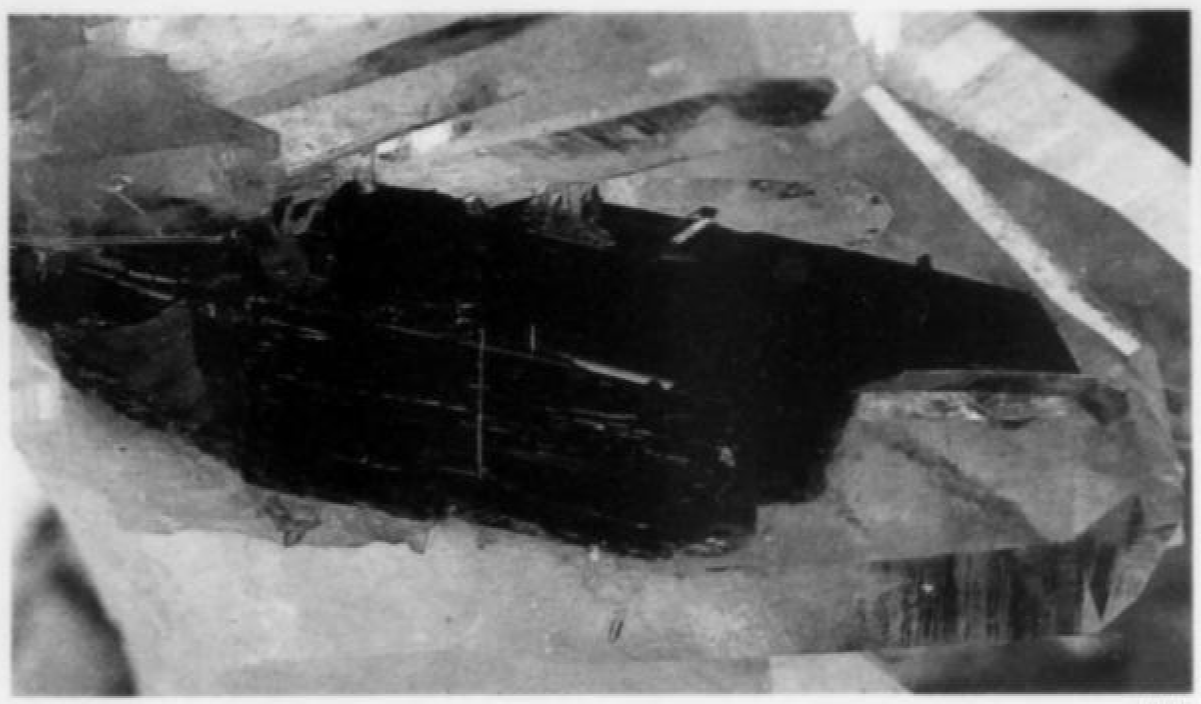

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Figure 4. Huebnerite crystal, 2.4 cm.

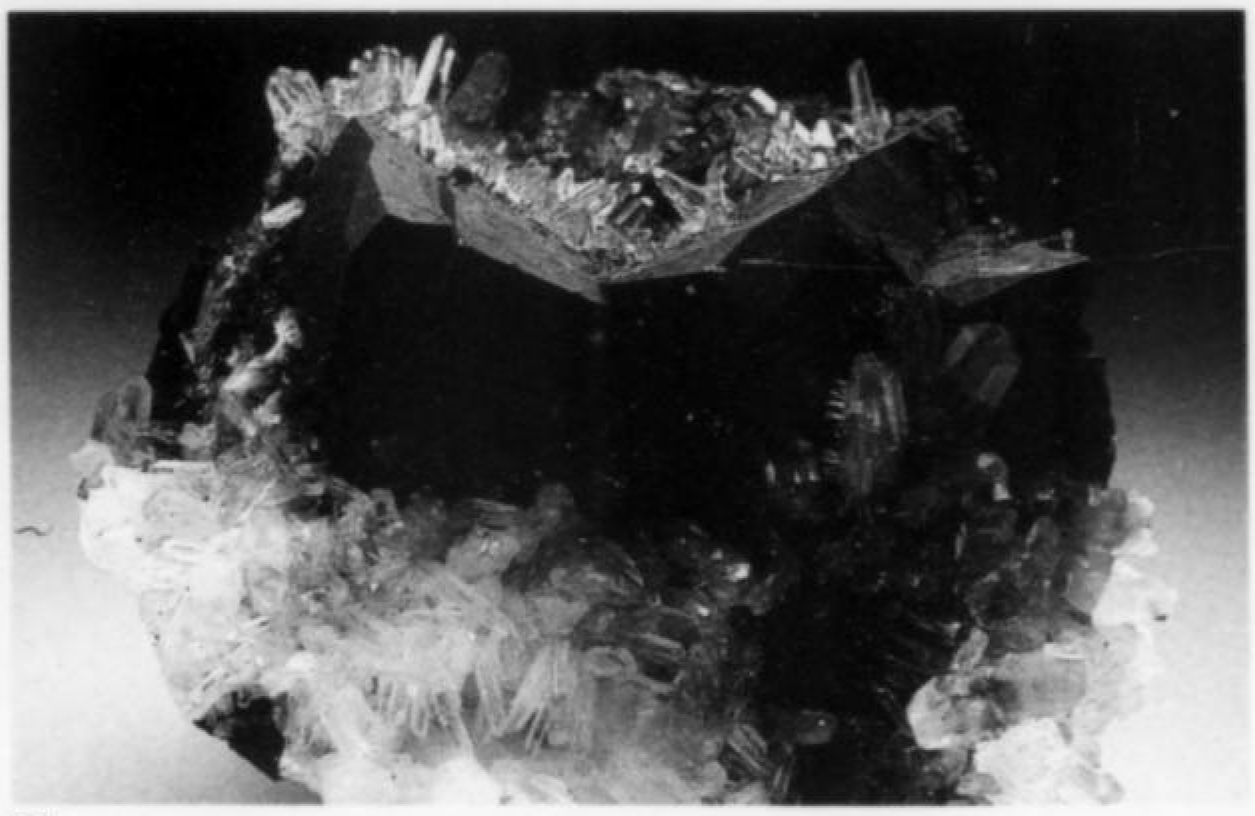

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Figure 7. Tetrahedrite and quartz group, 6.1 cm.

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Figure 5. Pyrite crystal group, 2.6 cm.

WEW

Figure 8. Anglesite crystal 3.9 cm.

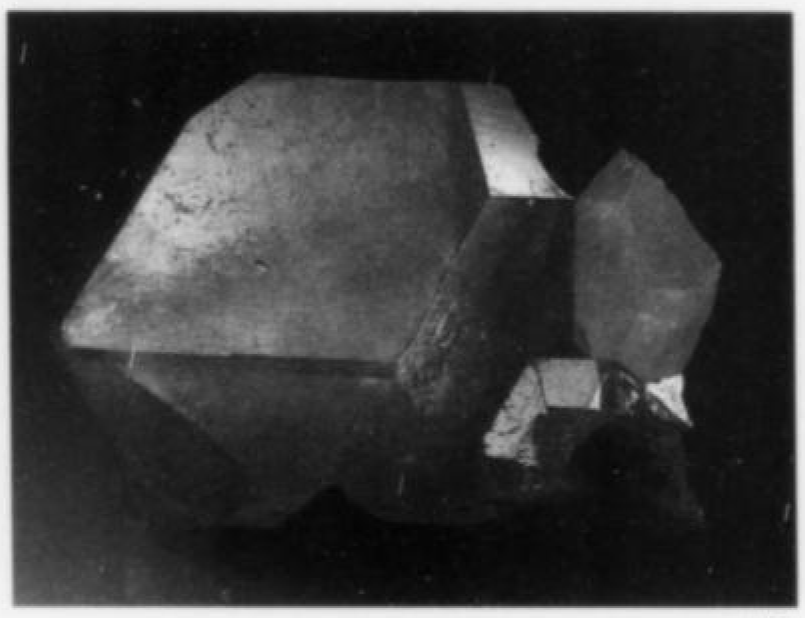

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Figure 10. Cerussite, 4 cm.

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Figure 9. *(right)* Cuprite, 9 mm.

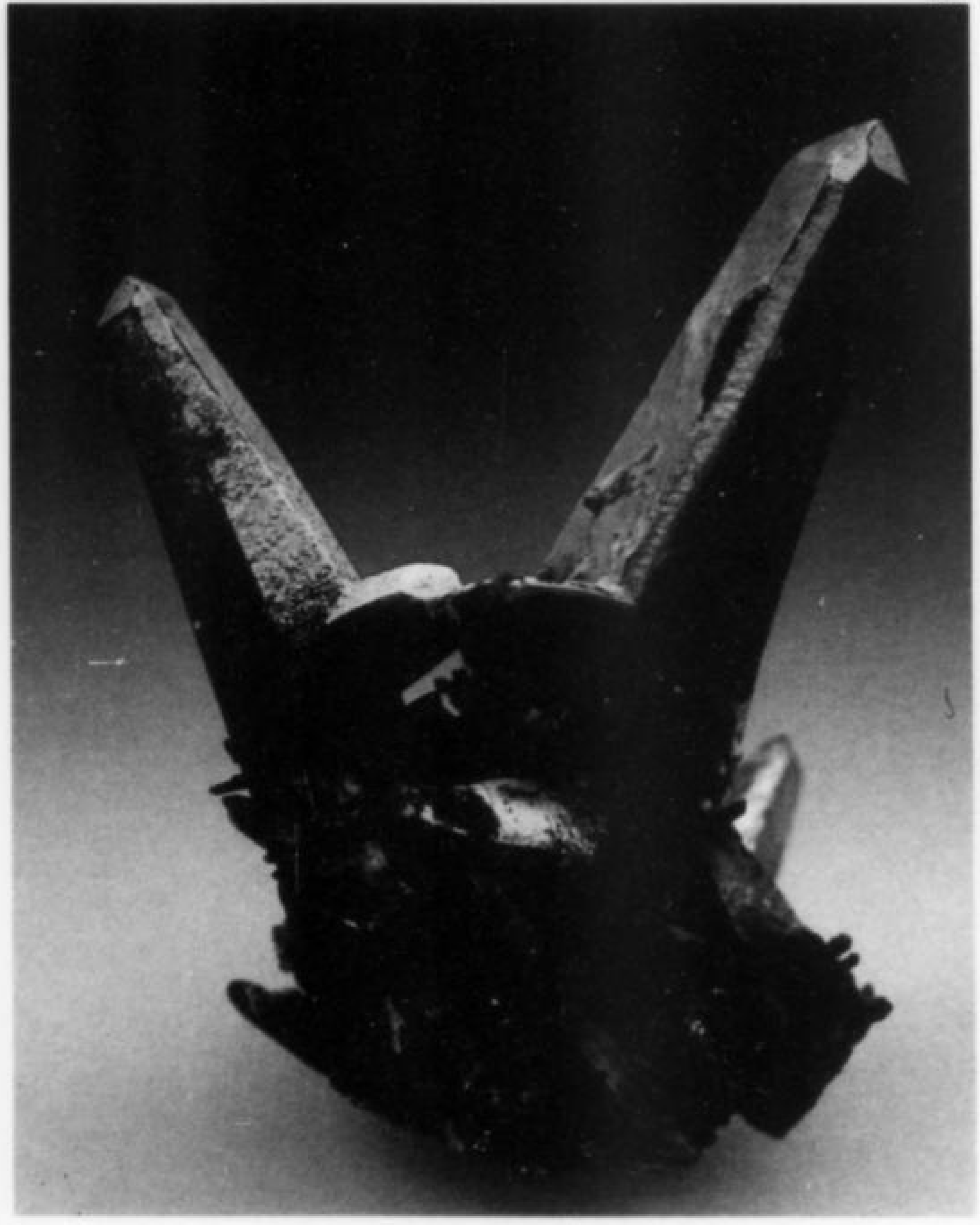

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Figure 6. Quartz, in Japan-law twins, with limonite coating, 4.1 cm.

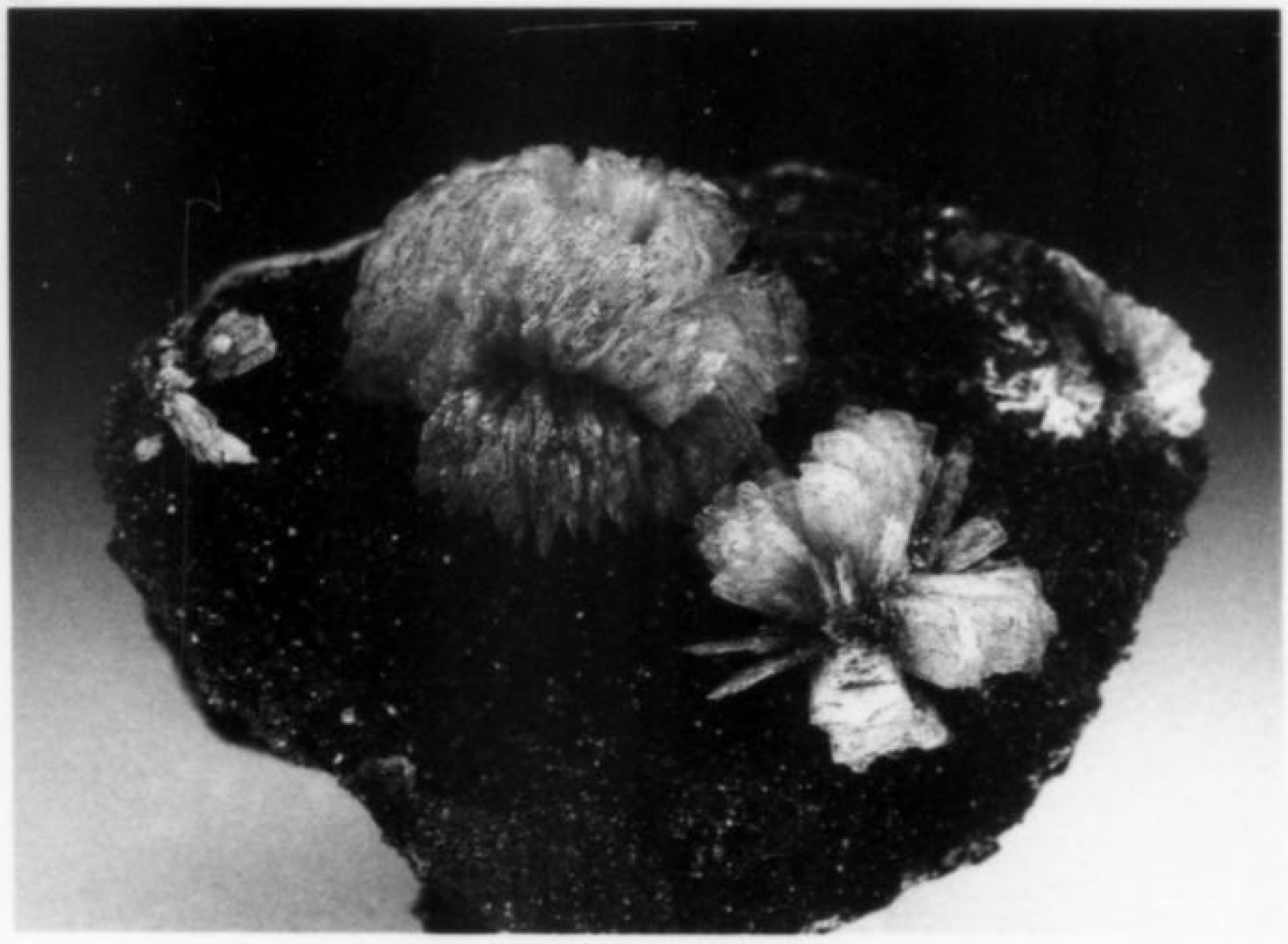

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Figure 11. Hemimorphite crystal sprays on matrix, 2 cm across.

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Figure 12. **Alpha-duftite and limonite on quartz, 3.9 cm.**

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Figure 13. **Stolzite crystals to 5 mm on huebnerite and quartz.**

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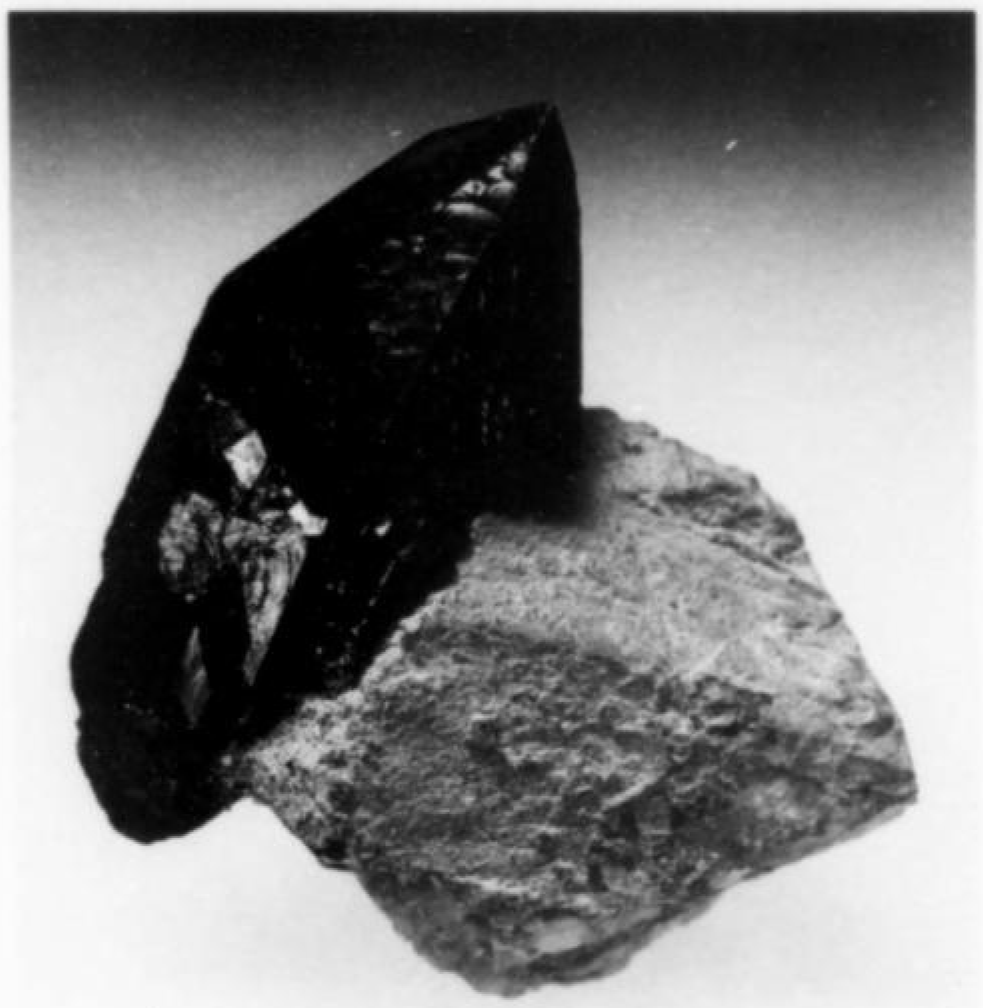

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Figure 14. **Veszelyite crystal, 1.6 cm. Herb Obodda specimen.**

Figure 15. (above) **Veszelyite crystal group, 2.2 cm. Herb Obodda specimen.**

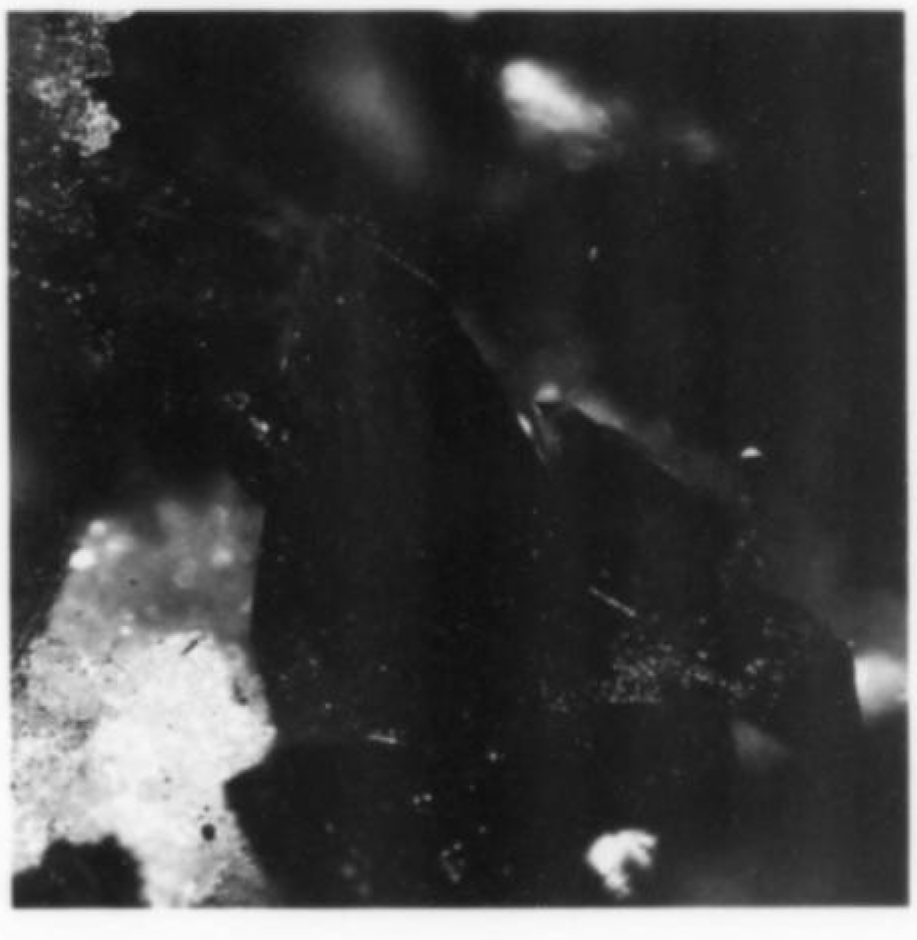

Figure 16. (right) **Veszelyite crystals to 1.6 mm. Dan Behnke specimen and photo.**

indicating the Black Pine veins are this age or younger. One potassium-argon age date (on sericite in the Combination Vein) of 63.9 ± 3.2 Ma (Waisman, 1985) implies a temporal relationship between thrusting, the local intrusions and mineralization.

The Black Pine mine orebody consists of a gently dipping quartz-sulfide vein system that occupies a thrust fault within the Precambrian Mount Shields quartzite formation. The vein is called the Combination Vein and is one of four subparallel vein systems at the Black Pine mine.

The vein is a complex system of numerous strands with a thickness between 50 cm and 2 meters. The quartz-rich vein is extremely vuggy, indicating low lithostatic pressure of a near-surface environment during mineralization. One vug that produced beautiful quartz crystals was over 2 meters long and 1 meter wide!

The deposit is approximately 150 vertical meters from the present surface. The proximity to the surface and the numerous late faults have exposed the ore minerals to oxidizing conditions. Sulfide minerals have been flushed from the vein within 100 meters of where it crops out at the surface. Oxidation diminishes noticeably with depth, but nowhere in the mine is there a lack of secondary minerals except in the lowermost workings.

MINERALS

The Black Pine mine has yielded numerous exotic and colorful mineral species. Many of the finer specimens have been acquired by collectors and museums all over the world. The locality first became well-known when large veszelyite crystals, larger than any others then known, were discovered nearly 20 years ago. More recently, the new mineral philipsburgite was found in the Black Pine mine.

Primary ore minerals of the Combination Vein are easily recognized and few in number. They form well-developed, often large crystals that commonly line sizeable cavities. These primary minerals are tetrahedrite, pyrite, galena, sphalerite, and huebnerite in a quartz matrix.

Secondary minerals are numerous. The latest to form usually coat or stain the rock with hues of green, blue, brown and yellow, marking specimens with a distinctive appearance. Secondary minerals account for the majority of species in the mine.

Primary Minerals

Huebnerite $MnWO_4$

Huebnerite was early to form in the vein and is usually overgrown by subsequent minerals. Free-standing crystals are usually coarse, well-formed, very dark red euhedra, typically with associated stolzite.

Pyrite FeS_2

Pyrite is not common as large cavity-filling crystals but occasionally forms beautiful pyritohedrons and modified cubes to over 3 cm. Pyrite was the first sulfide mineral to form within the quartz vein. Small pyritohedrons to 1 mm have been found included in the terminations of some quartz crystals.

Quartz SiO_2

Quartz twinned on the Japan law is common in the Combination Vein. Some cavities contain over 10% Japan-law twinned quartz. Multiple Japan-law twins, those with one large main crystal and several subordinate smaller crystals protruding from the large prism faces, are also quite common. Japan-law twins are relatively rare worldwide, but most occur in quartz-sulfide veins (Cook, 1979), and interestingly, many occur in quartz-sulfide veins having tungsten minerals, as in the Combination Vein.

Small, well-formed crystals of pyrite and tetrahedrite have been found included in quartz. This type of occurrence is probably more common here than is realized because of the masking effect of ubiquitous coatings of late secondary minerals. These coatings are a characteristic feature of Black Pine mine specimens and are usually not removed by the collector.

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

Tetrahedrite is commonly the dominant sulfide present in the vein and is the principle silver-bearing mineral. Crystals range from less than 1 mm to 5 cm on an edge. The crystals are usually sharp and distinct, but rarely have lustrous faces.

Secondary Minerals

Most of the secondary minerals are blue or green arsenates, phosphates or carbonates of copper. Table 1 lists the secondary minerals identified in the Combination Vein (Lester Zeihen, personal communication, 1989). The secondary minerals of greatest interest to the collector are described below.

Cerussite $PbCO_3$

Cerussite is not common, but when found it is usually as large, single or coarsely reticulated, slightly yellowish crystals. One clay-filled vug near the lower workings of the mine yielded over 200 crystals.

Duftite $CuPbAsO_4OH$

Duftite is rare in the Combination Vein. It occurs as green coatings on earlier minerals and as distinct microcrystals to 1 mm. Some of the larger crystals are actually alpha-duftite (mottramite X-ray diffraction pattern, but tests negative for vanadium) which are very rare in the vein.

Hemimorphite $Zn_4Si_2O_7(OH)_2{\cdot}H_2O$

Hemimorphite is rarely seen as distinct crystals. The only crystals observed in the mine were pale blue radiating tabular orthorhombic crystals to 1 cm growing on quartz crystals.

Hemimorphite is also reported (Lester Zeihen, personal communication, 1983) to occur as white crusts and coatings known as "dry bone" hemimorphite.

Philipsburgite $(Cu^{+2},Zn)_6(AsO_4,PO_4)_2(OH)_6{\cdot}H_2O$

Philipsburgite was discovered in 1983 by Dr. Lester Zeihen, who named the mineral after the nearby Montana mining community. Philipsburgite is brilliant deep green and is found as minute spherules and thin druses. It was the last of the secondary minerals to form. According to Peacor *et al.* (1985), some spherules previously thought to be veszelyite are a mixture of philipsburgite with varying lesser amounts of bayldonite.

Pyromorphite $Pb_5(PO_4)_3Cl$

Pyromorphite is particularly abundant in the ore. Apparently near-surface waters responsible for supergene mineralization were phosphate-rich. These waters were probably enriched in phosphate by passing through the nearby Phosphoria Formation which crops out 16 km to the northeast.

Pyromorphite crystals form small radiating groups on quartz, and less commonly on one of the primary sulfide minerals. They are usually cream to brownish in color and rarely over 1 cm in length.

Silver Ag

Native silver is seen rarely as paper-thin fracture fillings. It occurs very late in the secondary sequence along with azurite and malachite.

Stolzite $PbWO_4$

Stolzite is an alteration product which is almost always present as disseminated grains, but only on huebnerite. It occurs generally as small, off-white, lustrous crystals, but is also found as crystals 2 cm in size! These larger crystals are among the largest stolzites in the world.

Stolzite is strongly fluorescent in shortwave ultraviolet radiation and was probably misidentified as scheelite ($CaWO_4$) in the past. Neither scheelite nor any species with calcium as the main cation has been found in the Combination Vein.

Veszelyite $(Cu,Zn)_3(PO)_4(OH)_3{\cdot}2H_2O$

Due to the discovery of veszelyite in the early 1970's, the Black

Table 1. **Secondary minerals of the Black Pine mine (personal communication, Lester Zeihan, 1989).**

Species	Formula
Elements	
Copper	Cu
Silver	Ag
Arsenates	
Adamite	$(Zn,Cu)_2(AsO_4)(OH)$
Arthurite	$Cu_2Fe_4(AsO_4,PO_4,SO_4)_4(O,OH)_4 \cdot 8H_2O$
Bayldonite	$PbCu_3(AsO_4)_2(OH)_2$
Beudantite	$PbFe_3(AsO_4)(SO_4)(OH)_6$
Clinoclase	$Cu_3(AsO)_3(OH)_3$
Duftite	$CuPb(AsO_4)_3Cl$
Olivenite	$Cu_2AsO_4(OH)$
Pharmacosiderite	$KFe_4(AsO_4)_3(OH)_4 \cdot 6\text{–}7H_2O$
Philipsburgite	$(Cu,Zn)_6(AsO_4,PO_4)_2(OH)_6 \cdot H_2O$
Scorodite	$FeAsO_4 \cdot 2H_2O$
Carbonates	
Aurichalcite	$(Zn,Cu)_5(CO_3)_2(OH)_6$
Azurite	$Cu_3(CO_3)_2(OH)_2$
Cerussite	$PbCO_3$
Malachite	$Cu_2(CO_3)(OH)_2$
Oxides	
Bindheimite	$Pb_2Sb_2O_6(O,OH)$
Cuprite	CuO_2
Goethite	$FeO(OH)$
Pyrolusite	MnO_2
Stibiconite	$Sb_3O_6(OH)$
Phosphates	
Pseudomalachite	$Cu_5(PO_4)_2(OH)_4 \cdot H_2O$
Pyromorphite	$Pb_5(PO_4)_3Cl$
Tsumebite	$Pb_2Cu(PO_4)(SO_4)(OH)$
Veszelyite	$(Cu,Zn)_3(PO_4)(OH)_3 \cdot 2H_2O$
Silicates	
Chrysocolla	$(Cu,Al)_2H_2Si_2O_5(OH)_4 \cdot nH_2O$
Hemimorphite	$Zn_4Si_2O_7(OH)_2 \cdot H_2O$
Quartz	SiO_2
Sulfates	
Anglesite	$PbSO_4$
Tungstates	
Stolzite	$PbWO_4$

Pine mine is now a well-known mineral locality. Until then, veszelyite was known only as microcrystals or as coatings on other minerals. "Kipushite" from an occurrence at Kipushi, Shaba province, Zaire, and "arakawaite" from the Arakawa mine, Ugo province, Japan, are both now known to equal veszelyite.

Veszelyite is isostructural with philipsburgite (Peacor *et al.*, 1985). It crystallizes in the monoclinic crystal system. Crystals in the Black Pine mine form as radiating groups, single euhedra, and rarely as equant microcrystals usually growing on quartz. Superb, lustrous and beautifully colored blue-green veszelyites to 5 cm have been found. Veszelyite is one of at least four phosphate-bearing species in the vein.

The most recent major pocket of veszelyite crystals was discovered in 1986 in an area mined several years before. The crystals are beautiful, deep blue-green, radiating groups of two to three in a group, with individual crystals to 3 cm. Most of the specimens are thumbnail size, and surely are some of the best ever collected.

CONCLUSIONS

Specimens from the Black Pine mine have only been preserved in mineral collections for the last 15 years. Some limited collecting may continue at the mine, but future large-scale mining that would create new exposures and new mineral discoveries is uncertain. The economy and the price of metals will determine the fate of the mine. But it remains a possibility that renewed mining efforts in the future may again make the Black Pine mine a significant producer of silver and additional specimens.

ACKNOWLEDGMENTS

I am grateful to the Black Pine Mining Company for all their support, especially Dan McLaughlin, Albert Silva, and Park McClure. Many of the mineral species have been identified by Lester Zeihen, who has studied the mineralogy of the mine for many years.

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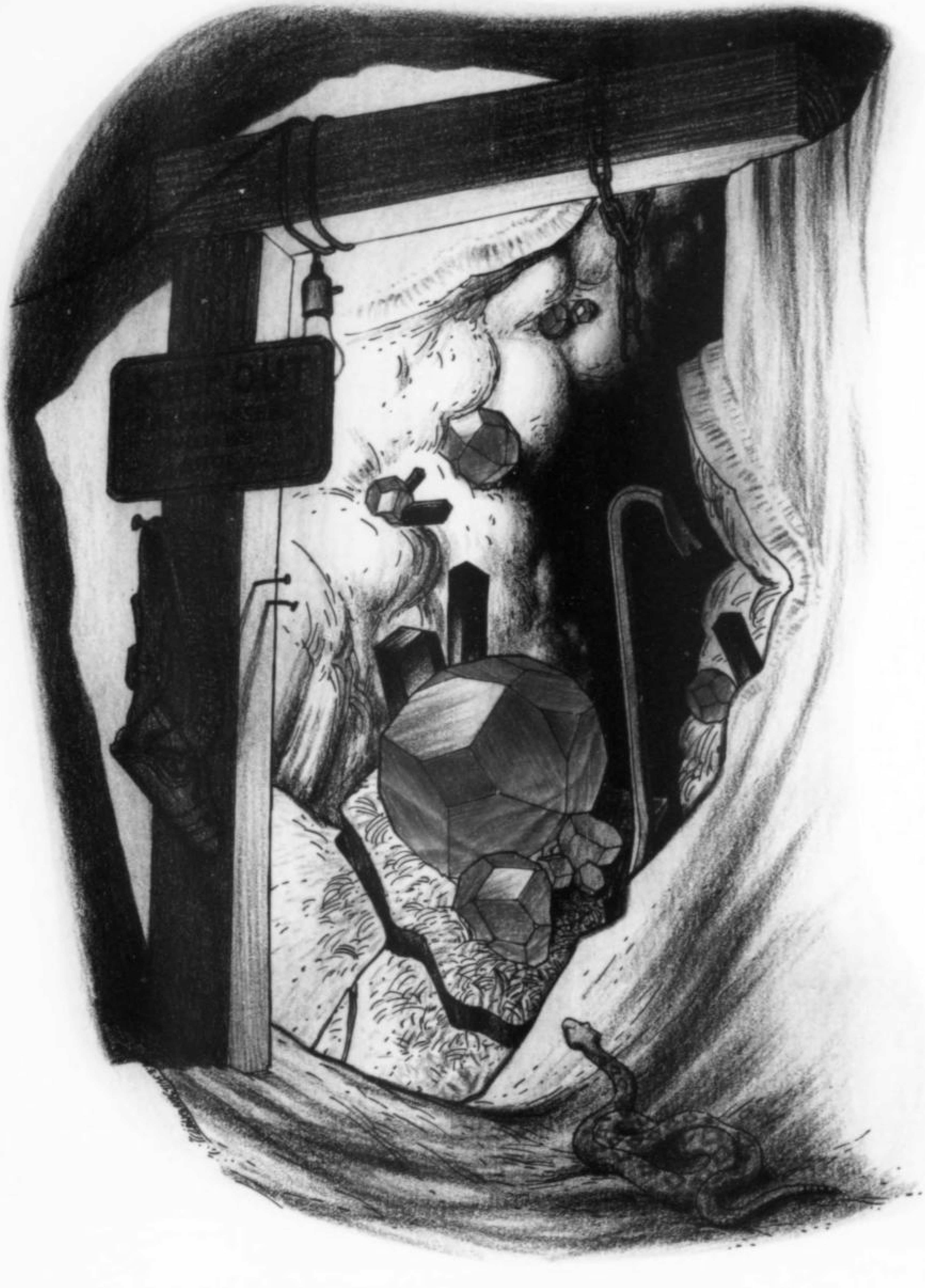

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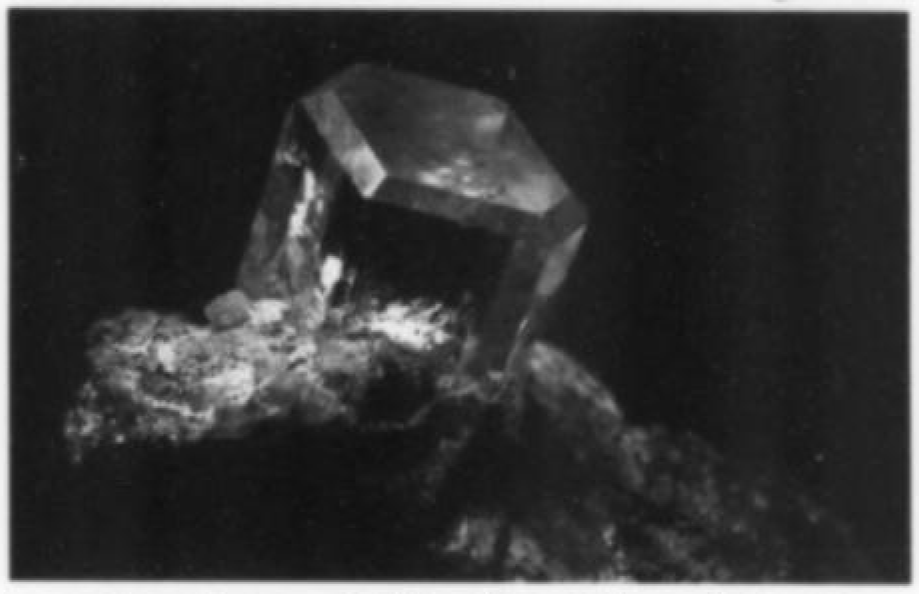

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An Occurrence of Bixbyite, Spessartine, Topaz and Pseudobrookite from Ash Creek near Hayden, Arizona

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The Ash Creek rhyolite occurrence in Arizona, discovered in 1966, is the only locality outside of the Thomas Range in Utah known to contain the bixbyite-spessartine-topaz-pseudobrookite suite.

INTRODUCTION

The story of this mineral locality is in part the story of a dedicated mineral collector. Arizona has given rise to a large number of field collectors worthy of the adjective "dedicated," some of whom have become quite famous. One of the superstars is the late Richard L. Jones, who died on March 20, 1982 (Bideaux, 1983). I formed a solid friendship in the early 1960's with Dick, living for more than a year in his hometown of Casa Grande. Dick enjoyed several advantages that gave him a bit of an edge in his collecting. First, he was strategically located near dead-center in a cluster of many of the best Arizona localities. And he owned his own business, so that his hours in the shop could be as flexible as new mineral discoveries required. Obviously the flexibility didn't change when he eventually gave up his typewriter repair business to become a full-time mineral dealer.

Dick also had a sympathetic family who offered support and encouragement in his mineral forays. In fact he and his son Roy, once the latter was old enough, formed an effective collecting team, a happy arrangement particularly because Dick had formerly been known to enter mines alone, which is a dangerous practice. He had read all of *Dana's System of Mineralogy* (and absorbed an astonishing amount), so that he seldom was stumped when he came upon something that was new to him in the course of his collecting.

In 1966 Dick followed a tortuous road to an obscure locality he described as "The Table Lands," 1.5 miles southeast of Hayden, Pinal County, Arizona. Here he found an occurrence of bixbyite, spessartine and topaz. This is an assemblage commonly associated with rhyolite, as in numerous other occurrences such as the Thomas Range, Utah (Holfert, 1977; Montgomery, 1934; Ream, 1979), and the Black Range, New Mexico (Fries *et al.*, 1942). What he found were loose crystals in stream beds with no matrix, an assortment of which, including spessartine, bixbyite and topaz, he donated to the U.S. National Museum. He was, however, never able to find specimens in place, even when he and Richard A. Bideaux returned to the locality later that year:

> Since I last wrote you Jones and I have been into the locality, perhaps the roughest trip I have made; three hours to drive 15 miles, the first 7 miles passable to a passenger car. How he found it in the first place is a wonder. . . . This last trip did turn up both topaz and garnet in matrix—the topaz specimen that Dick found had a 20-mm sherry-colored xl, the whole being indistinguishable from Thomas Range material. I was unable to locate the rhyolite in place, but think I found where it is covered. (Bideaux, 1966, personal communication)

Specimens from the Jones/Bideaux expedition, labeled as coming from Ash Creek, near Hayden, Pinal County, were subsequently sent to the U.S. National Museum by Bideaux; these consisted of bixbyite and spessartine occupying lithophysae in a typical gray rhyolite. Of particular interest from both collecting trips are specimens of spessartine partially or completely covered by bixbyite. The interesting relationship of these two minerals will be discussed elsewhere in this article. Since there are notable differences between the specimens collected by Jones alone, and those collected by Jones and Bideaux, the two lots will be described separately and denoted by (J) or (J/B).

MINERALS

Spessartine $Mn_3^{+2}Al_2(SiO_4)_3$

All of the (J) crystals are unattached to any matrix, but many of them have a rough zone at the base where they were once joined to rhyolite. They tend to be large, up to 3.4 cm, usually clean-surfaced, and the dominant trapezohedral faces show fine to prominent striations (Fig. 1). Many of the crystals have minor dodecahedral modifications. In nearly every case the portion of the crystal where growth began, and where it was once attached to matrix, is heavily included with tiny crystals of quartz comprising up to as much as 50 % of the volume (Fig. 2). Usually the inclusions of quartz, which are not preferentially oriented, are concentrated in a narrow area near the base of each spessartine crystal, disappearing quite abruptly a short distance into

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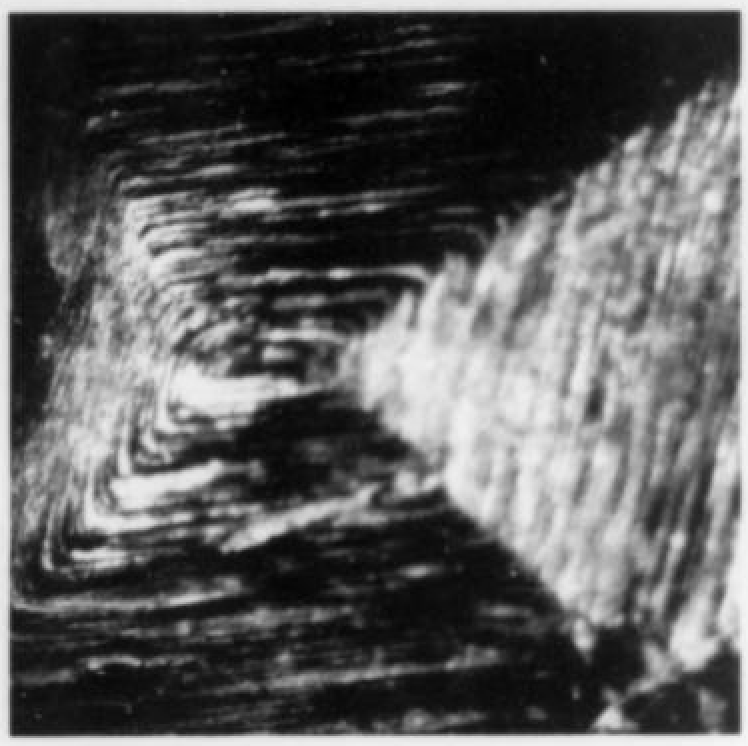

***Figure 1*. Spessartine crystal (J) showing prominent striations on trapezohedral faces. NMNH #119164. The crystal is 2 cm across. Russell Feather photo.**

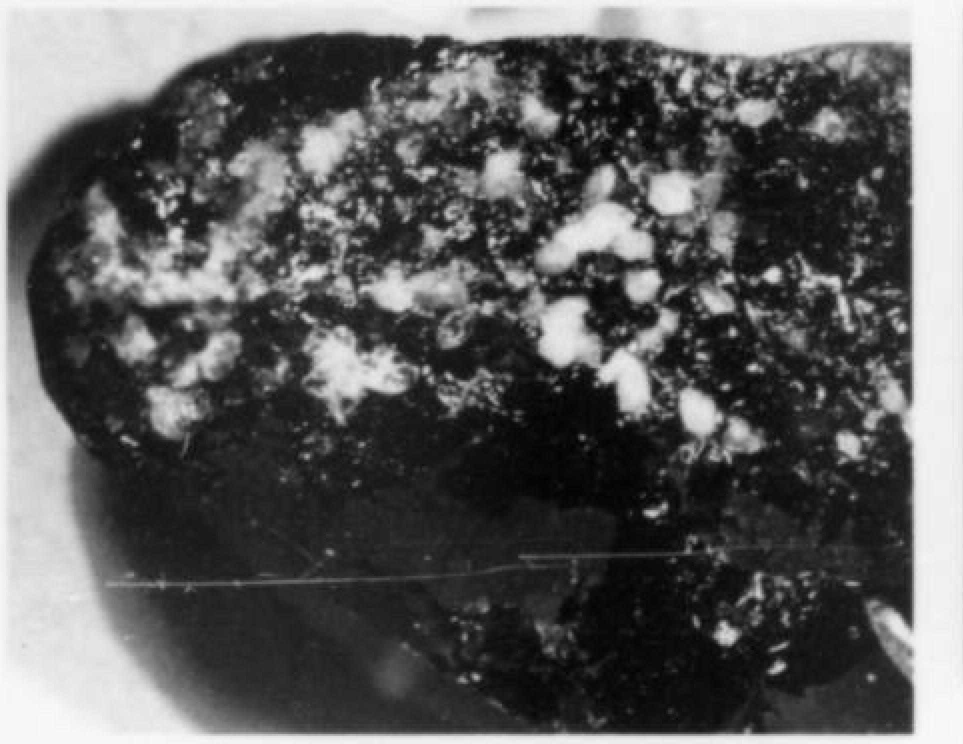

***Figure 2*. A cross-section of a spessartine crystal (J) showing quartz heavily concentrated near the base of the crystal (bottom) and virtually absent toward the top. NMNH #119164. The crystal is 1.2 cm across. Dan Behnke photo.**

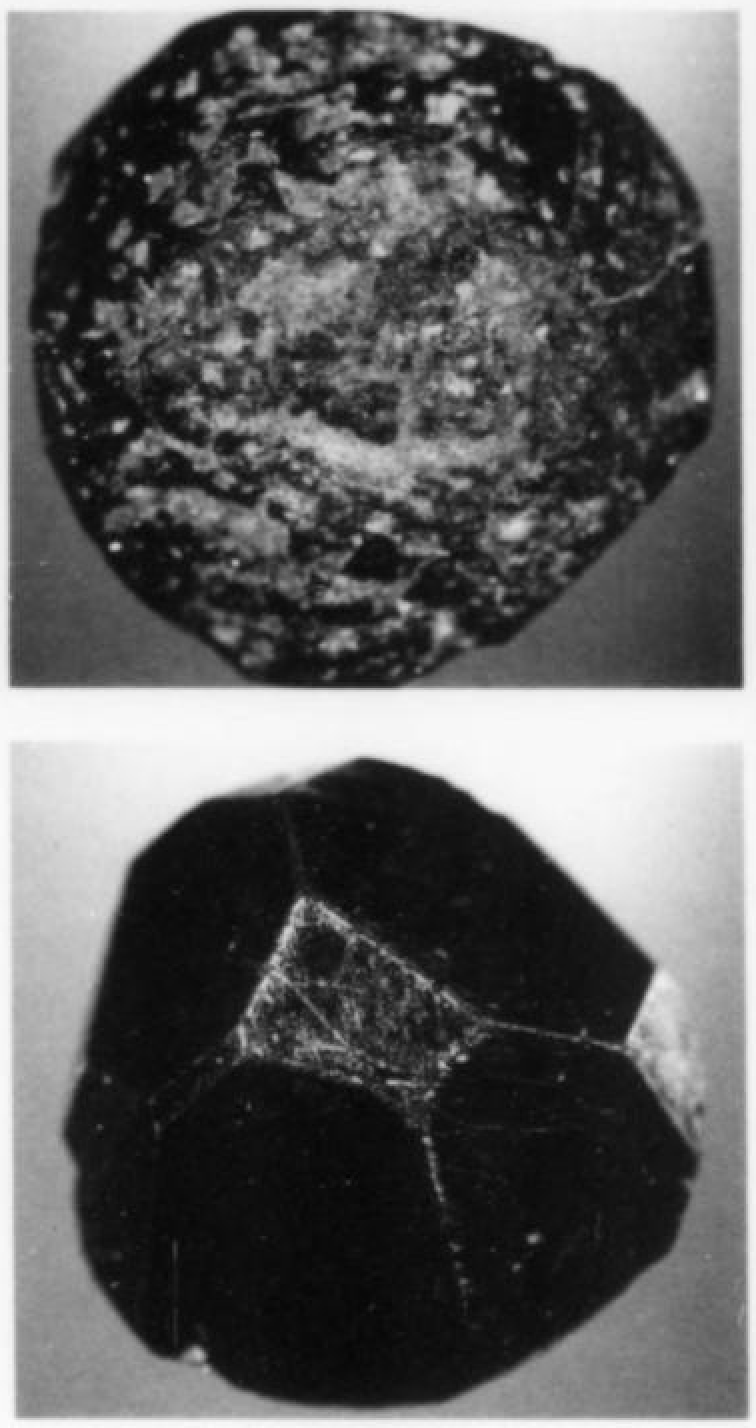

***Figure 3*. A typical spessartine crystal (J) as viewed from the bottom (a) and the top (b). The concentration of quartz crystals at the base is obvious. NMNH #119164. The crystal is 8 mm in diameter. Dan Behnke photo.**

each crystal. Most of the garnets are flat-bottomed half-crystals with quartz heavily included in their bases (Fig. 3a). Otherwise the crystals look like perfectly normal garnets (Fig. 3b) with well-developed trapezohedral faces that may be lustrous or dull, depending upon the amount of weathering they have endured. A small number, however, are bounded by crystal faces on all sides and, unlike the others, these tend to contain quartz inclusions throughout. The larger crystals appear to be quite gemmy and are a deep orange-red, but too dark for gemstone use. Those that are euhedral and full of quartz crystals appear a much lighter orange due to the lightening effect of the white quartz (Fig. 4).

The surfaces of the crystals are quite varied. The larger ones have striations and many have microscopic surface features that are very strange, especially the smooth round bumps and shallow depressions seen on them (Fig. 5). The bumps are more or less circular, but the depressions give the appearance of having been formed by directional impact, as if tiny projectiles struck the surface from an angle. On one side of each depression is a raised arcuate ridge of garnet which looks exactly as though it has been forced out of the area of the depression (Fig. 6). While there may be many of these on a single crystal face, there is no discernible common orientation. The ridge may appear on any side of the depression.

Of the nearly three dozen spessartine crystals collected by Jones, about a third of them either have bixbyite crystals growing on their surfaces (Fig. 7) or they are encrusted with a mass of fine-grained bixbyite, throughout which are crystals of quartz (Fig. 8). In the former case the relationship between fresh spessartine with striated crystal faces and bixbyite crystals appears obvious. The distinct bixbyite crystals, which are rounded by weathering so that they look like cuboctahedrons, line up along the striations of the garnet. The likelihood that at least some of these are epitaxial is strong, but the author has made no attempt to prove an epitaxial relationship. The other spessartine-bixbyite specimens collected by Jones are perhaps more interesting even though the relationship between the two phases is less obvious. These are nodules that consist of spessartine cores surrounded by a thick coating of bixbyite. There is no possibility of spessartine having been partially altered to bixbyite in the opinion of the author. Figure 9 is a thin section of the specimen illustrated in Figure 8. It shows that there is a sharp separation between spessartine (sp) and bixbyite (b), although a thin film of presumed oxidized spessartine can be observed at the interface and within surficial cracks. While there are numerous quartz inclusions in both portions, the concentration of quartz is noticeably greater in bixbyite. A curious feature is that the topography of the garnet's surface is extremely irregular, not planar, as one would assume it should be if these cores were well-formed crystals subsequently encrusted with bixbyite. Disseminated throughout the bixbyite and quartz is interstitial quartz which has an atypical appearance. It is in sinuous fibrous form and is very likely an inversion of quartz after high-tridymite.

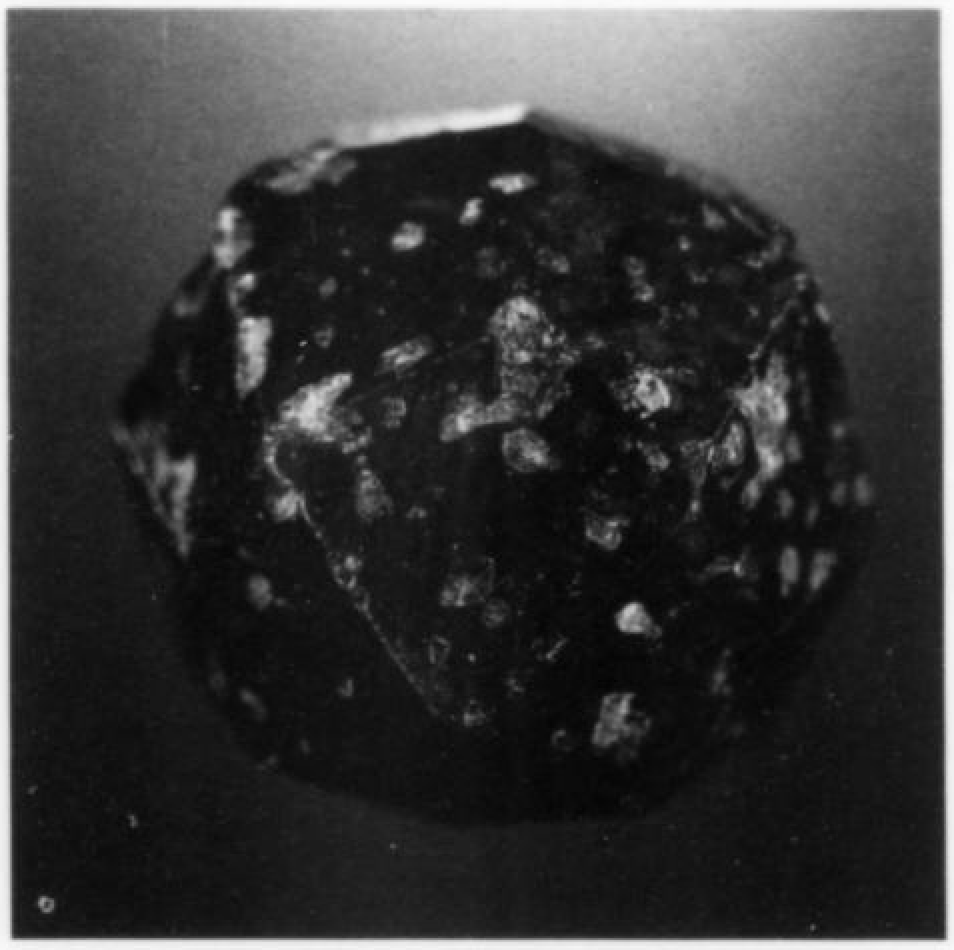

***Figure 4*. A euhedral spessartine crystal (J) with quartz throughout, imparting a lighter color to the garnet. NMNH #119164. The crystal is 8 mm in diameter. Dan Behnke photo.**

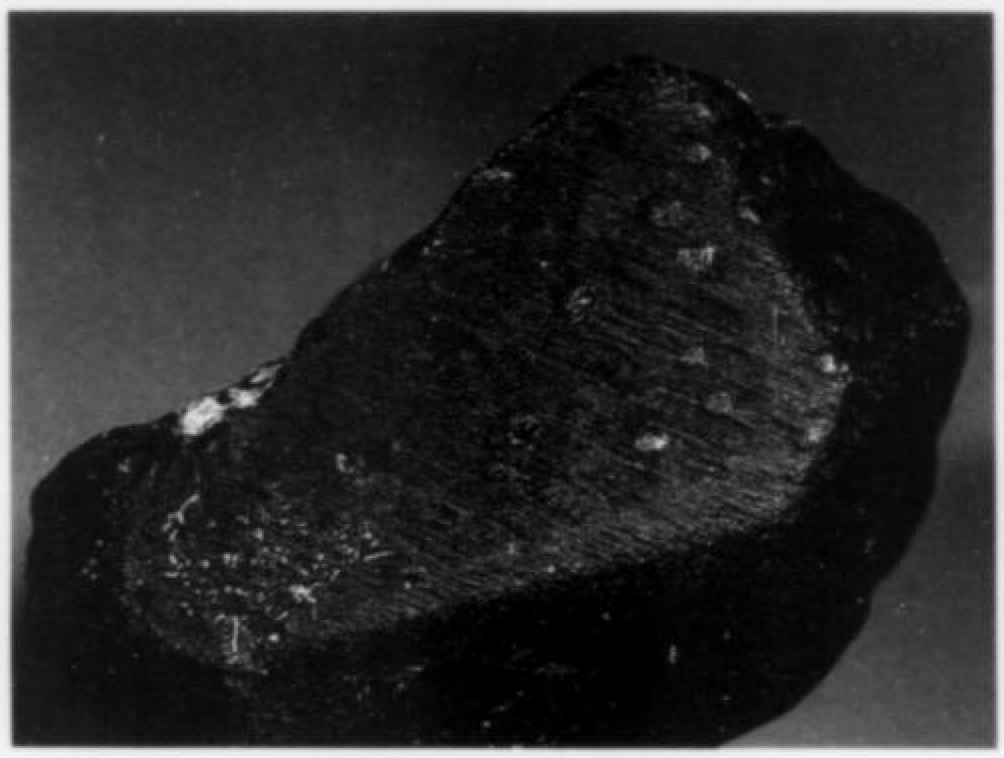

Figure 5. **Spessartine crystal face showing pits and bumps on its surface (J). NMNH #119164. The view is 1 cm across. Dan Behnke photo.**

Figure 6. **Close-up of spessartine crystal face shown in Figure 5, in which the ridged pits are clearly revealed. Dan Behnke photo.**

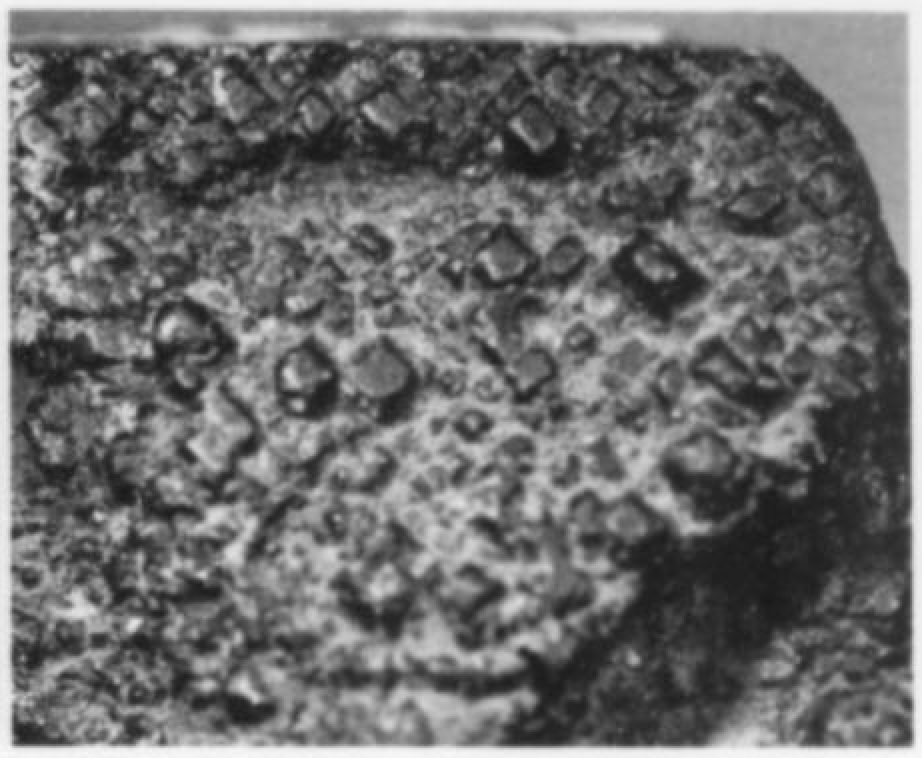

Figure 7. **Bixbyite crystals epitaxially positioned on a spessartine crystal face (J). NMNH #119166-1. The view is 1 cm across. Dan Behnke photo.**

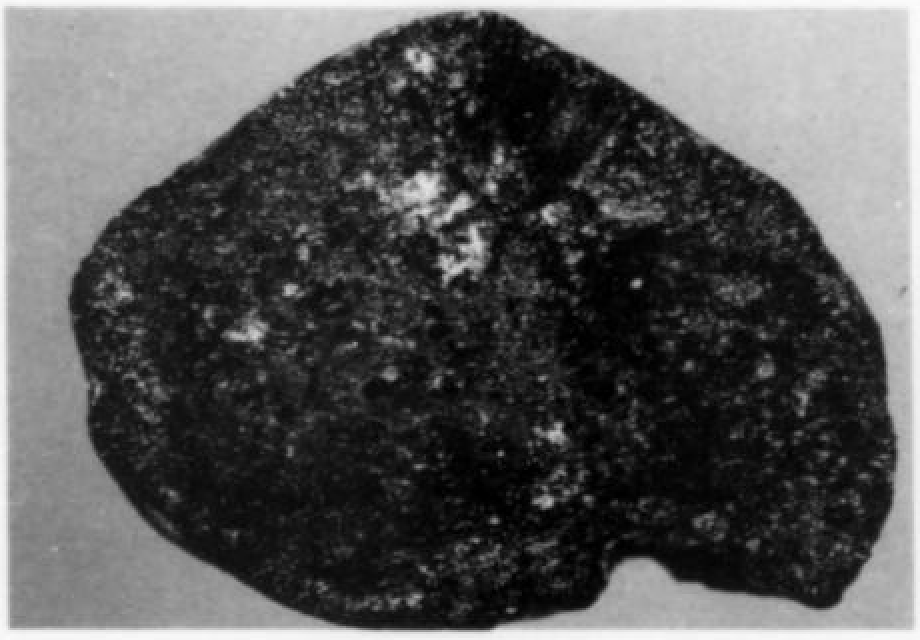

Figure 8. **Interior of a bixbyite-encrusted spessartine crystal (J). Note the disseminated quartz. NMNH #119166. The specimen is 2.2 cm across. Dan Behnke photo.**

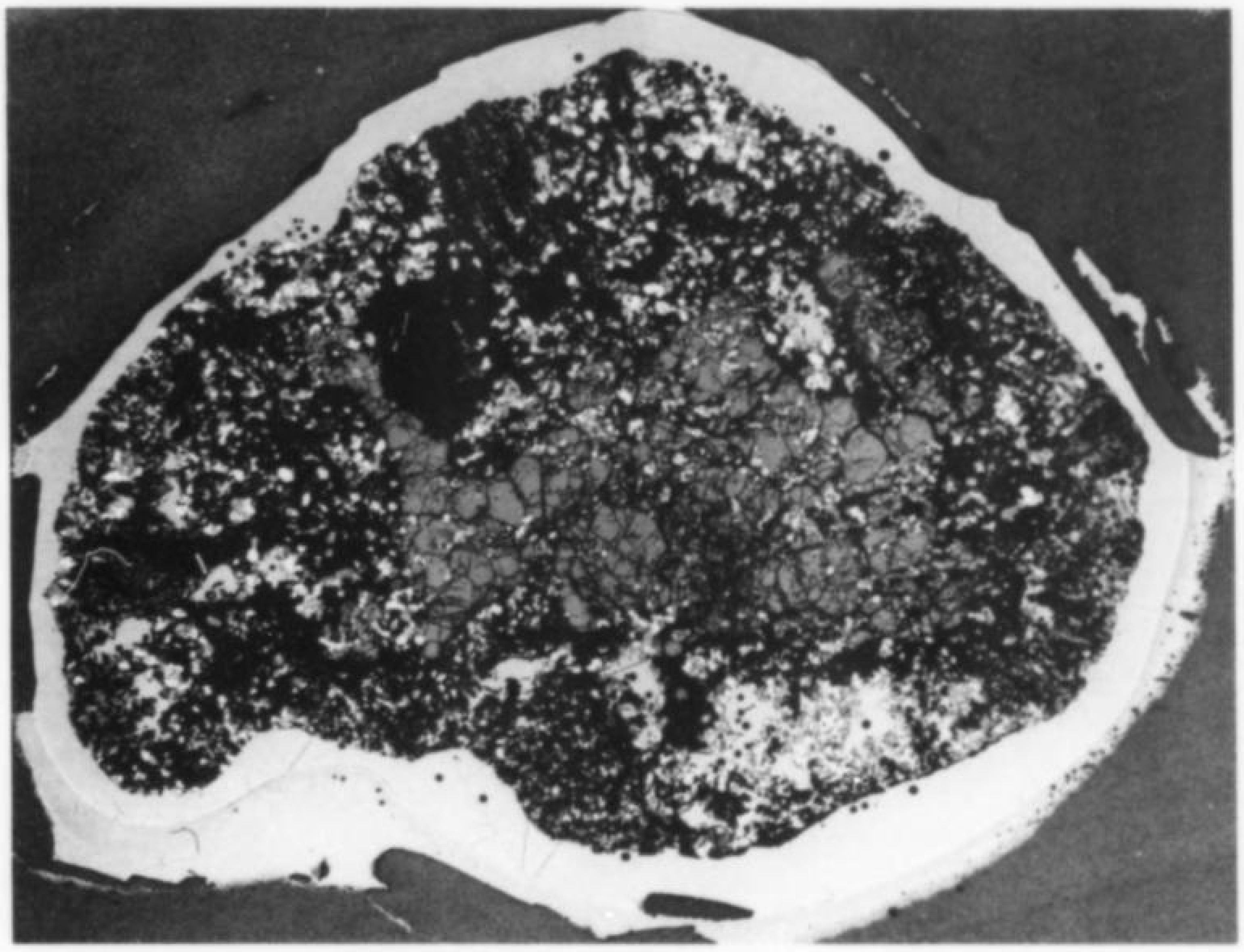

Figure 9. **Thin section of the same specimen as shown in Figure 8. Note the interstitial high-tridymite inverted to quartz. NMNH #119166. Victor E. Krantz photo.**

The spessartine collected by Jones (J) was analyzed using the electron microprobe and found to be ferroan, with only traces of magnesium, calcium and titanium (Table 1).

Table 1. **Chemical analysis of spessartine (NMNH #119164).**

SiO_2	34.61	MgO	tr.
Al_2O_3	17.07	CaO	tr.
MnO	33.56	TiO_2	tr.
FeO	9.82	Total	96.56

Analysis by J. A. Nelen, 1990.

The spessartine found on the second trip to the area (J/B) is very different in that the crystals are on matrix even though the specimens were found as float. Their *in situ* source was not discovered. The crystals, which range in size from about 1 mm to 4 mm, are sharp, lustrous and dark orange-red. They occupy lithsophysal cavities in gray rhyolite (Fig. 10), the interior surfaces of which are lined with quartz in crystals and as chalcedony, much of which is coated with a thin film of calcite. Many of the lithophysae have several concentric shells which make up the walls of the cavity. Gaps may separate the shells.

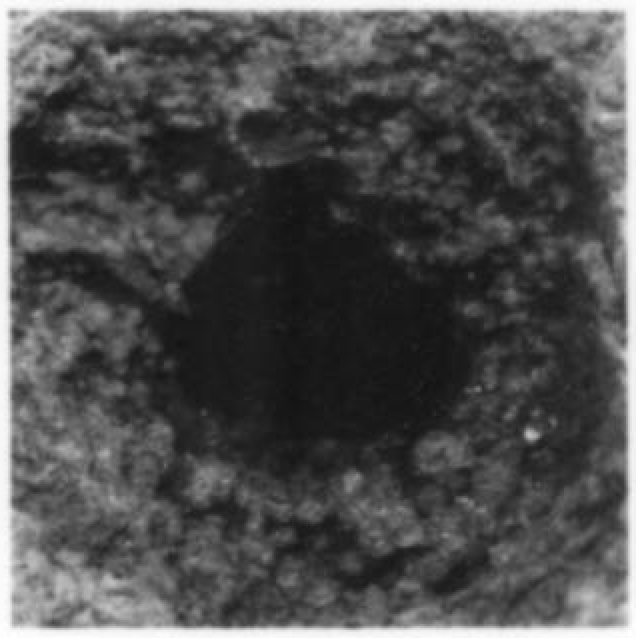

Figure 10. **Spessartine in lithophysal cavity (J/B). NMNH #166829. The crystal is 3 mm in diameter. Dan Behnke photo.**

Bixbyite $(Mn^{+3},Fe^{+3})_2O_3$

As with spessartine, bixbyite occurs at this locality in several very different and distinct forms. There are trains of tiny bixbyite crystals traversing trapezohedral spessartine crystal faces in the directions of the striations along with irregular clusters of bixbyite crystals elsewhere on the specimens of Jones (J). In some of these samples the bixbyite crystals, even though aligned along striae grooves, seem to be in random orientation so that they do not appear to have an epitaxial

Figure 11. **Bixbyite crystals (J) lying in striae troughs on a spessartine crystal. NMNH #119166-1a. The spessartine crystal is 1.4 cm across. Dan Behnke photo.**

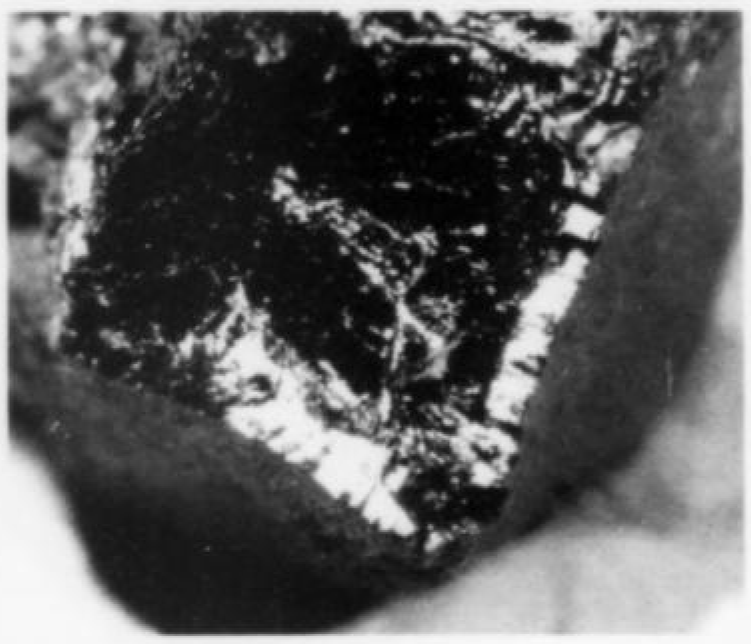

Figure 12. **Bixbyite crystal (J) broken to reveal internal texture. Note fibrosity of the zone along the edge. NMNH #119165. The crystal is 4 mm across. Dan Behnke photo.**

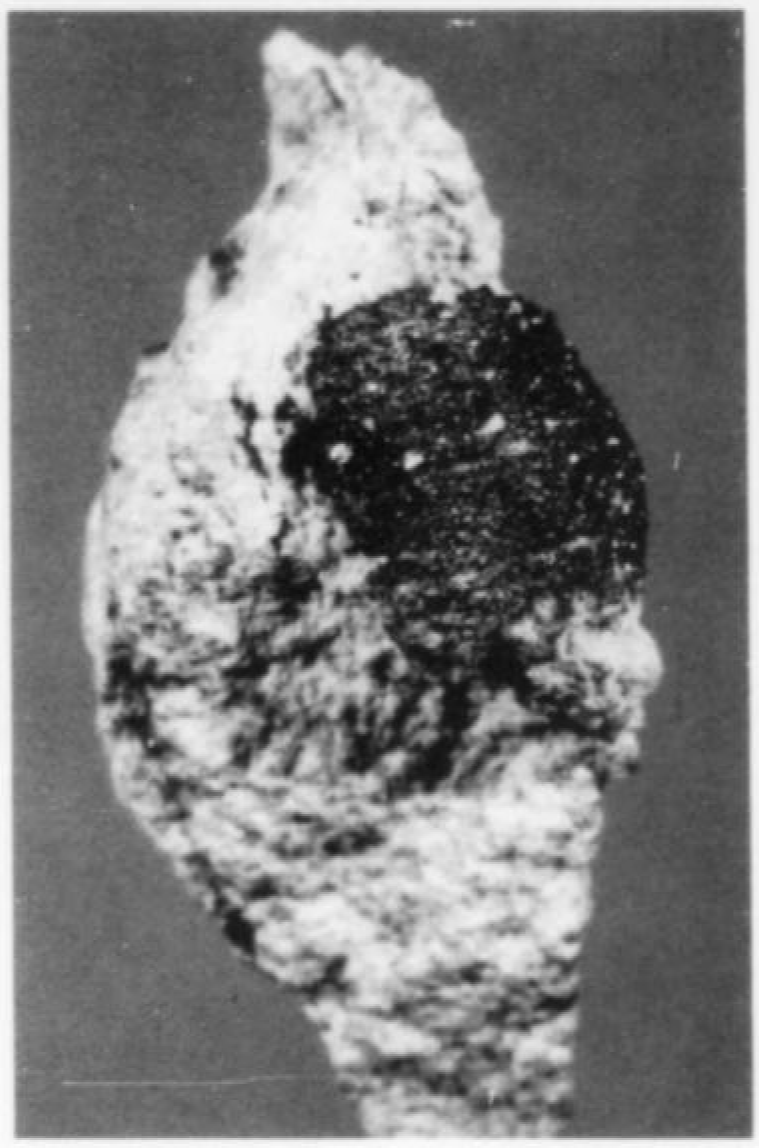

Figure 13. **Dense cluster of tiny bixbyite crystals on rhyolite (J/B). NMNH #166830. The bixbyite group is 9 mm in diameter. Dan Behnke photo.**

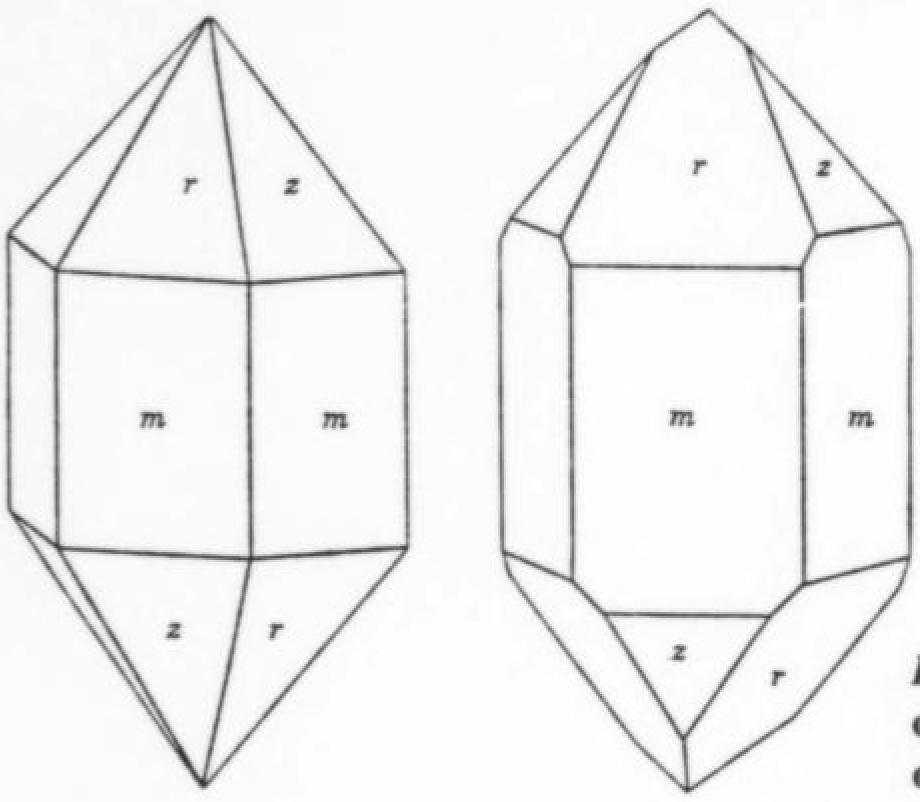

Figure 14. **Line drawings illustrating the forms observed on the crystals of quartz in the lithophysae.**

relationship with the spessartine (Fig. 11); the grooves appear to have provided an attractive place for bixbyite crystals to nucleate. Other specimens in the same lot reveal trains of bixbyite crystals that clearly are preferentially oriented (Fig. 7), making a strong case for epitaxy. In some examples the trains of crystals are very prominent, yet the entire garnet is usually covered with smaller bixbyite crystals, mostly with rounded edges, presumably due to weathering.

Other Jones specimens, alluded to above in the description of spessartine, appear at first to be pseudomorphs of bixbyite after spessartine. They are round and irregular on the surface, which contains about as much quartz as bixbyite. They obviously have suffered extensive weathering. When sectioned, these nodules are seen to consist of a core of spessartine similar in overall shape to the exterior of the nodule. It does not appear that spessartine altered to bixbyite. If it had, there would not be such a sharp break between the two. A thin film of what appears to be oxidized spessartine may be seen at the interface separating garnet from bixbyite and along fractures in the garnet, suggesting that the garnet suffered some form of alteration before it became covered by bixbyite. The layer of bixbyite immediately surrounding garnet is denser and contains less quartz than the later bixbyite.

A small number of single loose bixbyite crystals, less than 1 cm in size, were found by Jones. They are predominantly cubes modified by trapezohedra. Even though the crystals have been weathered, the trapezohedron modification is distinct. One of the crystals was sectioned for a microprobe analysis. The interior was shown to be pure, homogeneous, bixbyite but a thin zone along the crystal edge has a fibrous texture perpendicular to the crystal surface (Fig. 12). Microprobe analysis revealed that the crystal is a normal bixbyite but there is a slight iron enrichment at the expense of manganese near the edge. A complete analysis was not performed.

Figure 15. **Quartz in the form of chalcedony in a lithophysae in rhyolite (J/B). NMNH #166833. The field of view is 3.5 cm across. Dan Behnke photo.**

The bixbyite of the second (J/B) expedition was also found in at least two distinct forms. There are single crystals similar to those already described, up to about 5 mm in size, that were found loose and must have weathered out of matrix. These are primarily simple cubes or cubes modified by trapezohedra.

Other specimens consist of clusters of sharp cubes of bixbyite, attached to rhyolite, which appear to have grown epitaxially on spessartine (Fig. 13). When one specimen was cut in half, however, no garnet was found in the core. It is bixbyite throughout, so one is forced to conclude that it is the product of the growth of bixbyite on bixbyite. In this instance, instead of epitaxy, we have mosaics of subparallel crystals that probably have grown upon the faces of underlying bixbyite seed crystals. The term mosaic is used because there are no large continuous crystal faces. Instead there are groups of tiny oriented crystals, each in the position of what would be a prominent face for a single bixbyite crystal. The individuals in each group are in nearly parallel, but not perfect, alignment. One other specimen of this type had broken free from the matrix, revealing a small amount of spessartine at the core where it had been attached. This does not, however, necessarily mean that the bixbyite grew in an oriented fashion on garnet. All of the mosaic crystals in these specimens are sharp cubes unmodified by any other forms.

Topaz $Al_2SiO_4(F,OH)_2$

Included in the group of specimens donated by Jones from the first collecting trip are five small (1 cm or less) colorless topaz crystals. They have rough surfaces on one end where they were once attached to matrix, undoubtedly rhyolite. They are classic rhyolitic topaz crystals in terms of their morphology and are virtually indistinguishable from the famed Thomas Mountain, Utah, crystals.

Pseudobrookite $(Fe^{+3},Fe^{+2})_2(Ti,Fe^{+3})O_5$

Dick Jones reported having found pseudobrookite at this locality, but none was included in the suite of specimens given to the U.S. National Museum. The author has been unsuccessful in locating specimens among the various collectors with whom Dick is known to have shared his findings. In the opinion of the author, however, Dick's report of pseudobrookite must be viewed as reliable. All four minerals—spessartine, bixbyite, topaz and pseudobrookite—have been reported from this occurrence in Anthony *et al.* (1977), with Richard L. Jones cited as the source of the report (erroneously cited there as *Robert* L. Jones).

Quartz SiO_2

Quartz is present in three very different habits. The most abundant habit consists of simple hexagonal bipyramidal crystals as illustrated in Fig. 14. These encrust the walls of the cavities in the rhyolite. They are also found within garnet crystals, either concentrated at the bases or, less commonly, uniformly distributed throughout, and even into the bixbyite where it encrusts the spessartine. Associated with these crystals are what appear to be inversions of quartz after high-tridymite, which is likely. Or they may be pseudomorphs of quartz after crystals of a platy mineral that formed bow-tie shaped clusters of crystals no larger than a millimeter in their greatest dimension. They are white and have a frosted surface. When broken from the matrix they have a tendency to part in thin platelets, as though they possess a platy cleavage. They do not look at all like quartz and are likely the same material observed in thin section.

Associated with both habits of the quartz crystals are typical botryoidal growths of chalcedony (Fig. 15). These range from microscopic to a maximum of 2 cm in diameter. The smaller ones are pale yellow to tan, but this color is only surficial staining by calcite. The larger masses are a typical waxy gray color often seen in this form of chalcedony.

COMPARISON WITH SIMILAR OCCURRENCES

There are numerous published descriptions of the minerals of rhyolites found throughout the western United States and Mexico. One of the best dealing with so-called "topaz rhyolites" is by Burt *et al.* (1982). Many of these occurrences are known to produce some combination of bixbyite, spessartine, topaz and pseudobrookite, but as far as is known to the author, the Thomas Range, including Topaz Mountain, Utah, is the only other locality where all four of these minerals are found together.

Topaz Mountain in the Thomas Range is also famous for crystals of red beryl, with hematite and fluorite found in association. There are two distinct habits for the beryl and these seem to relate directly to the mode of formation. Platy tablets of small, usually non-gem, red to pink beryl crystals occur in typical lithophysae. The gemmy crystals, which tend to be larger and prismatic (elongated along the *c* axis) and commonly are in clusters, are concentrated along veins (Ream, 1979).

The assemblage of bixbyite, topaz, garnet and pseudobrookite is reported from "five localities in the tin-bearing rhyolite in the Black Range in southwestern New Mexico" (Fries *et al.*, 1942), except that the garnet is described as andradite. The authors presented no evidence to support their identification of the garnet as andradite so, in view of its association with bixbyite, spessartine is a far more likely choice. The U.S. National Museum's mineral collection contains a suite of specimens collected and studied by Fries *et al.* (1942), but no garnet could be found in this material. Fries *et al.* (1942) report the following associated minerals found in contact with bixbyite here: cassiterite, hematite, topaz and quartz. Other minerals not found in direct contact with bixbyite but "association inferred" are pseudobrookite, magnetite, "andradite" (discussed above), titanite, sanidine, cristobalite, tridymite, opal, zeolites (unspecified), fluorite and calcite. Kimbler and Haynes (1980) found red beryl on the west side of the Black Range in the Gila National Forest of northwestern Sierra County. The crystals are simple tabular prisms, 1 to 3 mm, and vary from pale pink to raspberry-red.

A similar suite of minerals in a rhyolite from Lander County, Nevada, was reported by Fries *et al.* (1942). Bixbyite is not included but hematite, topaz, garnet (undesignated species), cassiterite, quartz, cristobalite, tridymite, opal and fluorite are.

A very prolific spessartine and topaz locality is known at Ruby Mountain, Nathrop, Chaffee County, Colorado. The spessartine crystals are found attached to the walls of lithophysae in rhyolite, often in direct association with transparent topaz crystals which vary from sherry-colored to colorless. Cross (1886) analyzed the spessartine which has a composition similar to that from Arizona except that it is more iron-rich (FeO 14.25% vs. 9.82%). The only other minerals reported by Cross are sanidine and quartz with possible hematite. Had bixbyite been observed it is very likely that Nathrop would have become the type locality for the mineral because bixbyite wasn't introduced as a species until 11 years later. Cross's description of the lithophysae is elegant and so nearly applies to the Arizona material that it is quoted here.

> These are more or less round cavities, partially filled by thin curving walls, which, by a concentric arrangement and an overlapping, produce rose-like forms. In the present case these folia are often not very well developed and appear as low curved projections on the outer walls. Again, a cavity may be nearly filled by a series of concentric shells. The outer walls and the leaves of the calyx-like lithophyses [sic] are usually lined by glassy quartz crystals of minute size, with prism and pyramid. The former being clearly striated, the latter showing the hemihedral forms quite evenly balanced.

Occurrences in rhyolitic lavas may be found in the Mexican states of Guanajuato, Zacatecas and Durango, where hematite, topaz, cassiterite, quartz, tridymite, opal, fluorite and zeolites (unspecified) were found (Fries *et al.*, 1942). The U.S. National Museum collection contains numerous bixbyite crystals from Mexico with virtually no meaningful locality information. All were acquired between 1964 and 1966.

For those readers who may be stimulated by this article to want to see more color photographs of minerals found in volcanic rocks in the western United States, I heartily commend the photo essay by W. A. Henderson, Jr., published in this journal in 1985.

ACKNOWLEDGMENTS

The author is grateful to Joseph A. Nelen for microprobe analyses and to Dr. Pete J. Dunn for several X-ray identifications. I am particularly indebted to Dan Behnke for the many superb photographs, most of microscopic subjects, that he so graciously produced for my use. His important support is heartily applauded. Thanks, too, to Victor Krantz for the photomicrograph. Both Merle Berk and Robert Cook made constructive suggestions which, I feel, greatly improved the manuscript.

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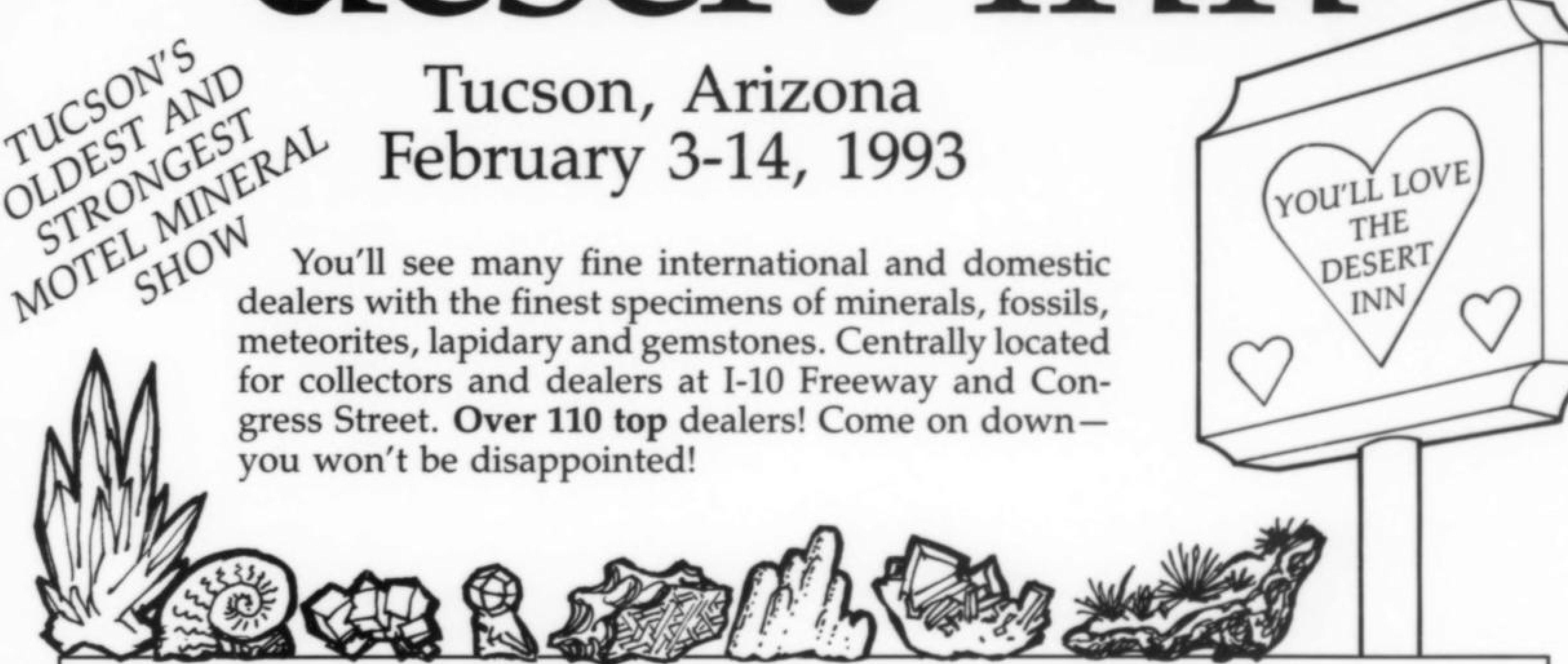

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Letter from Europe

by **Michael P. Cooper**

Ste-Marie-aux-Mines Show 1992

Sainte-Marie-aux-Mines in the Vosges mountains of Alsace, France, is an ancient silver mining town with a long and illustrious history. Although the mines are long closed, relics of their importance are to be found all over town, from the Mineralogical Museum to the large and centuries-old galena specimen embedded in the wall of a tower in one of the squares. It's fitting, therefore, that the largest and oldest mineral *bourse* in France is held in Ste-Marie. Beginning as a small local show, it became an international event in 1966 and has grown steadily since. The show opens to the public on the last weekend in June, but dealing begins from hotel rooms and tailgates on the previous Wednesday; stalls and stands are set up on Thursday; and there is a dealer day and wholesale market on Friday. The last attracts many dealers and buyers just for the one day. This year a total of 317 dealers from 29 countries registered to serve an anticipated 8,000 to 10,000 visitors.

Unable to take more time away from the office, I was obliged to wait until Thursday afternoon before flying into Strasbourg, the nearest international airport to Ste-Marie that I could reach from England. Luckily the Cooper travel jinx must have been pushed for time too, so that I was merely charged almost double the quoted fare to London's Gatwick Airport by British Rail, and the flight was delayed only an hour. (Last year I drove here, shattered a rocker shaft on the *autoroute* near Metz, and spent several frustrating hours while a French mechanic cannibalized a sea of wrecked cars around his garage for spare parts for my "foreign" Ford; and we will draw a veil over the nightmare trip to Paris reported in my last "Letter from Europe.") From the airport, friends drove me past vineyards and fields full of cabbage—principal ingredients in the regional specialties of wine and *choucroute* [sauerkraut]—to my hotel near Ste-Marie where a coterie of mineral collectors was already in residence. Over dinner the talk was entirely of minerals: specimens, species, collections, the repatriation of old-time British pieces, Wendell Wilson's provocative "Farewell to the BM(NH)" in the last *Mineralogical Record,*[1] and what had already been unveiled up the road at the *bourse*.

The following morning the day was thankfully mild (hot days in Ste-Marie are *hot*), and I was at the show bright and early. I was greeted warmly by show organizer Michel Schwab (32 rue de Baldersheim, F-68110, Illzach), who arranged a lunch date with me, and I was almost ready to go off in search of minerals. First stop was the ticket office to get a press badge, where there was a bit of confusion, as I wasn't sure of the French word for "badge"; it turned out to be "*badge*."

A first reconnaissance of the show turned up little really new material, but I was interested to see a lot of stuff around that previously I'd only read about, much of it in Thomas Moore's piece on the Tucson Show in the May-June *Mineralogical Record*. He may be a good few thousand miles away but he can still write the "Letter from Europe"! As in Tucson, minerals from the dismantled Russian bloc were prominent, almost as if the demolition were physical as well as political. Proof of this was offered in the sales displays of authenticated fragments of the Berlin Wall colorfully coated with the remains of spray-can graffiti. But on to the minerals. It's a good sign that there is an increasing amount of "Russian" material available, collected primarily for its specimen potential and not simply as the by-product of larger economic mineral extraction. For instance, the cubes of **perovskite** from Cheljobinsk, Ilmen, Urals or the black penetration twins of the related species **loparite** (once regarded as merely a niobian variety of perovskite) from the classic locality at Lovosero in the Kola Peninsula. Also from the Urals, at Perm, were some delicate tabular **brookite** crystals to 3 cm or so. These milky brown specimens appear to be floaters.

Several stands featured selections of the now well-known sulfides and **fluorite** (green-tinged yellow cubes to 12 cm), and the less well-known pale green **datolite** (in large druses of crystals to over 6 cm), and sharp **ilvaite** crystals to 5 cm, from the Nikolajev mine at Dal'negorsk, Primorsky Kraj. And from Kara Oba in Kazakhstan, there was an interesting assortment of huge **wolframite** blades (these reach 60 cm long, though no such monsters were at Ste-Marie), rough-textured green and purple **fluorite** octahedra to 15 cm, and large rhombs of dull brown **rhodochrosite,** all associated with **quartz, calcite** and, more rarely, with small **cookeite** or **bertrandite** crystals. Prominent among the dealers with such material were Erich Schmidt (Friedhofstrasse 3, 8591 Tröstau, Germany), a regular visitor to the Eastern Bloc, with an office in Moscow and, most importantly, one of the rare official export licenses; and Falko Baatz (Clayallee 347B, W-1000 Berlin 37, Germany), a young student studying in Moscow. Falko also had some good specimens of the well-crystallized sulfides from the increasingly important locality of Dzhezkazgan, Kazakhstan, including rusty-looking **bornite** in large (3 cm!) coarse crystals, and groups of small but bright **chalcocite** crystals to 1 cm. He also had a very large (20 cm high) example of the purple **tourmaline** illustrated in my last "Letter" and was able to give me a more precise locality for it: Krasnoi Tschukoi, Baikal. Other notables were large **hematite** crystals from Korshunika, and 10-cm **quartz** *gwindels* from the "Polar Urals." Several stands had specimens of **orpiment** labeled Elbroska, Caucasus, Russia. Although small, these crystals are very attractive, forming contrasting bundles and bow-ties of 3–4 mm orange needles on slabs of off-white matrix. Very pretty and very reasonably priced. There were also a few specimens from a new find of **stibnite** at Kadamajaz, Osh Obiast, Kirgizia, although I'm told that the best of these disappeared as soon as they were unpacked. Those I saw consist of sprays of bright, terminated crystals to 10 cm or so piercing colorless barite plates 3 cm across, and smaller crystals protruding from complex

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[1] In defense of the curatorial procedures of the BM(NH)—now officially the NHM—it is worth noting that, although *some* light-sensitive topazes and "ruby silvers" are indeed on public display exposed to full sunlight, the *finest* specimens are not as maltreated. For as many years as I can recall, the best pieces have been hidden from view, some protected by hand-made crystal-shaped sleeves, accessible only by appointment. They look as good now as they ever did.

gray calcite crystals. Obviously one to look out for in the future. And, although they were described and illustrated in the last Tucson Show report, the superb **ferroaxinite** from Paiva (or Saranpaul), Polar Urals, Russia has to be mentioned: razor-sharp textbook-perfect single crystals to over 7 cm were available from several dealers.

For the committed supergene-species collector it's disappointing to note that nearly all of this "Russian" material consists of primary species: ores, gangue and accessory minerals. Doubly conspicuous, therefore, were the few oxidation-zone specimens available from the old USSR. These included **dioptase** specimens collected recently from the classic (type) locality of Mt. Altyn Tube, Kazakhstan, carried by several dealers. Quality is high and prices moderate, much cheaper than comparable material from Tsumeb. And there were a few small **wulfenite** specimens, in bright reddish orange plates to 1 cm and small bipyramids, of more interest for their source (Sit Schag in Kazakhstan near the border with Uzbekistan) than for their aesthetics, although they are very pretty under magnification. In the case of Dzhezkazgan at least, the paucity of supergene minerals may be a reflection of the mining system: apparently, using their current metal extraction techniques, yields of metals from the oxidation zone are too low to make processing worthwhile. Although such ore is stockpiled against the implementation of improved processing methods, it is not actively sought. Rumor has it though that the supergene stockpile is rich in **brochantite.**

Excellent quality zeolites and their associations are available from various "Russian" sites. Falko had some curious twisted **stilbite** crystals and large (8–10 cm) textbook trapezohedra of **analcime** from Amudicha. A nice selection of these was also on sale at the stand of Russian specialist András Lelkes (Alpári Gyula u.11, H-1051 Budapest, Hungary), along with some excellent loose **heulandite** plates to about 8 cm from "Tunguska, Yakutia." Jordi Fabre from Barcelona had some pretty **chabazite** in groups of blocky orange crystals, and some peculiar **stellerite** (or should I now say stilbite?) in glistening globular masses a couple of centimeters in diameter on matrix. Both of these come from a quarry at Sokolovsko, Sarbajsk in the Urals.

I spoke to several dealers who had visited some of these distant localities. All talked glowingly of the enormous potential for minerals, and less enthusiastically for the quantities of red tape in the "new" eastern countries. But prospects look bleak for some of the base-metal mines. Many Russian lead-zinc producers, including the Nikolajev mine at Dal'negorsk (despite its current annual production of some half million tonnes of ore), are not viable operations in Western terms. The impact of an international market economy could close such mines overnight. More secure are the copper mines; the complex of open pits and underground workings at Dzezkazghan has 20 years of proven reserves, and has been producing 20 million tonnes of copper ore annually: a valuable deposit in any terms.

Over lunch (local smoked trout and Alsace beer in the main refreshment tent outside the theater) I talked to Michel Schwab about the show. He's been organizing it personally for over 10 years, a "hobby" that takes up 6 hours a day for 5 months of each year. Michel has promised himself two more years, seeing him into the third decade of shows at Ste-Marie, and then he will pass the reins to someone else. The *bourse* has reached its maximum size now, taking up the municipal theater, the school over the road, its gymnasium and school yard, the intervening street and several marquees. Many of the more prestigious dealers accumulate in the main floor of the theater and the stage is given over to trade in cut or carved stones and jewelry. This year the upper foyer contained an excellent display of European mining memorabilia and associated items such as stamps and banknotes featuring mining. It was mounted by ATREHMI (*Association de Travail, Recherche et Etude Historique des Memorabilia Miniers et Industriels*—a rather tautologous title, perhaps best translated as the Association for the study of mining and industrial memorabilia). Central European mining lore and custom goes back centuries and is heavily invested with tradition and ritual. The elaborate batons of the mining captains on display here were particularly beautiful, bringing back memories of the even more intricate examples it had been my pleasure to see in the museum in Freiberg, Germany, last year.

Elsewhere in the show, fossil dealers had a large tent to themselves, the main wholesale dealers displayed in the schoolyard or on the street, and everyone else fitted in where they could. Good material can turn up anywhere at a show like this and every nook and cranny deserves attention from the wandering collector. Some particular bargains were had this year from some unfortunate Peruvian dealers, whose stock was priced in Deutschmarks but was sold unawares in French francs—an instant discount of about 65%. Business was very brisk and they sold everything in record time before realizing their mistake.

Early this year some excitement had been generated by a strike of **fluorite** at La Viesca, near La Collada, Asturias, Spain. Two large ("walk-in") vugs of crystals discovered in an old underground gallery in a deposit now being worked opencast had yielded some 600–700 specimens of which 80 or so (accounts varied) were of good collector quality. The finest specimens constituted less than 1% of the total; of these one of the best was quickly acquired by the Natural History Museum in Paris, and several of the rest are already in private hands. Jordi Fabre and also Christian Lallemont (7 rue Nungesser et Coli, 37000 Tours, France) have the bulk of the remaining specimens. The 2 vugs yielded slightly different specimens. From the first find the fluorite forms simple, pale aqua-blue cubes in druses on matrix, and from the second even paler blue-gray crystals with delicate purple zoning, their edges bounded by crude dodecahedral planes formed by minutely stepped cube faces. Crystals average 4 cm on specimens I saw, the largest reaching some 8 cm on edge. The subtle color is probably too pale for these pieces to be regarded as a great find, but they are nonetheless attractive, being well-formed and clean. In common with all fluorites of this color, and certain other species such as scorodite, these specimens turn out a disappointing pinkish gray when photographed. Christian Lallemont also had another Iberian speciality: a large specimen from Panasqueiera, Portugal, with a 15–20 cm **wolframite** crystal that is one of the best to have been discovered this year. It protrudes from a mass of mica crystals and displays very well.

African minerals were abundant, with central African copper minerals, Nigerian gems, Moroccan copper and lead species being especially noteworthy. Pierre and Martine Clavel (4 chemin Vie Borgne, 38460 Crémieu, France) have been visiting some hairy places in the search for new sources of minerals, and are currently making good contacts in Nigeria to obtain some excellent gem minerals. Single crystals of **aquamarine, emerald** and others made a rich display at their theater stand (they also had a stand in the school yard, selling minerals and antiquarian mineralogy and mining books). The principal problem in obtaining these Nigerian pieces is the continuous fighting in the area around the deposit; tribal and religious clashes have left several hundred people dead each year. If you have the confidence and luck to handle such horrors there are good minerals to be had there. Also mixed up in a battle zone were some specimens obtained by Christian Gobin (13770 Venelles, France) from the Kamoto cobalt mine at Kolwezi, Zaire. Late last year some 200 specimens of **cuprite** with **planchéite** were discovered, and Christian obtained 60 of the best. These show deep red cuprite octahedra to 2 cm surrounded by velvety beds of bright blue acicular planchéite. But before the specimens could be exported, trouble broke out and he had to leave the country fast—without the specimens. These languished, packed for shipment, in a shop that was wrecked in the subsequent fighting. By a freak of chance the cases survived this disaster and were later rescued from the rubble and shipped out to France. Christian had the majority of these at Ste-Marie, but I was beaten to them by American dealer Victor Yount, and only a few minor specimens were left by the time I got there. By the looks of these, I missed an important and attractive find. Christian also had some curious **copper** specimens from the Kamoto mine, derived from an intersection between veins of cobalt

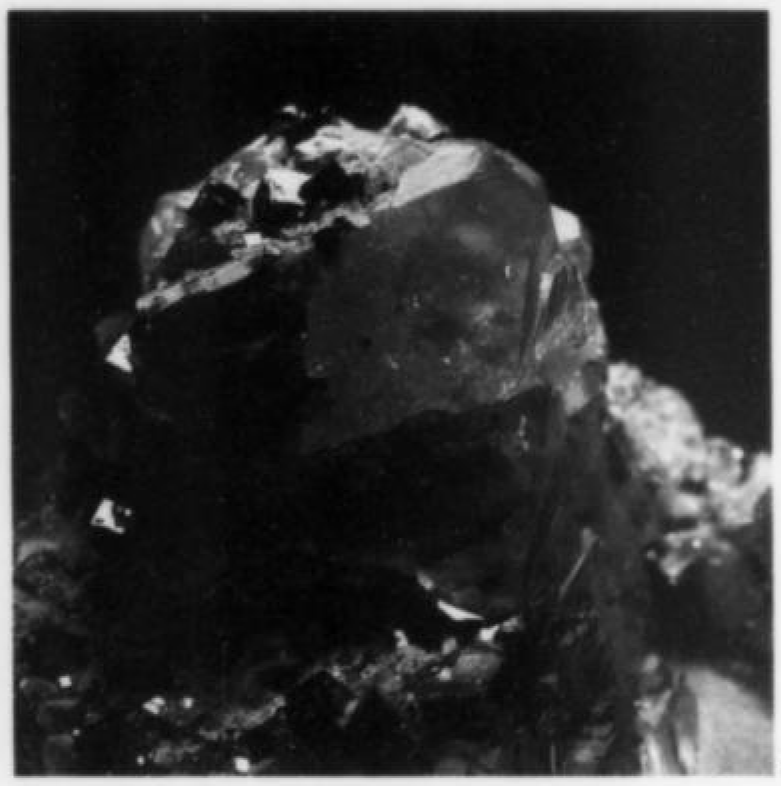

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Figure 1. **Fluorite octahedron, 2.3 cm, with pyrite from Kara Oba, Kazakhstan. Pierre and Martine Clavel specimen.**

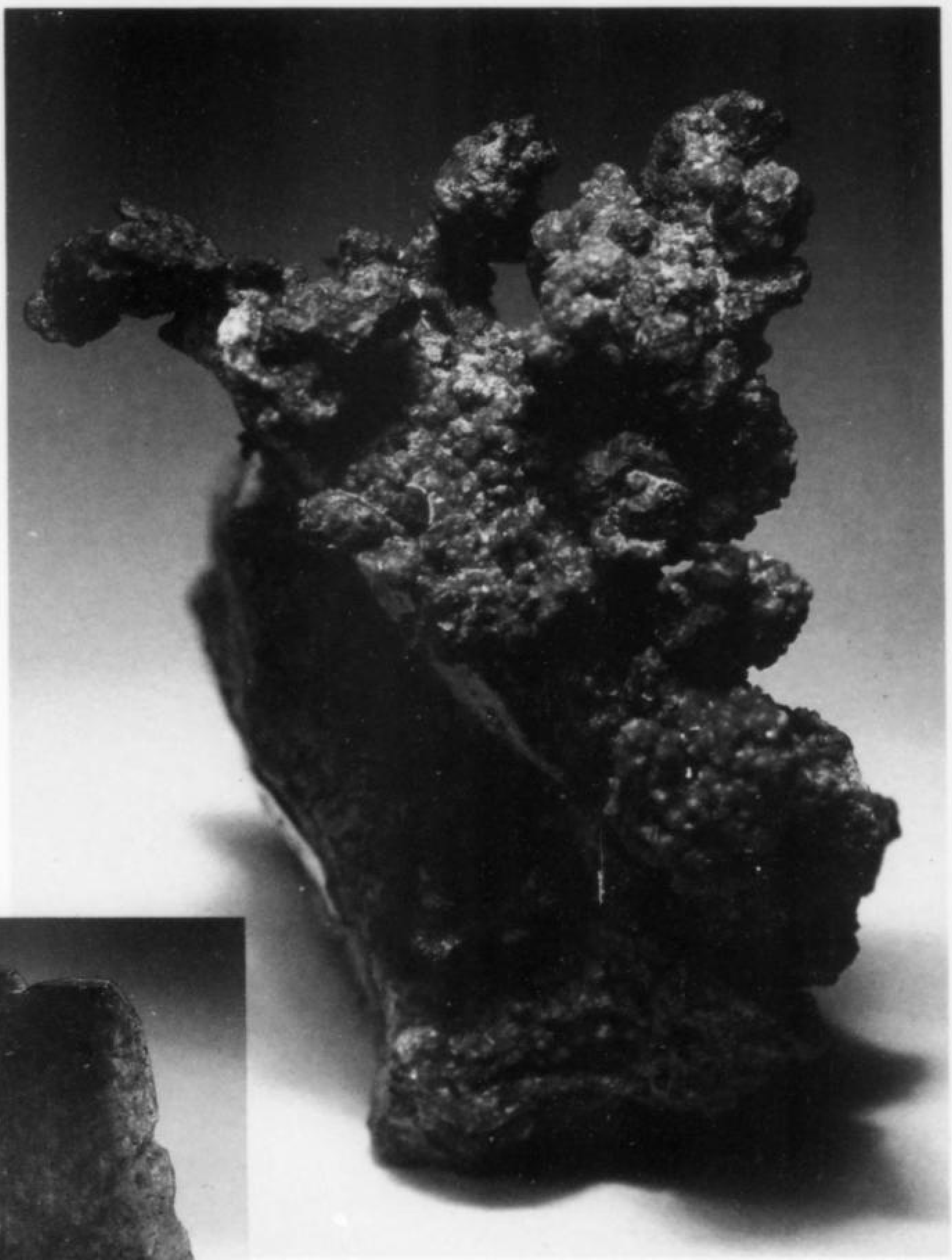

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Figure 2. **Cobaltoan dolomite on copper, 5 cm, from the Kamoto mine, Zaire. Christian Gobin specimen.**

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Figure 3. **Brookite crystal, 3 cm, from Perm, Urals, Russia. Jordi Fabre specimen.**

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Figure 4. **Aquamarine beryl crystal, 8.5 cm, from Boca Rica, Minas Gerais, Brazil.** ***La Pierrerie*** **specimen.**

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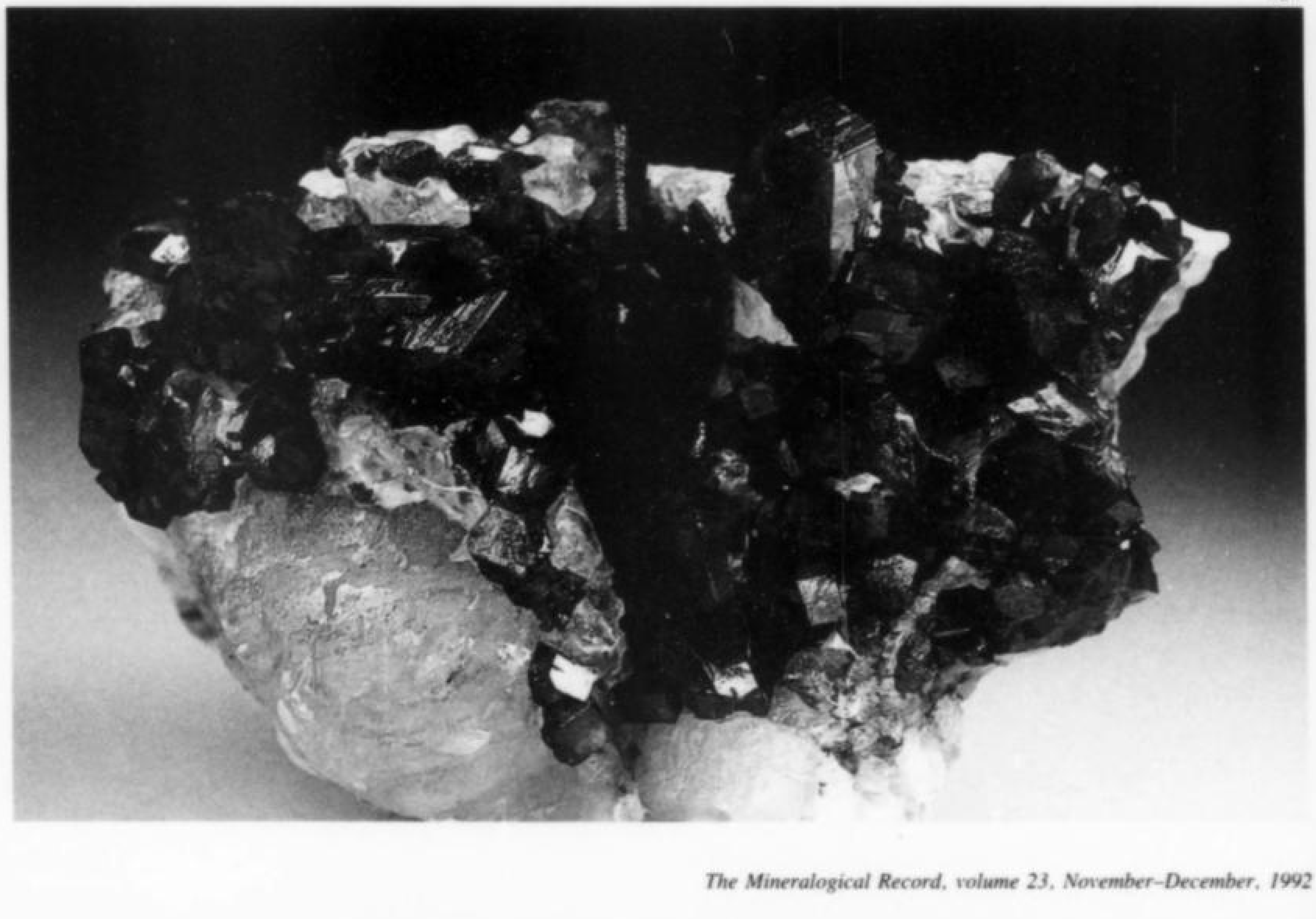

Figure 5. **Dioptase crystal group, 6.8 cm across, from Altyn-Tube, Kazakhstan. Brad Van Scriver specimen (not at Ste-Marie, but representative of specimens that were).**

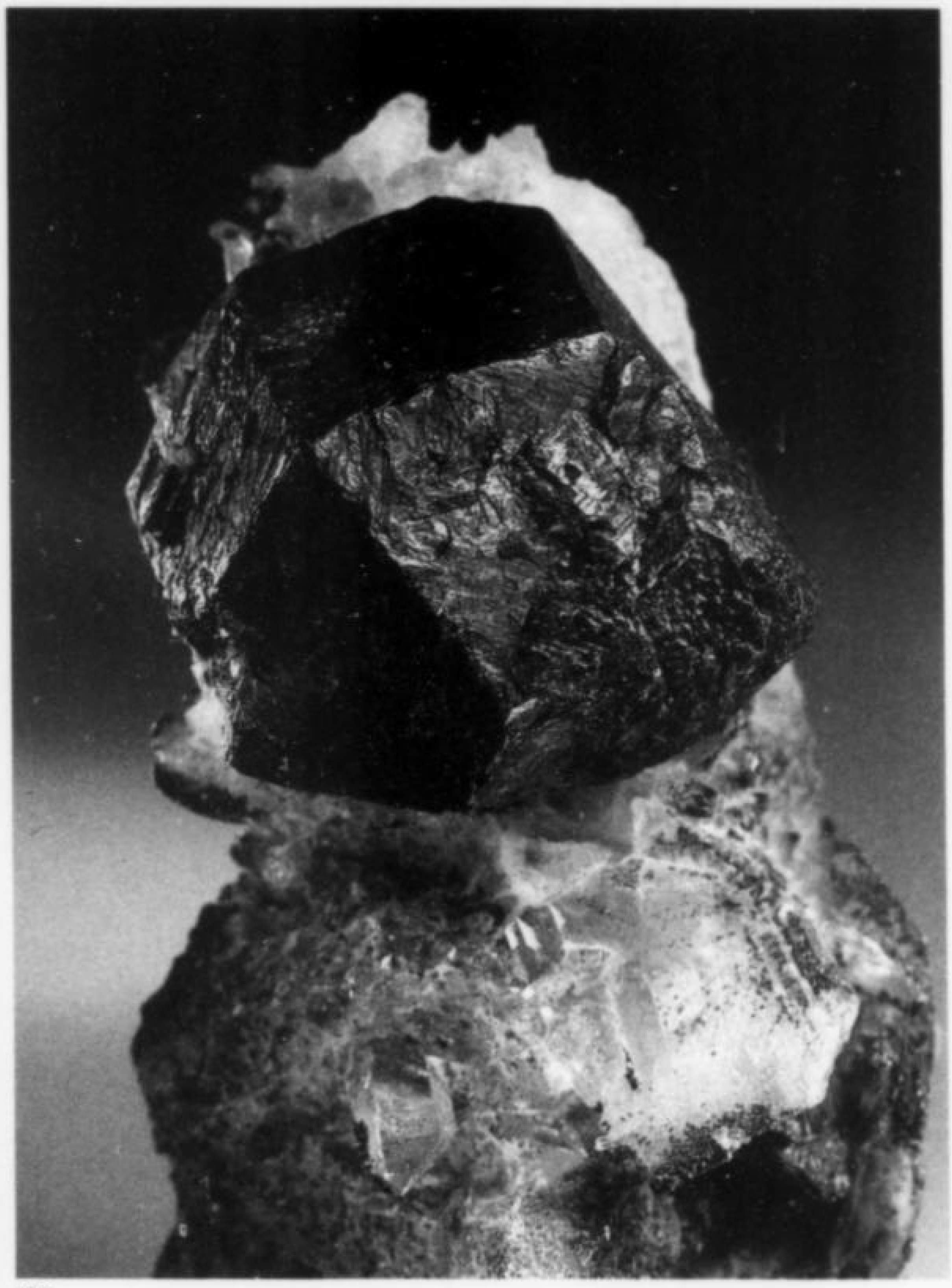

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Figure 6. **Bornite, a superb 2-cm dodecahedron on a matrix of calcite, barite, pink quartz and dusty marcasite; from Dzezkazgan, Kazakhstan. Dzezkazgan bornites were available at Ste-Marie; this, one of the best known examples, was brought out by Brad Van Scriver and is now in the Tom Gressman collection.**

and copper ores, an unusual occurrence apparently. In these pieces, twisted strands of crystalline copper emerge from masses of breccia coated in cobaltoan dolomite. Only about 20 specimens were found, the best of which (half a dozen pieces) had also been quickly sold.

Jean-Pierre and Nicole Voilhes (*La Pierrerie*, rue de Foirail, Plauzat, 63730 Les Martres de Veyre, France) always have an interesting stand. They specialize in Brazilian minerals, and this year had some intriguing **aquamarine** from a newly opened mine at Boca Rica, Minas Gerais. These crystals are notable for their transition from a transparent gemmy blue at one termination to what appears to be a compact mass of white fibers at the other end. They are most unusual, and a good deal more attractive than my description might suggest! *La Pierrerie* also had a nice selection of specimens from the well-known Brumado mine, Bahia, including large **magnesite** crystals, **uvite, hematite,** and a most unusual delicately green-tinted **quartz.**

Although there was a great deal of very good material, there were no truly exciting new minerals unveiled at this year's *bourse* that had not debuted in Tucson. However, there are some distinctly exciting new developments to report in the world of **mineral books.** First among these must be Georg Gebhard's *Tsumeb*, a few copies of which were available on Gilbert Gauthier's stand. The author himself was selling these, but my attempts to meet him failed (I should have tried harder!). His book is surely one of the world's finest topographical mineralogies, as befits the world's premier specimen source. It is large format (25 x 31 cm), and filled with superb color photographs of fine specimens (including many rarities), backed up with detailed technical data and much historical information, both mining and mineralogical. [See the review in the previous issue.] Unfortunately my German is not good enough for me to make a fuller judgment at the moment, but were it not for the promise that an English edition is imminent I would suggest that those interested just buy it anyway and enroll in German classes. But, for non-German readers, the wait will be more than worth it, for the English edition is to contain further information. Hopefully the new edition will be released at the Munich show. Also due to be published soon in English translation is Rainer Bode and Artur Wittern's excellent *Mineralien und Fundstellen Bundesrepublik Deutschland* [Minerals and localities in Germany], a very well illustrated and authoritative guide. Publication is planned in time for the Denver show this year. And, as I learned at the Saturday night dinner for dealers and friends of Ste-Marie-aux-Mines, a book of mineral photographs by leading mineral photographer Nelly Bariand is also due to be published by the end of the year. Titled *Minéraux passion* it will be a large-format book devoted to spectacular minerals, the second in a series that began with *Orchidée passion*. It would seem that 1992 promises to be a bumper year for mineral books.

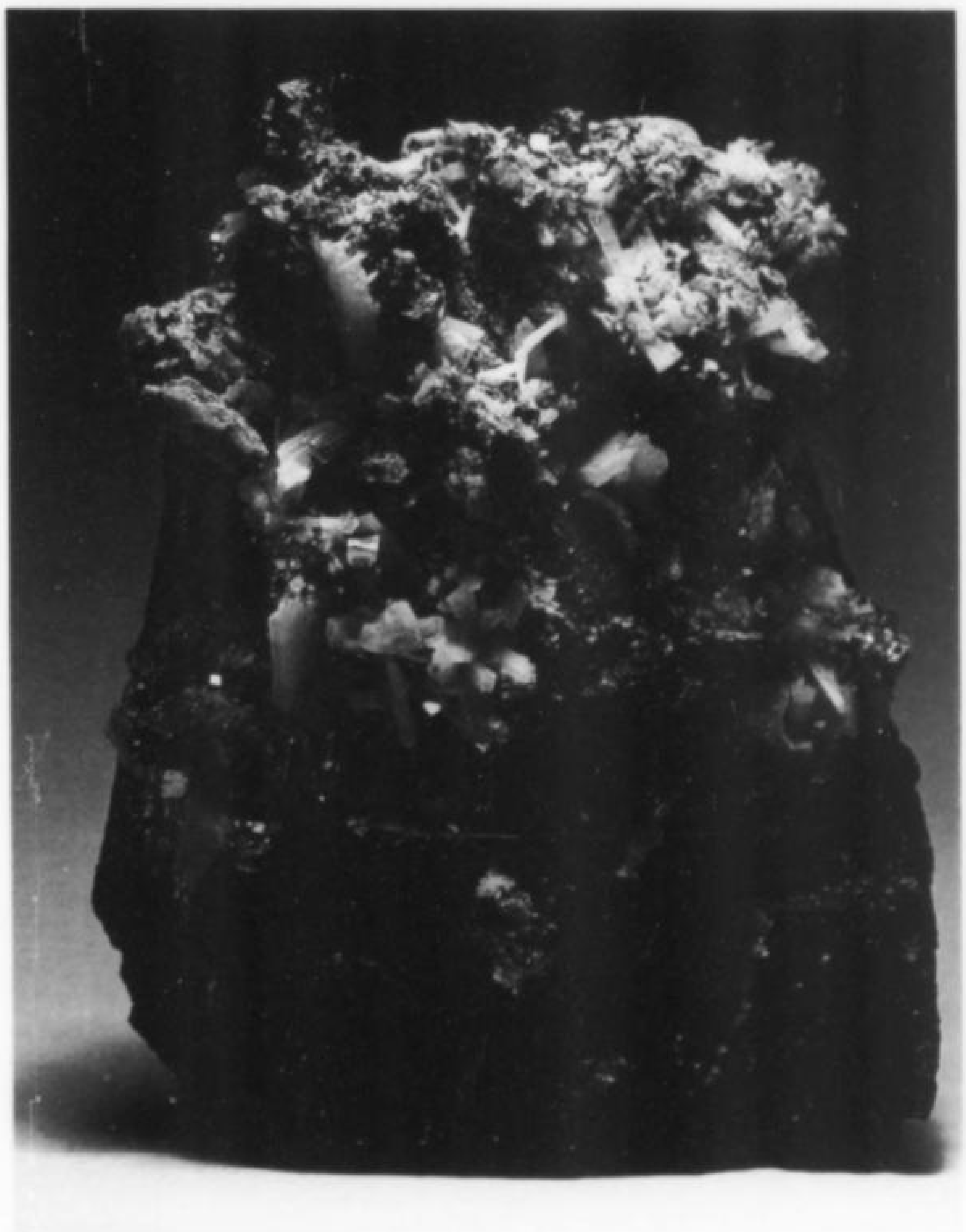

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Figure 7. **Bertrandite crystals to 1 cm, on a 5-cm black wolframite crystal, from Kara Oba, Kazakhstan. Falko Baatz specimen.**

At the same dinner, Pierre Bariand, curator of minerals at the Sorbonne in Paris, told me of an exciting development there. Readers familiar with this superb mineral display (see *Mineralogical Record*, **13**, 31–34) will know that until now public access has been limited to only a couple of days a week during the university term. Plans are now well advanced to open the museum 7 days a week throughout the year, and a new access tunnel direct from the street is being constructed to make the collection easier to find. This tunnel is designed to resemble a mine level, complete with authentic timbers taken from ancient Celtic gold workings at Le Bourneix, near St Yrieix, Haute Vienne, discovered recently during opencast mining. Since this new access will open into the present rear of the mineral gallery, the whole exhibition is being revamped to invert the systematic display so that a visit still follows the familiar chemical classification beginning with elements and sulfides through to silicates, sulfates and so on. The official opening is planned for January next year.

The weather got hotter as the show went on, and the sun came out in force on Sunday. Moving around got harder and calls to the bar more frequent. I spent most of the day wandering about trying to have one last word with everyone I knew and to say goodbye or *au revoir* as appropriate. But by then I was past my best and I needed some time to reflect. I never did get to make all the calls I'd planned, and after a few hours I was met by my wife who took me off into the mountains to a friend's holiday flat for a lazy week of French food, wine, and hospitality. I'm writing this on our balcony, looking out over a forest, eating the best black cherries in the world. If only life was always like this (it would probably kill me).

And now it's egg-on-face time. I had some very interesting responses to my comments on historic mineral dealers in my last "Letter," several writers congratulating me on my good fortune in obtaining an original Heuland catalog from the Muséum d'Histoire Naturelle in Paris. Yes, my "Letter" did read like that didn't it? So before this gets any further, let me say that what I came home with was a *photocopy* and that the original rests safely in the Muséum archive where it belongs! A couple of people have asked me when my dealers project will be finished, to which I can only ask: "How long is a piece of string?" The database grows daily. There may also be letters asking what happened to the review of the British collecting scene promised in my last "Letter." I'm afraid circumstances overtook me, but life is back on track now and hopefully the review will be with you soon. But for the present I must get out that German phrase book and start gearing up for Munich.

Michael P. Cooper
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What's New in Minerals?

by **Tom Moore**

Springfield Show 1992

Of a year's major American mineral shows, the one at Springfield, Massachusetts is nearest to where I am calling home these days. So it was inevitable that I should drive two hours up the road from Niantic, Connecticut, to attend this August event, the "1992 East Coast Gem and Mineral Show," which I found sprawling energetically over the whole ground floor of the Springfield Civic Center. Show manager Marty Zinn, his skills honed on the conclaves at Tucson, Costa Mesa and Denver, did a fine job of filling this huge, otherwise rather plain-looking interior space in Springfield's plain-looking downtown with mineralogical glitter: some 90 retail and wholesale dealers, and 20 or so small but classy display cases, especially featuring the **minerals of California** (this year's show theme), and especially *especially* starring California gold. Visitors were greeted just inside the entrance by a row of exhibits on California gold mining and panning, gold literature and lore, and of course world-class gold specimens. They could then go on to the exhibit alcove, back in a corner of the floor, for follow-up treats on California gem pegmatite minerals, benitoite/neptunite, and more gold, in cases put in by (among others) the Natural History Museum of Los Angeles County, the Houston and Boston Museums of Science, Pala International, Harvard, and the American Museum of Natural History (New York). And Doug Wallace shone, even in such company, with a casefull of his own field-collected California specimens, including an astonishing 10 x 15-cm Calaveras County axinite. Then, having indulged awhile in California dreams, the visitor could further admire the case of Arizona copper minerals put in by George Feist; the rhodochrosite case by Stuart and Donna Wilensky; the case of minerals of St. Lawrence County, New York, put in by the St. Lawrence Mineral Company—and more. An exercise in indoor gold panning, and three days' worth of lecture/presentations by guests like Joel Bartsch, Wayne Leicht and Anthony Kampf completed the weekend's agenda.

It was, in short, a Good Show—this despite a lack of striking new mineral discoveries among the dealers' offerings. And, as we all know, a Good Show is not only a thing of immediate beauty, but also a joy, if not forever, at least for a good subsequent week's worth of afterglow—notwithstanding the frustrating memory-images of specimens that "got away." My own list, unusually long this time, included (in thumbnail sizes, of course) a Brazilian chrysoberyl, a N'Chwaning mine gaudefroyite, an Ontario uraninite cube, a Russian scheelite, and even, God help me, a Långban native lead, unspeakably ugly but atavistically appealing. I mention these personal trivialities only to evoke and to stroke, for fun, the symptomatology of the collector-mania which unites us. A further symptom of the disease is how, at a truly Good Show, your time seems to end just a moment after it has begun, when, paying for your admission and filling out the little card for the door prizes, you luxuriate in the sense that you have "all day"—then find in an *Augenblick* that it is evening, and time to go.

Of course I'd especially hoped to see at Springfield some old classic things from eastern U.S. localities, if not also from Europe: and at the dustily disorganized, mesmerizing stand of Vandall King of Rochester, sure enough, I was gratified. Van was selling off things from the **mineral collection of the late Curt Segeler** of New York City—engineer, physicist, educator—who began collecting in 1908 (see the personality sketch by Van in vol. 6, p. 273). There were a great many flats full of micromounts, and some larger pieces, but most of the specimens were miniatures and thumbnails lying loose in old box lids, many accompanied, enticingly, by antique labels in Segeler's and (presumably) earlier collectors' handwritings. There were good rhodonites, franklinites and gahnites from Franklin/Sterling Hill; euhedral New Hampshire triphylite crystals; wolframites and wolframite pseudomorphs after scheelite from Trumbull, Connecticut; and there were venerables from Cornwall and Příbram and Långban . . . what's more pleasant than to examine the marginalia from an old collection, especially when the collector was clearly a person of knowledge and taste?

Immediately next door to the King/Segeler stand, and contrasting with it, was a wealth of well-scrubbed contemporary pieces in contexts of modernistic glass shelving and plastic pedestals, offered by trusty Francois Lietard of *Minerive*—the same fine French dealer whom I have noted more than once, including from this Tucson show just past, for his outstanding Himalayan and *nouveau* Russian material. Here again, as at Tucson, were many excellent thumbnails of the new Dzezkazgan, Kazachstan wire **silver,** and, in a new and exciting statement by the same locality, two bright 6-cm peacock-iridescent *groups* of sharp modified cubes of **bornite.** Here again were Francois' gorgeous **vesuvianites** from Bellecombe, Aosta, Italy, and his Tanzanian gem **scapolites** and Ural **axinites.** And here were about 15 small, flattened, reticulated "cogwheel" groups of milky white **beryllonite** crystals from Paprock, Kunar Valley, Afghanistan—no more attractive in color or luster, unfortunately, than beryllonite ever is, but interestingly constructed and very different from the old loose single crystals from Maine and New Hampshire. Considering the rarity of this species in *any* crystal manifestations at all, Francois' price range of $50–$150 for a good thumbnail seems quite reasonable.

Here, too, as well as at two or three other dealerships around the show, some fine gem **zoisite** (*tanzanite*) crystals were to be seen. The familiar locality of Merelani, Arusha, Tanzania, seems to be in a modestly productive phase again, and these new crystals, while not of the deepest blue-purple color, are absolutely clear and gemmy for the most part, and quite splendidly sharp. Kent Bricker of *Pala International* had the best around.

Wendy and Frank Melanson of *Hawthornden* brought a great variety of fine Mont Saint-Hilaire material—as well as other material—to tempt the collector who is turned on (as I'm getting to be, thanks in part to the splendid Mont Saint-Hilaire special issue—vol. 21, no. 4) by the riches of this Contemporary Classic locality. Limpidly transparent, colorless to palest brown, sharp, hexagonal plates of **catapleiite** to 1.5 cm across were available, either as loose floaters, or sitting attractively in brushy black fernlike aegirine growths. The Melansons' **leifite** was just about as fine as it gets, with radiated "open" spherules of well-terminated purplish glassy crystals. Blocky, deep orange-pink **serandite,** sharp groups of siderite rhombs, and good **rhodochrosites** fill out, though they don't yet exhaust, the Saint-Hilaire menu. There were, in addition, many very respectable, small, loose **cubanites** from Chibougamou, Quebec; good **rose quartz** groups from the new find at Sapucaia, Minas Gerais, Brazil; very heavily etched, gemmy pale green, loose **beryls** from Mina Chia, Linopolis, Brazil; some lovely rounded groups to 2 cm of very pale greenish white **prehnite** from the new epidote find in the Val di Viu, Aosta, Italy; and at least a hundred beautiful green, pinkish purple, and bi-colored or multi-colored **vesuvianite** groups from the Jeffrey quarry, Quebec.

Figure 1. **Catapleiite crystal, 1.4 cm, from the De Mix quarry, Mont Saint-Hilaire, Quebec. T. Moore collection; J. Scovil photo.**

Figure 2. **Vesuvianite crystals, 3.3 cm, from Veracruz, Mexico. Rough & Ready Gems specimen; J. Scovil photo.**

Speaking of vesuvianite, there *was* one noteworthy new find to be seen at this show, after all. Steve Green of *Rough & Ready Gems* (P.O. Box 10404, Denver, CO 80210), having recently traveled through some very rough-and-ready back country in Veracruz state, Mexico, and having returned, somehow, unharmed by the diverse membership of the opium-trafficking subculture there, had excellent **vesuvianite** crystal groups from a source discovered this June somewhere (we are not yet to know *just* where) in the region. The crystals range up to 3 cm wide; they have two orders of prism faces, and large, very low-angled pyramids, and tiny basal-pinacoid tips; because the prisms tend to be short, the overall aspect is blocky, nearly equidimensional. The color is a mottled brownish grayish green, glassy to near-gemmy in some small areas. The largest was a matrix piece, about 7 x 15 cm, with four sharp vesuvianites irregularly stacked on a granular, off-white limestone; the other half-dozen specimens were all miniatures except for one handsome 2-cm thumbnail (for $30). Further development of the locality should, for reasons already implied, be difficult and sporadic, but according to Steve there is no *other* reason for not expecting more of this pretty material to surface; certainly it's a Mexican vesuvianite of a kind quite radically different from the long-familiar, loose brown-orange Lake Jaco, Chihuahua, crystals.

That's about it, then, for this Good Show—although I could go fondly on awhile about, say, having had the pleasure of meeting for the first time an old mail-trading pen pal; or about having briefed a quizzical security guard on gold ("see—it *doesn't* really look like fool's gold"); or about this or that, fruitful or fruitless, specimen speculation. Never mind: happy hunting, this coming fall season, to all who'll go to Denver, or even to Munich (as regrettably I will not); and let's soon start thinking TUCSON.

Tom Moore
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MINERAL STORIES

Lawrence H. Conklin

A Collection given to a Foundation . . .

[The following story was submitted by Sir Howard Smith of Coolangatta, Queensland, Australia.]

Among the classic Australian mineral occurrences other than those well-known at Broken Hill in New South Wales, are those of the New England Highlands in the north of that state. Molybdenite and quartz crystals from the Kingsgate mines; smoky quartz crystals shot through with tourmaline (schorl) crystals; citrine and "frosted" crystal groups from Torrington; large, clear, green beryl crystals from Heffernan's mine; remarkable curved stibnite crystals from Hillgrove; they and others occurred in first-class specimens among the hundreds of mines operating there early this century. Specimens now are almost impossible to obtain unless, as rarely happens, an old collection emerges from obscurity.

Touring in northern New South Wales, my wife and I were calling at every antique shop we found when in the quaintly beautiful township of Bangalow we at last ran across one with an example of the type of Victorian glassware that Lady Barbara so ardently pursues. As the proprietor carefully wrapped the fragile object of my wife's desire, we fell into amiable conversation and naturally the subject soon got around to minerals.

It turned out that the antique shop proprietor had recently purchased the entire contents of a private museum. The museum's collections had been formed early this century at a sheep station homestead near Armidale, in the New England district. The new generation had inherited the property and were modernizing the homestead. Rooms were being converted so the museum had to go.

The antique man, unfamiliar with minerals, purchased the entire contents of the museum including the beautiful display cases, crafted in the finest timbers and lined with green felt, but he declined to make an offer for the mineral collection. Already heavily committed in the purchase, he felt that speculation with the minerals, a field unknown to him, was too risky. He suggested that another buyer might be found for that part of the museum. The collection was accordingly advertised locally but not even one prospective buyer came forward.

The next step, according to the storyteller, was to offer the collection as a gift to the University of New England in Armidale. Its reaction, he said, was that the collection would be accepted if it was delivered to them but they could not send anybody to pick it up. This response aroused great indignation at the homestead and the university was promptly ruled out as a donee. There being no interested party willing to buy the collection, the decision was taken to dump it. All the specimens were packed into boxes, taken to a building site and there tipped into the aggregate for the concrete foundations.

I suggested to the antique man that sometimes mineral collections are formed mainly from rocks and ore samples which although perhaps curious and often pretty, are of no real value as mineral specimens since good crystallized specimens are absent. He reiterated that he knew nothing of such things but remembered that he still had a catalog of the collection, which he produced for my perusal. Another customer entered the shop and he had to attend to business, but not before he passed me the catalog.

I glanced randomly through the lists of hundreds of items. I read: "Quartz Crystals with Molybdenite from Kingsgate Mines . . . A Collection of Sapphires and Topazes . . . Cairngorm Crystals with Tourmalines from Torrington . . . Carbonate of Copper Crystals from Cobar . . . Stibnite Crystals from Hillgrove . . . Carbonate of Lime Crystals from Lionsville . . . Tin Crystals from Elsmore . . . Beryl Crystals from Torrington . . . Wolfram Crystals . . ." At about this point I had a heavy attack of the Vapours and even now I am far from recovered.

The Disappearing Antarcticite

[The following story was submitted by Wallace D. Kleck of Orange Coast College, Costa Mesa, California]

In November of 1963 a group of geology students and I stopped at one of the roadside trenches in Bristol Dry Lake. This lake is in the Mojave Desert east of Barstow, California. The Lesli Salt Company (now the National Chloride Company) used the lake water as a source of calcium chloride. The company excavated trenches in the dry lake bed and processed the saline water that accumulated in them. I had been to this place and wanted to show the students halite crystals growing in the saline water, and gypsum crystals in the lakebed mudrock.

This time there was another mineral in the ponds, one I had not seen before. It consisted of long, clear, hexagonal prisms with terminal pinacoids, in open, interlocking masses. The crystals had the shape of a common wood pencil; individual crystals were up to 20 cm long. I collected a sample about the size of a football; to protect it, I carefully wrapped the crystals in several layers of newspaper.

When I got back to the college the paper was wet, presumably from the saline water adhering to the crystals. However, when I unwrapped the newspaper, there was nothing inside! A joke—obviously the students had hidden my sample. Well, we would meet in class in a couple of days, and surely the students would return the specimen. The next day I glanced at the newspaper—it was wet; the following day, it was still wet.

When we met in class, the students denied doing such a foul deed as hiding my sample. One of the students told me *his* sample had *also* disappeared, and left the wrapping paper wet. After thinking about this, I concluded that the mineral must be deliquescent—that it absorbed water from the air and dissolved itself in that water. I checked a reference on saline minerals; none of the minerals listed had the necessary properties.

Several weeks later, I went back to Bristol Dry Lake. This time I took a Mason jar and collected enough of the material, with the brine, to fill the jar. The mineral was indeed deliquescent.

No such mineral was described in any of the references I had. Was this a new species? Naw, it couldn't be—20-cm crystals from a known locality within 3 meters of a well-traveled, paved road? No way. Besides, these days new minerals are always found as white microcrystals in white rock, or as yellow powder in cruddy material from Tanzania.

The sample got placed on a shelf in a sealed jar. The identity of the mineral would have to wait until the next time I got to a good technical library. In the normal way of events in Murphy's world, the sample sat there for the next two years. Occasionally, I would pick up the jar, puzzle a moment, and mutter, "Next time. I've got to look this up."

In 1965 a new mineral description was published in *The American Mineralogist*: "Antarcticite, a new mineral, . . ." (vol. 50, p. 2098). Someone found a new mineral in a saline pond in Antarctica. It was hexagonal. deliquescent, and a hydrous calcium chloride.

Damn!

I still have that sealed jar of antarcticite on a shelf. It mocks me every time I pass.

A Biblioclast Recants

I remember it quite clearly; the year was 1974 and I was thinking about what to take with me to sell at the mineral show in Washington, D.C. The usual complement of mineral specimens was, of course, available, but this time I wanted something special, something that would attract attention and would really *sell*, but what could it be?

This I pondered for days and finally decided that I had the answer right under my nose. Antiquarian mineral books were much easier to obtain in those days, and I had just bought, from an English bookseller for a modest sum, a copy of volume I (in original boards) of Rashleigh's *Specimens Of British Minerals, Selected From The Cabinet Of Philip Rashleigh, Of Menabilly, In The County Of Cornwall, etc*. (London, 1797). For those of you not familiar with this work, it contains 29 lovely quarto-size plates of Cornish minerals, all hand-colored, and therein lay my idea.

Who, I thought, could resist purchasing an individual 18th-century mineral color-plate, especially if it were handsomely and professionally matted and framed? I carefully extracted all 29 plates from the volume (there were a few others, but they were not colored), made a deal with my local framer, and had them all expensively gilt-framed with suitable matching and contrasting colored mats. Please remember that I would shudder at the idea of doing such a thing *today*; I wouldn't even want to *think* of such an action, but people, as well as their ideas, do need time to grow.

The prints made a truly impressive display as I set about half of them out at the show that first morning. They were examined, studied, inquired about, handled, but they did not sell. One of their most fervent and constant admirers for the four days of the show was my dear friend Dick Heck, who never lost an opportunity when he passed my booth to examine one or two, including the ones not on display.

Sunday afternoon arrived heralding the end of the show and, although I probably had some mineral sales, I had not sold a single one of the Rashleigh prints. As I was packing up, Dick came by and said that he had thought about it for the entire show, and guessed that he should purchase one of the prints, and would I help him to pick out the best one. I said, to his surprise, "absolutely not." I was not about to destroy a lovely book for the sale of a *single* print, and I refused his money.

When I got home it was a very simple thing to remove all the prints from their new but short-lived gilded homes, re-unite them with their individual textual descriptions, send everything to the binder, have a new spine made for the original boards (which I had carefully preserved), and have a "book" again. The empty frames today are down to a population of about a dozen, and are slowly being used up for other prints and photographs. **L.H.C.**

Book Reviews

Museos Españoles de Minerales

["Spanish Mineral Museums"] by E. L. Gomez (General Director and Coordinator), B. C. Perez (Technical Director) and A. H. Rodriguez (Editorial Director), published (1990) by the Instituto Tecnológico GeoMinero de España, c/ Ríos Rosas no. 23, 28003 Madrid, Spain. Hardcover, 25 x 31 cm, 156 p., ISBN #84-7840-055-9; price: 5,120 pesetas (about $50) excluding shipping.

This is a truly spectacular book on the 30 most important public mineral museums in Spain, with additional notes on the most prominent private collections. The production quality is lavish beyond expectation; the many large color mineral photos, for example, are printed on a thick, smooth, matte-finish paper and each photo is individually varnished, so that the photos are high-gloss but the margins and text portions of the pages are matte. The contrast is striking.

In concept the book is similar to Burchard and Bode's *Mineral Museums of Europe* (1985), and in fact a number of Bode's fine specimen photos are included. Each museum is described in terms of its history, holdings, staff and facilities. Over 170 color photos of specimens are included, along with many fascinating photos of the interior display systems and cabinetry. (I particularly enjoyed seeing a custom-built wooden cabinet, very tall and wide but shallow, designed specifically to display a collection of over 1,000 wooden crystal models made by René Just Haüy.)

For the mineral collector who cannot travel through Spain on a tour of museums, this exceptional book is the next best thing, and a fine addition to any library.

According to the publisher, the book is being sold at the production cost, without any mark-up for profit. This accounts for the low price, which is less than half of what would normally be expected.

W.E.W.

Colorado Gold, from the Pike's Peak Rush to the Present

by Stephen M. Voynick. Published (1992) by Mountain Press Publishing Company, P.O. Box 2399, Missoula, MT 59806. Softcover, 15 x 23 cm, 206 p., ISBN 0-87842-282-X, $12 excluding shipping.

Colorado Gold, a historical review of gold mining in Colorado, is written by the author of *Leadville: a Miner's Epic* (1984), *The Making of a Hardrock Miner* (1978), and numerous other books and articles on mining history. Voynick is thoroughly familiar with his subject, and writes in an easy, friendly style which is a pleasure to read. Frequent extracts from miners' journals and letters, and contemporary newspaper accounts add authentic flavor to the narrative. Topics covered include historic and modern gold booms, from the first discovery in 1803 to modern professional and recreational miners; a look in particular at Cripple Creek; gold mining technologies; lost mines; and the preservation of historical sites. A four-page color insert shows ten individual gold specimens, a case of Breckenridge gold specimens, a 61-pound bar of gold, and a privately minted $20 gold piece made from Colorado gold. Fifty black and white photos and maps serve to illustrate the text.

W.E.W.

The Tucson Experience: World's Largest Gem & Mineral Shows

[Videotape] "Official souvenir video" of the 1992 Tucson Shows, produced by Creative Vision, 935 E. South Union Avenue, Suite #D202, Midvale, Utah 84047; Telephone (801) 562-5136; ISBN #1-56362-032-4; 60 minutes, $24.95 excluding shipping.

At last someone has made a video about the Tucson Show phenomenon. If you want something to show your non-mineralogical friends and relatives what all the excitement is about, this tape will do nicely. It begins with the early history of the TGMS show, proceeds through to the current mammoth size and worldwide stature of the show, and then goes into similar detail on the concurrent gemological shows. All of this is done through interviews with the movers and shakers, the organizers, the curators, the satellite show promoters and a few prominent dealers.

Unfortunately, there are a lot of things which this tape is *not,* that it might have been. From our standpoint, over half of the tape is of little interest because of its concentration on matters gemological; the tape is not just about the mineral aspect. In fact, the tape is not even specifically about the

1992 show, during which it was shot. It is more like a generic promotional piece. Finally, it is not about specimens or about mineralogy or mineral localities. We do get to see a few specimens here and there (albeit unidentified); but primarily this is a tape of "talking heads," burbling about how wonderful and significant the whole Tucson Show phenomenon is. That wears thin after 20 or 30 minutes, and we yearn for some real documentary meat, but none is forthcoming. It doesn't even qualify as that modern hybrid, the "infomercial," because there is too little info.

Nevertheless, if you need something to watch during the long hot summer that will remind you of our favorite winter get-away, this tape is the only one available, and it *is* generally informative for the stranger to gems and minerals who is more interested in the show as a socioeconomic phenomenon.

W.E.W.

The Proctor Collection

[Videotape] by Keith and Mauna Proctor, published (1988) by the authors, 88 Raven Hills Court, Colorado Springs, Colorado 80919-1316; 96 minutes, VHS format, $29.50 plus $1.50 postage.

The collector of aesthetic mineral specimens will find much to savor in Keith Proctor's video catalog of his collection. The Proctor collection is among the best-known private mineral collections in the world, and is a six-time winner of the prestigious McDole, Lidstrom and Goldschmidt awards. Practically every one of his golds, silvers, gem-species crystals and other minerals have been pictured, at one time or another, in over 40 books and magazine articles, and he has been a regular exhibitor at major mineral shows for many years.

This video offers an opportunity to see and study Proctor's exquisite specimens at leisure. Many are pictured on slowly revolving turntables, allowing all sides of the specimens to be seen, and their three-dimensional shapes to be fully realized, as reflections play across crystal faces and gemmy interiors. This is the way you examine a specimen when you have it in your hands, and it reveals far more than the most skillful still shot.

Although the script is rather breathless and laden with superlatives (no soft sell here), this really is one of the best private collections ever assembled, and it merits most of the hype. Proctor (through a tag team of professional narrators) begins by outlining the twelve criteria he has used in selecting his specimens: (1) interesting or rare habit, (2) transparency, (3) high luster, (4) vivid color, (5) presence of matrix, (6) sculptural composition, (7) crystal relief on matrix, (8) freedom from damage, (9) size ratio between crystals and matrix, (10) color contrast between crystals and matrix, (11) isolated rather than intergrown crystals, and (12) rarity of species, shape and associations.

One hundred and eighty specimens are then shown and described in terms of species, specimen size, locality and history, often including interesting background on their discovery. Many still photos of the various famous localities where the specimens originated are worked into the presentation. There are some technical errors (e.g. stating that the species pyrite was named after the pyritohedron), and a tendency to bestow odd colloquial names on specimens, species and varieties (e.g. calling multi-colored Brazilian tourmaline crystals "parrot" crystals). But these shortcomings can be forgiven in light of the great value inherent in the permanent recording of such a significant collection, at great expense, by a non-professional in mineralogy. We would all be the better for it if more private collectors did so.

This tape runs for a full 96 minutes, almost too long to take in at a single sitting. The incessantly effusive narration, apparently aimed at people who may not realize how good these things really are, becomes a little tiresome after a while, no matter how well justified. And the visual images are so intense and concentrated that the viewer's mind can become oversaturated, just as it can at a major mineral show where thousands of superb specimens are suddenly available for examination at one time. Viewing it in 30-minute installments is probably the best approach.

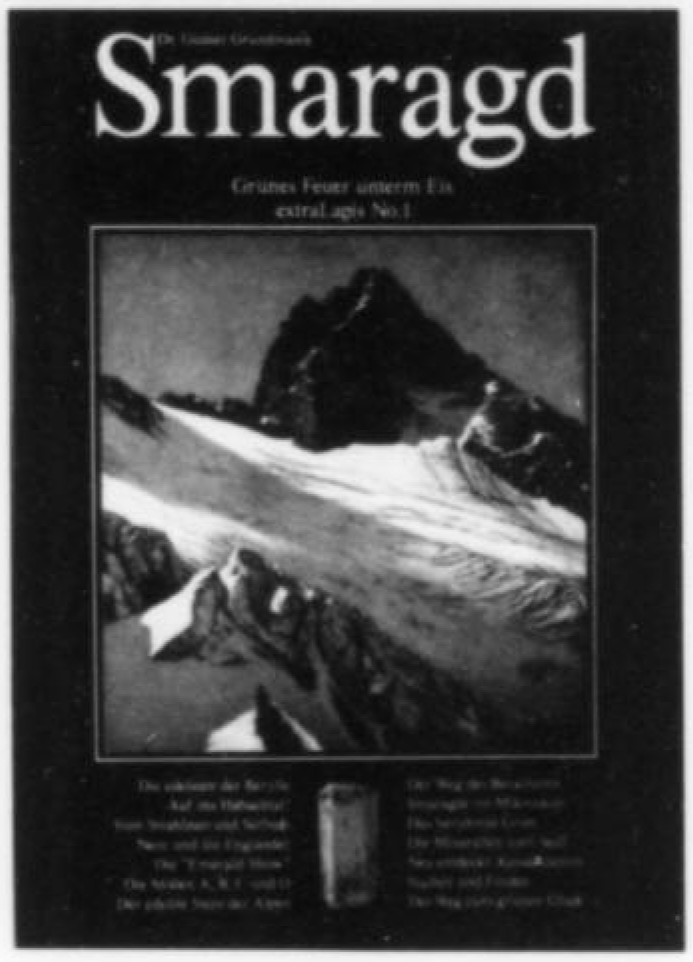
Like the Tucson Show video, and like many illustrated collection catalogs of the 18th and 19th centuries, the Proctor video is designed primarily to serve a promotional function. But it really delivers in terms of extraordinary mineral images and specimen information. Like the book-format catalogs that have come before it, the Proctor video will stand for many years to come as a historically valuable documentation of one of the great private collections of our time.

W.E.W.

Smaragd; Grünes Feuer unterm Eis

["Emerald; Green Fire under the Ice"] by Gunter Grundmann, published (1991) as "extra-Lapis No. 1" by Christian Weise Verlag, Orleansstr. 69, D-8000 München, Germany. Softcover with glued sewn binding, 21 x 30 cm, 96 p., ISBN #3-921656-22-2; price: DM 24.80 excluding shipping.

Christian Weise, publisher of *Lapis,* has begun a new series of publications called "extraLapis" issues, presumably because they are softcover and of the same page size as *Lapis* magazine but are not distributed as part of a *Lapis* subscription. Each deals with a special topic in a book-format graphic design, with lavish use of color photography, thick, high-quality paper, and a durable sewn binding. These are beautiful examples of the publisher's art, and will, we hope, continue through many numbers.



Number 1 is devoted to the famous Habachtal emerald locality high in the Austrian Alps, one of the oldest and most famous gem localities in Europe. The history of the mine and its specimens is reviewed in detail, with many fine color illustrations, locality photos, maps and mine diagrams. Then the surprisingly varied mineralogy of the deposit is reviewed: in addition to emerald, there is fine aquamarine, gem-grade phenakite crystals to 2 cm, orange monazite crystals, cassiterite, scheelite, gadolinite, aeschynite, friedrichite, chrysoberyl, anatase, brookite, xenotime, uraninite and many others. Finally, there is a 94-entry bibliography.

This is an enjoyable book to page through, being well over 50% illustrations, even if the informative German text is ignored. The price, about $16, is very reasonable.

W.E.W.

Gold; Mineral, Macht und Illusion: 500 Jahre Goldraush

["Gold; the Mineral, the Power and the Illusion: the 500-year Gold Rush"] by Maximillian Glas (editor), published as "extrs Lapis No. 2" (1992) by Christian Weise Verlag, Orleansstr. 69, D-8000 Munchen, Germany. Softcover with glued sewn binding, 21 x 30 cm, 96 p., ISBN #3-921656-23-0; price: DM 29.80 excluding shipping.

This special publication "extraLapis No. 2") of *Lapis* magazine provides a general survey of the geology, mineralogy, mining and legends of gold. Both native gold and many of its associated minerals are beautifully illustrated in color, along with many historical scenes, and there are useful bibliographies dealing with amateur gold prospecting, gold loyalties and gold rushes. A list of gold-related articles that have appeared in past issues of *Lapis* is also given. Chapters on the minting of gold coins and on gold testing will be interesting to the mineralogist.

Michael O'Donoghue

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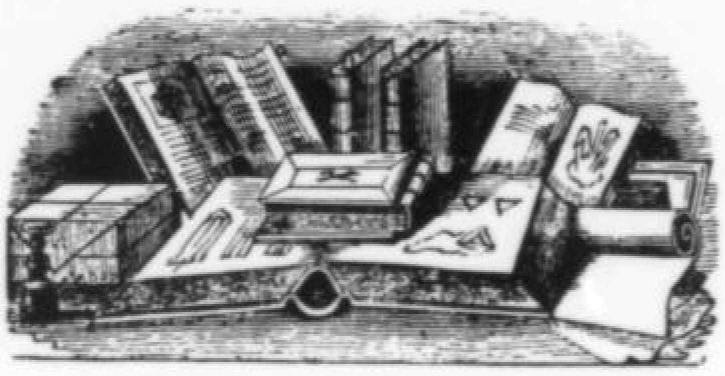

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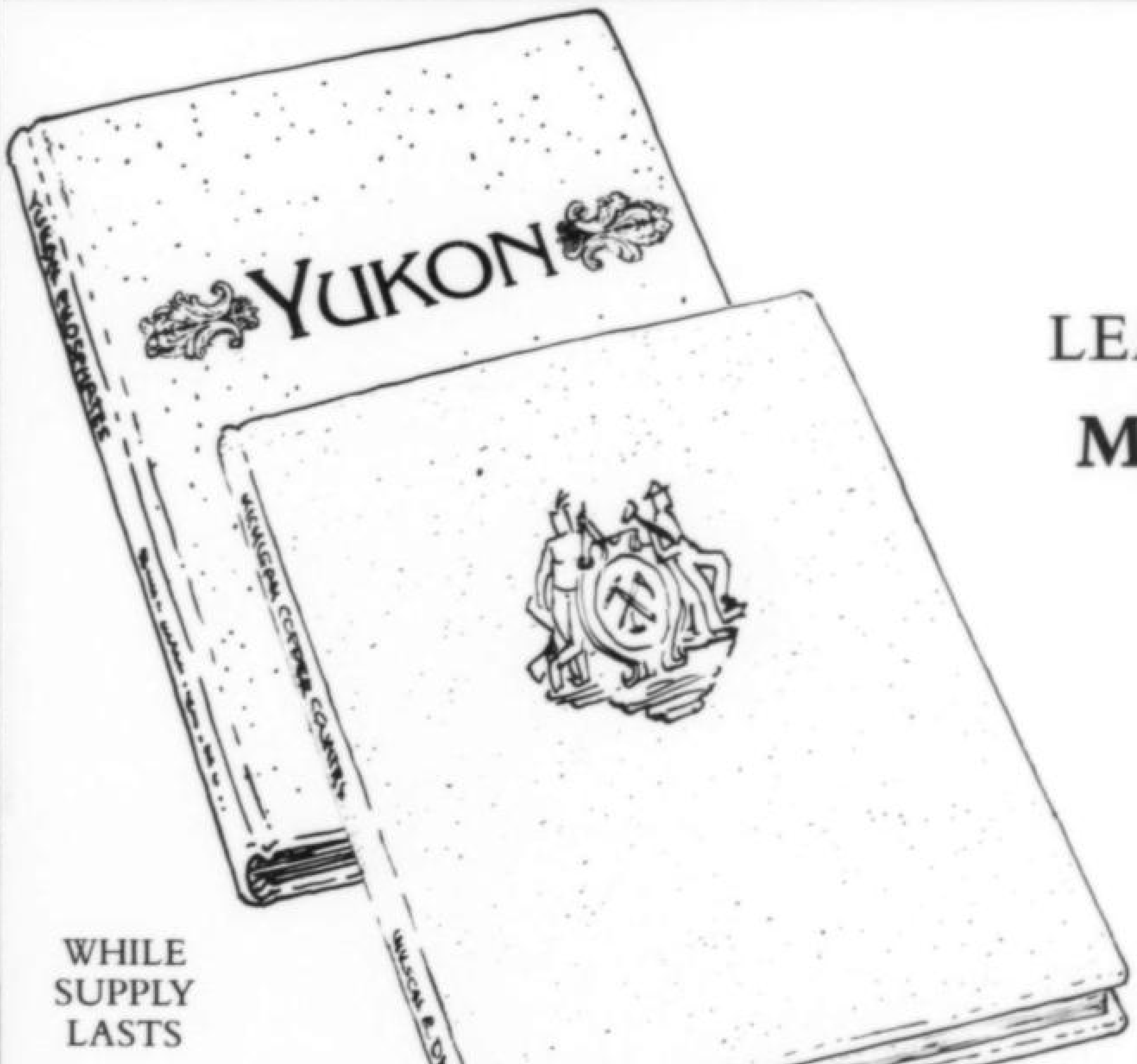

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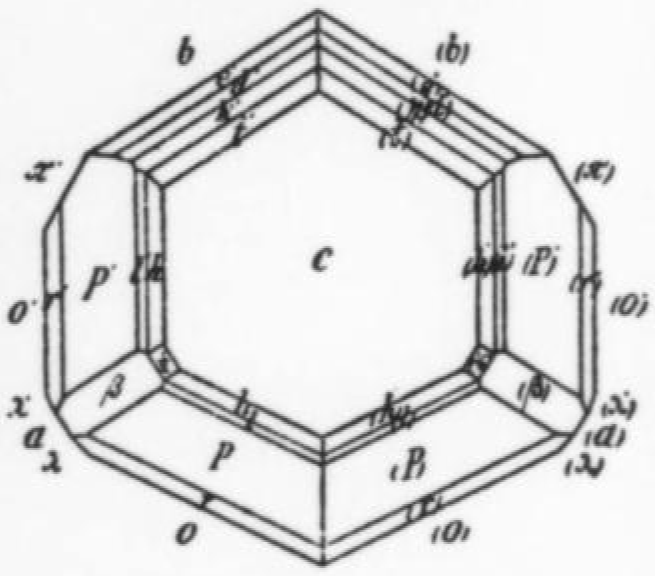

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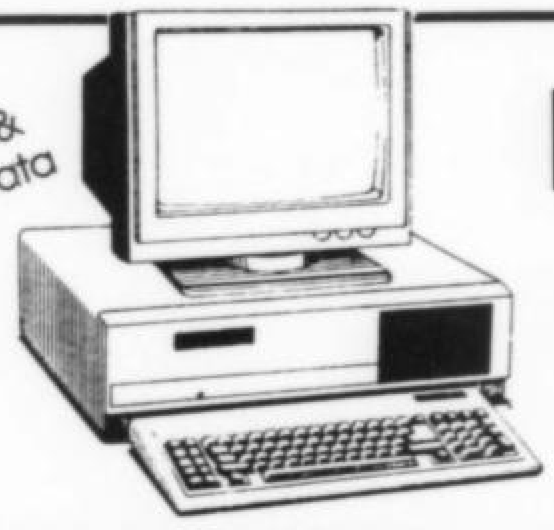

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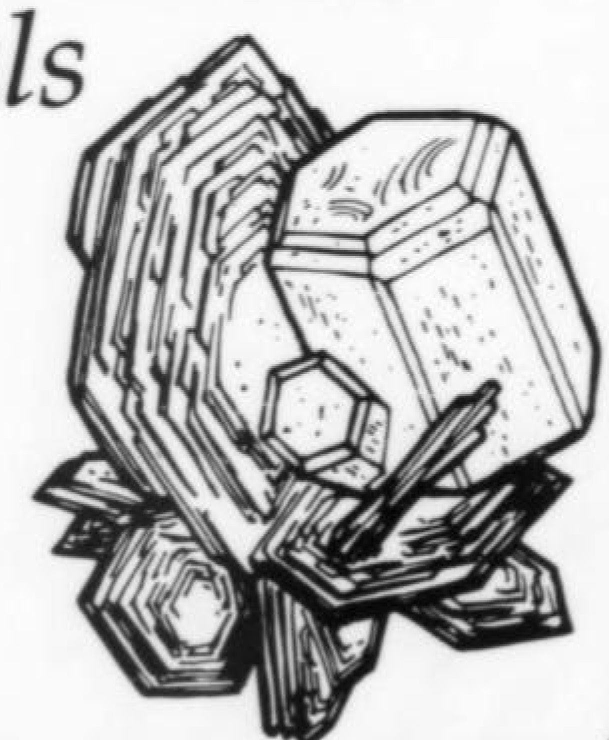

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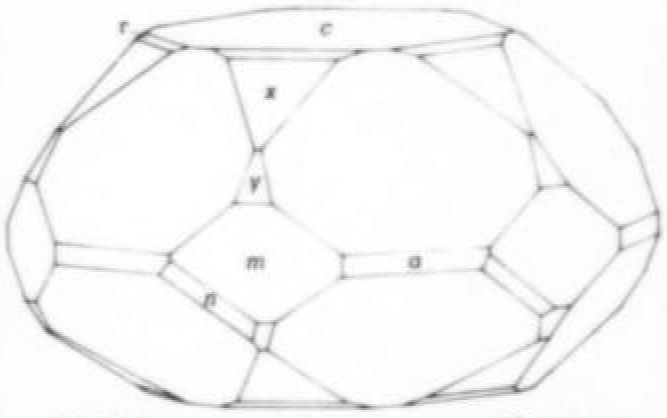

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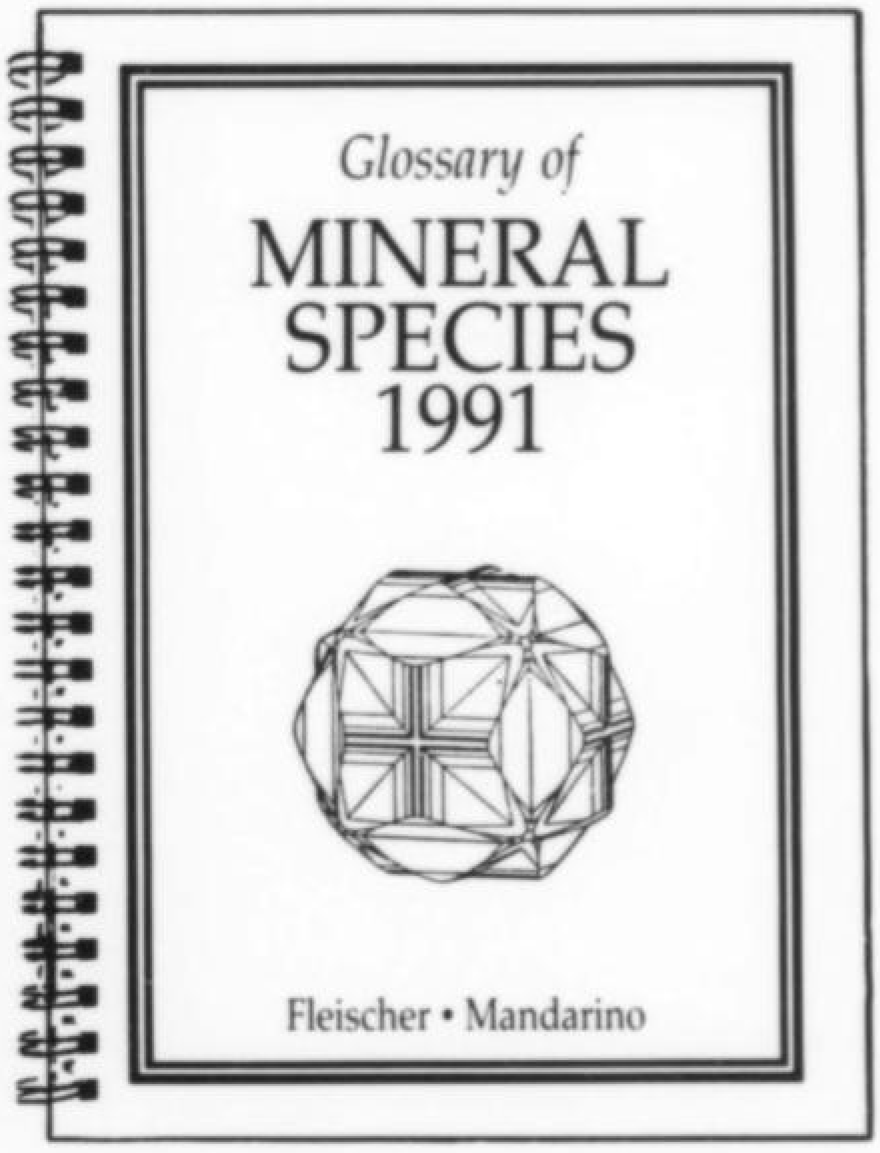

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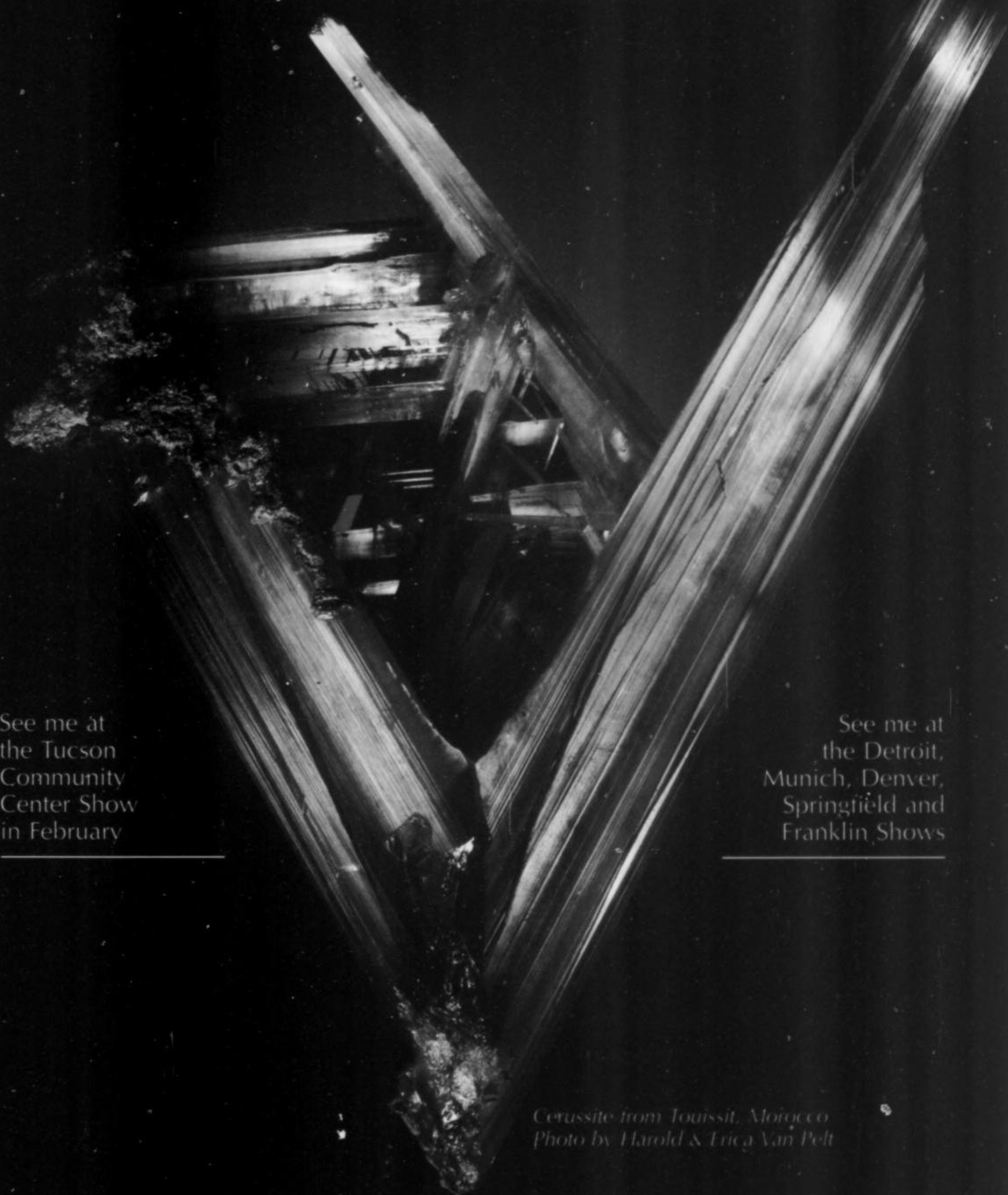

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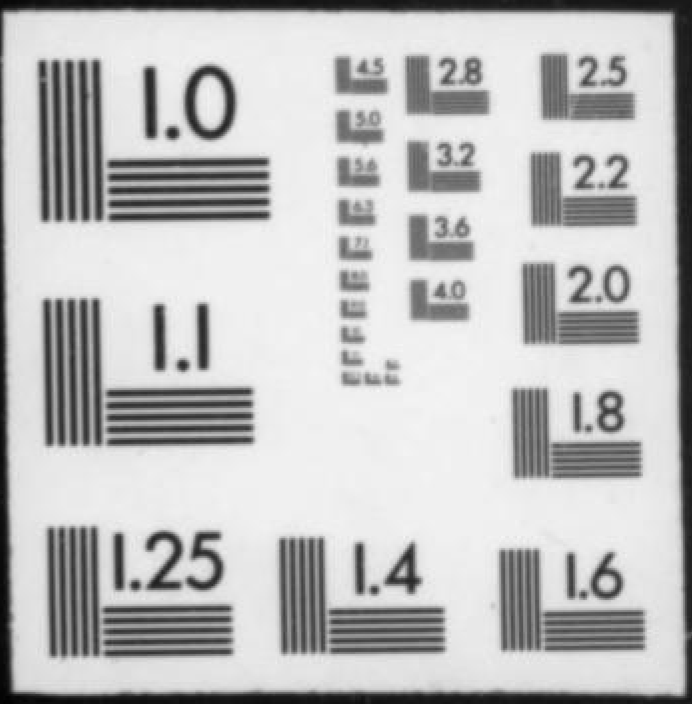
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