the Mineralogical Record

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Number Three
May–June 1997
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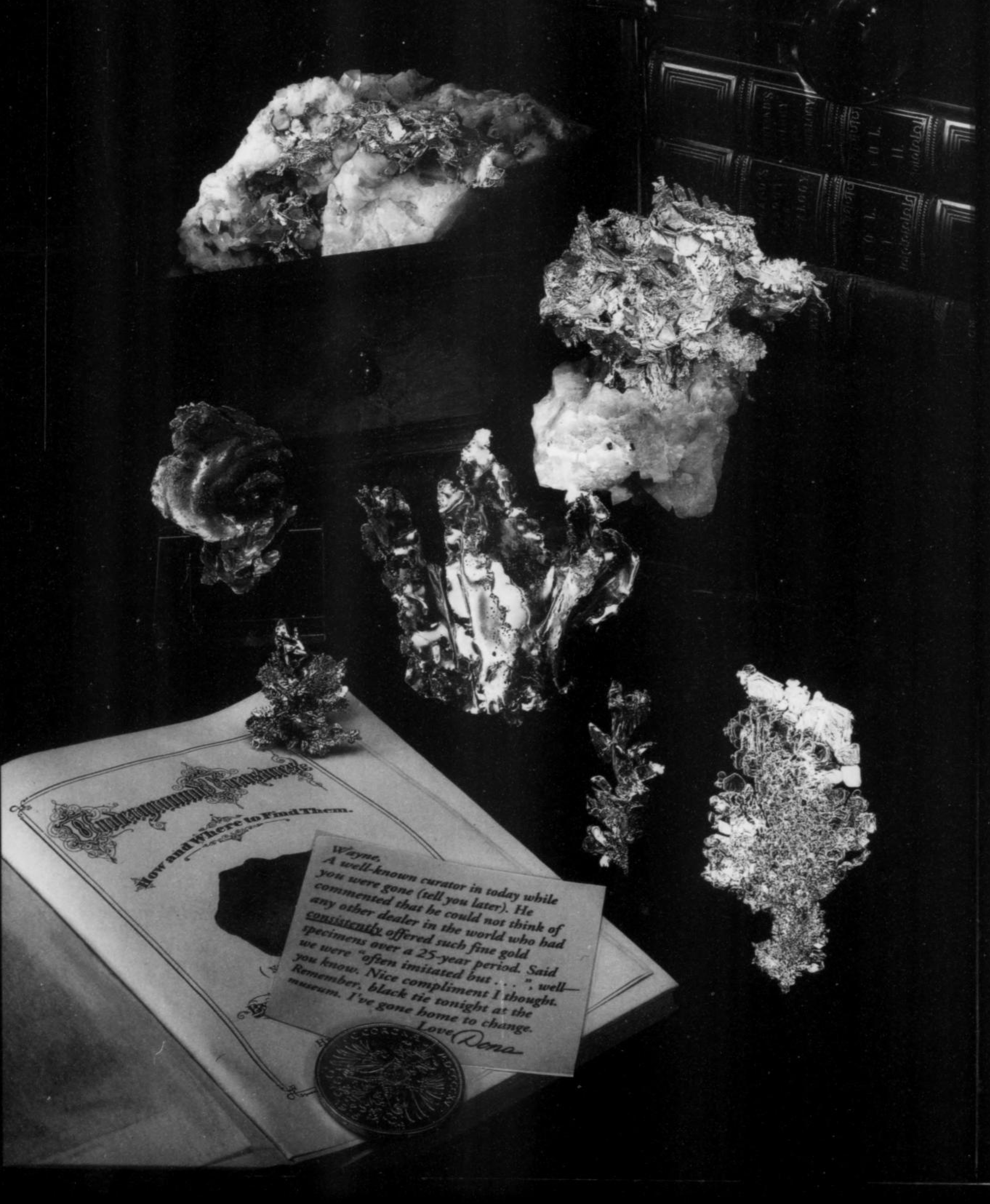
How and Where to Find Them.
Wayne,
A well-known curator in today while you were gone (tell you later). He commented that he could not think of any other dealer in the world who had consistently offered such fine gold specimens over a 25-year period. Said we were "often imitated but . . . ", well— you know. Nice compliment I thought. Remember, black tie tonight at the museum. I've gone home to change.
Love, Dona

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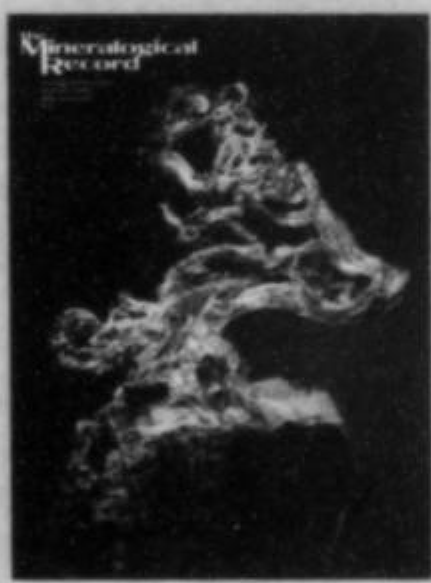
*Continued on p. 239

THE MINERALOGICAL RECORD

May–June 1997 Volume Twenty-eight, Number Three

Articles

Columns



COVER: Wire SILVER, 12 cm, from Kongsberg, Norway. William Larson collection. This *fabulous* specimen was at one time in the David P. Wilber collection, and was exhibited at the 1997 Tucson Gem & Mineral Show in the "David P. Wilber Reunion" case (see What's new in minerals, this issue). Photo by Jeffrey A. Scovil.

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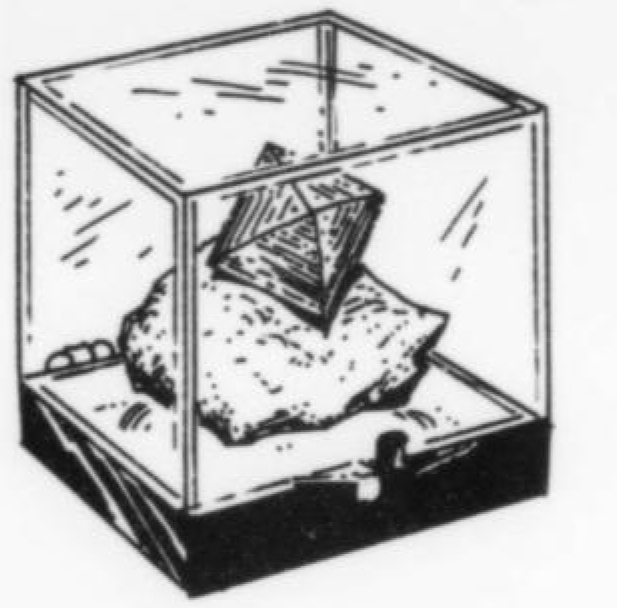
notes from the EDITOR



MINERAL CASES (VI)

One of the better-known makers of mineral cabinets these days is a company called *Vector* (64956 Lutz Road, Constantine, MI 49042). They have several different models having drawers of various depths, all constructed from aspen, a "soft hardwood." The drawers are fitted with white porcelain drawer-pulls, optional brass label holders, and optional felt drawer liners. Finishes (colors) available include golden oak, red oak and walnut. These are nice looking cabinets which can be made to stack. The ten-drawer unit (model 14-21-10) has drawers which are 1.6 inches deep inside and about 13 x 18 inches across; it stands about 2 feet tall. The six-drawer unit (model 19-26-6) has drawers 2.25 inches deep and about 22 x 26 inches. These are base-priced at $320 and $345 respectively. Bigger drawer sizes are available. And in the spring Vector will begin offering cabinets in various hardwoods such as oak and walnut. For a detailed brochure, list of models and price list call toll-free 1-800-366-2260.

A HISTORY QUESTION . . .

Here is a question for the more senior members of the mineral fraternity: When and how did the term "thumbnail" come into common use for specimens measuring about 1 x 1 inch?

The earliest reference to the "thumbnail" size that I can find is in Arthur L. Flagg's 1944 book *Rockhounds & Arizona Minerals.* Flagg refers casually to the collecting of "large showy specimens, 2 x 3 specimens, thumbnails and micro mounts." He does not bother to define what a thumbnail is, but its place in the size sequence and his statement that 300 of them can easily be stored in a 6 x 7 x 12-inch box confirm the approximate meaning.

Interestingly enough, the other size terms in common use today ("miniature" for under 2 x 2 and "cabinet specimen" for over that size) were not yet well established in the 1940's. "Cabinet size" meant roughly 2 x 2 or 2 x 3, but a "cabinet specimen" usually meant simply a display quality specimen of any size. The term "miniature" was not yet popular. Plastic "thumbnail boxes" were not marketed until the mid-1950's, by Althor Products (1 x 1) and by Willard Perkin ($1^1/_4$ x $1^1/_4$ "perky" boxes). The first regular columns in the hobby magazines did not begin appearing until 1964 ("Thumbnails" by John Reiner in *Rocks and Minerals*, and "One by one" by Eula Short in *Gems and Minerals*).

Thumbnail collecting in the 1940's was certainly the least expensive of specialties—with the exception of micromounting, the origin of which goes back at least to the 18th century. Legend has it that the formal collecting of thumbnails was begun by some Western mineral dealer whose customers wanted only full-size miniatures (near 2 x 2) or larger and would not pay for smaller specimens; collecting thumbnails from his own stock therefore cost him nothing because they had almost no dollar value.

We can at least be fairly sure that the thumbnail is an American innovation. Europeans have never collected them *per se*, although the meaning of the term is well known there. And, of course, only the British and their cultural descendants would use the "inch" anyway.

If you can add anything to this historical puzzle, please write down what you remember and send it in to the Editor, Mineralogical Record, 4631 Paseo Tubutama, Tucson, AZ 85750. Your memory of early events in our hobby is valuable!

CHECK OUT OUR NEW WEBSITE!

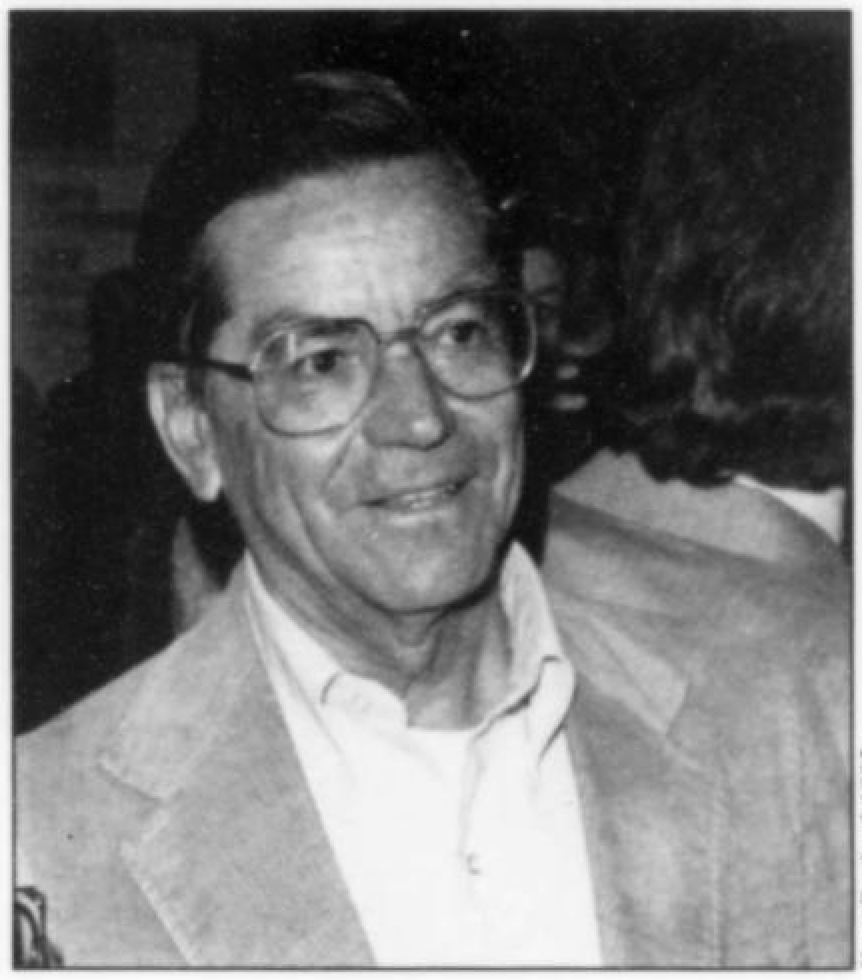
Yes, the Mineralogical Record now has its own website at **www.minrec.org**. You'll find quite a variety of features including full-color covers and tables of contents for every issue ever published, a sample article (the recent Red Cloud mine article—click on the specimen photos and blow them up to full-screen size!), a news page from the editor, and a screen for ordering back issues, books and subscriptions electronically. We'll be adding even more features as time goes by, so check in periodically and let us know what you think.

CALL FOR PAPERS

The 19th Mineralogical Symposium sponsored jointly by the Friends of Mineralogy, the Tucson Gem and Mineral Society, and the Mineralogical Society of America will be held in conjunction with the 44th Tucson Gem & Mineral Show, Saturday, February 14, 1998. The topic of the symposium will be **fluorite and other Alpine minerals**—the theme minerals for the show. Papers on descriptive mineralogy, paragenesis, classic and new locations, etc. are invited. An audience of knowledgeable amateurs as well as professional mineralogists and geologists is expected.

If you wish to present a paper, please write or call (**immedi-**

ately) Robert B. Cook, Symposium Co-chair (Department of Geology, 210 Petrie Hall, Auburn University, Auburn, Alabama 36849: (334) 844-4282: e-mail: cookrob@mail. Auburn.edu) or Beau Gordon, Symposium Co-chair (Jendon Minerals, P.O. Box 6214, Rome, Georgia 30162-6214: (706) 235-9121: e-mail: jendon6214@aol.com), with your topic, a few sentences describing the paper, and your address, phone number and e-mail. Presentations will be 15 or 20 minutes in length followed by a period for questions. Upon acceptance of topics all authors will be required to submit a 200-300 word abstract by September 15, 1997 (**firm date**). Those abstracts will be published in the January–February issue of the *Mineralogical Record* (subject to the approval of the editor), which will be available for sale at the 44th Tucson Gem and Mineral Show.



Miguel Romero
(1926–1997)

NOTICE

Died, Dr. Miguel Romero Sanchez, 72. The world lost a true gentleman and scholar when Dr. Miguel Romero Sanchez died on January 8, 1997 in Mexico City. Although Dr. Romero had been battling cancer for more than five years, he remained active in business and mineralogy to the end. Miguel built the world's finest collection of Mexican minerals and was dedicated to preserving and documenting Mexico's rich mineral heritage. He was extremely generous with his time and knowledge, and literally hundreds of collectors sought out Miguel at major shows and mineral symposia for advice and information. Miguel's charm and keen intellect will be sorely missed.

Miguel was born in 1926, into humble beginnings in the southern Mexican state of Oaxaca, where his family owned a sugar cane and corn farm. He was the youngest of ten children, and despite the fact that his father died when he was an infant, he worked hard to assure opportunities to excel. Miguel attended the Universidad Nacional Autonoma de Mexico (UNAM), the premiere educational university in the country. Although Miguel was pursuing a degree in chemistry, he received a job in the laboratory of Eduardo Schmitter. Schmitter was the leading Mexican mineralogist of his day, and he provided Miguel his first chance to work on the chemistry of minerals. Miguel later got a job in the Institute of Chemistry but remained life-long friends with Schmitter. Schmitter knew the Pedrazzini family, which had owned and operated the Las Chispas mine near Arizpe, Sonora. The family sent Schmitter a number of fine minerals in the early 1970's, and he passed these along to Miguel—these specimens include perhaps the world's finest acanthite.

After graduation, Miguel won a scholarship to attend Harvard, where he received M.S. and Ph.D. degrees in organic chemistry. When Miguel showed up in Cambridge, he could barely speak English, but as was typical of his style, he developed partnerships with other students—he helped them with their chemistry, and they helped him with his English! Miguel enjoyed visiting the Harvard Mineralogical Museum, and it was there that he was impressed by the variety and quality of the mineral kingdom.

After a postdoctoral fellowship at Imperial College in London, Miguel returned to Mexico. He taught at UNAM and accepted a position as Research Coordinator for Searle Labs in Mexico City. He later left Searle to work with his brothers and sisters in the poultry business. Miguel's outstanding chemistry background helped turn the business, Grupo Romero, into one of the most sophisticated companies in Mexico. Miguel built a world-class analytical laboratory, and his expertise in nutritional chemistry was continually in demand.

When Miguel returned to Mexico after his education abroad, he married a remarkable woman named Margarita Sobral. Mago, as she is known to her friends, is a noted "historical" architect. She has headed several restoration projects on churches and convents. She has also published on the geometry of pre-Columbian structures. Mago and Miguel had three children. The oldest, Miguel Jr., is a research chemist at the University of British Columbia. Luisa is a veterinarian, entrepreneur, and aerobatic pilot. Alejandro, the youngest, has a B.S. in chemistry and has followed in his father's footsteps as a director of Grupo Romero.

After Miguel began to work for the family business, he had opportunities to travel. One trip to Brazil was particularly auspicious: he bought a beautiful tourmaline, and the Romero Collection was started. In the early 1970's he began to focus his collecting on Mexico, and by the mid-1970's he was dedicated to the task of building a great Mexican collection. The collection eventually grew to nearly 10,000 specimens. These specimens were not only the beautiful display variety; Miguel was dedicated to documenting the richness of the Mexican mineral heritage as well. For example, there are more than 130 Mapami adamites in the Romero Collection! In an attempt to make his collection more accessible, he opened the Museo Mineralógico in Tehuacán, Puebla, the Romero home town. One of the real joys of Miguel's life was the fact that school children visited the Museum, and perhaps some were inspired to become new collectors! In 1992 the Carnegie Museum of Natural History awarded Miguel the Carnegie Mineralogical Award in recognition of his efforts to preserve Mexico's mineral heritage.

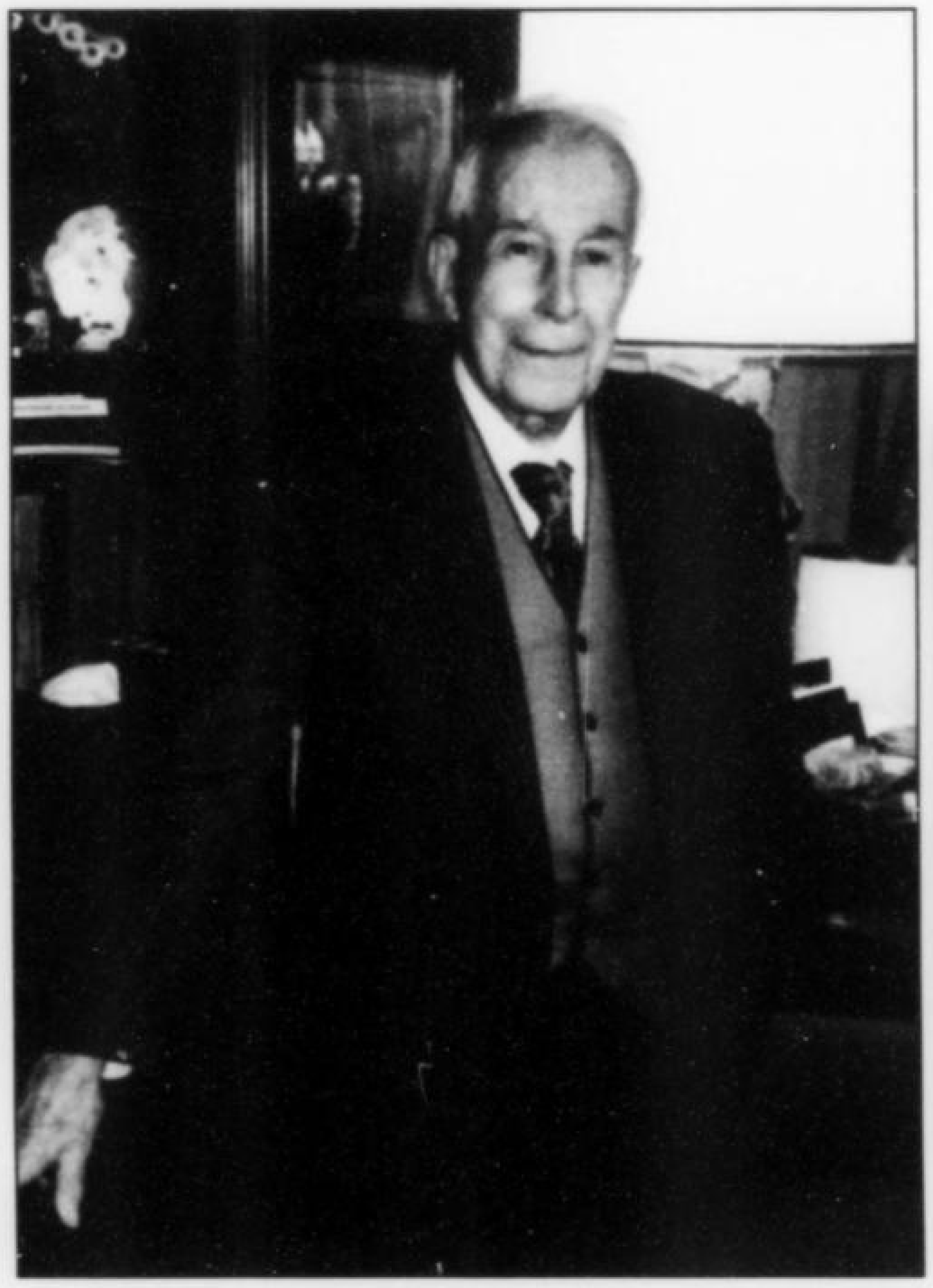
Miguel's standing in the community eventually led one of the major political parties to draft him to serve in the Congress as a federal deputy. Miguel professed to hate this job, but I believe he loved visiting his constituents in the state of Puebla. He had many fond memories of traveling on the backs of donkeys to isolated mountain communities. He later served in the Puebla legislature. The reason he loved visiting these remote places is the same reason he was a great collector: he loved Mexico.

Although it is nearly impossible to provide an appropriate tribute to such a fine gentleman, the Tucson Gem and Mineral Society has initiated two activities. The first is a trophy, "The Dr. Miguel Romero Trophy," which will be awarded annually to the finest Mexico mineral display at the Tucson Gem and Mineral Show. The second is a fund to purchase Mexican minerals to be added to the Romero Collection, now housed in the University of Arizona Mineral Museum. Those who wish to make contributions to the Romero Collection Fund should contact Peter Megaw, Tucson

Gem and Mineral Society, P.O. Box 42543, Tucson, Arizona 85733.

Terry C. Wallace

Died, Alexis Chermette, 94, of Lyon, France. Chermette, a popular French author on mineralogical subjects, was trained as a geological engineer specializing in mining geology. His first job took him to Madagascar, following which he accepted a position with the French National Geological Service in the former French West Africa, prospecting mainly for gold. He was a passionate collector of minerals; his personal research and his collection were directed particularly toward fluorite, and over the years he amassed a very important and remarkable collection of French and world-wide fluorite specimens. He was the author of approximately 110 publications, most notably a major work in 1985 entitled *The Fluorite*, a good synthesis of his life's work on that species, and a historical study of the Saxon mining engineer Schreiber, who had been engaged by French King Louis XVI to reorganize the Alpine silver mines. Chermette was an active member and frequent speaker in many natural history societies. In 1995 he exhibited some of his best specimens in the special fluorite exhibit at the Munich Show. His collection has since been bequeathed to the Natural History Museum of Lyon, France.



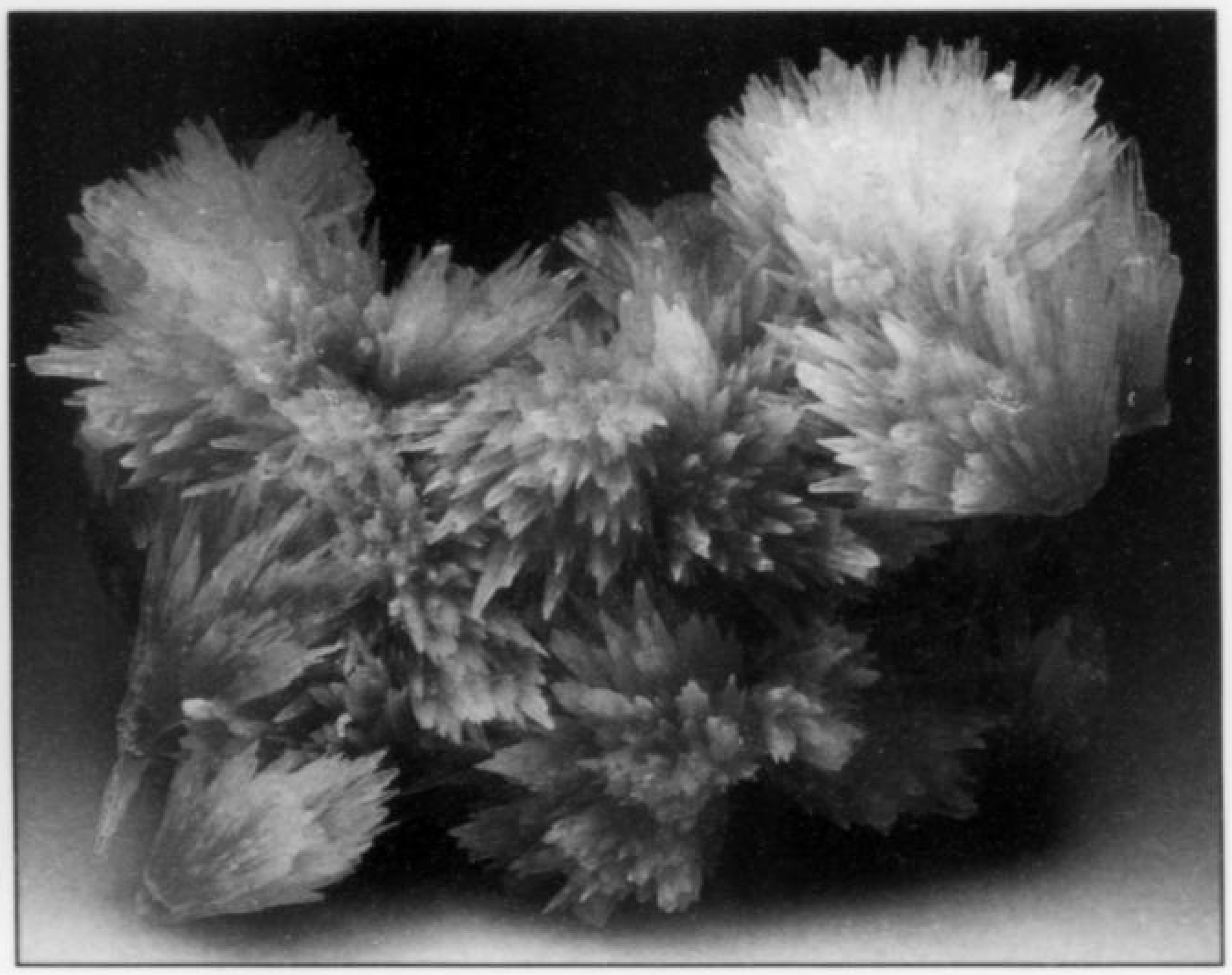
Alexis Chermette
(1902–1996)

Eric Asselborn

Died, Helen M. Rice, 83, of Hillsboro, Oregon. Helen Rice was a Past President of the American Federation of Mineralogical Societies, an avid collector, and a co-founder of the Rice Northwest Museum of Rocks and Minerals. She and her husband Richard began their collection in 1938 with a handful of Oregon beach agates. Shortly thereafter they joined the Oregon Agate and Mineral Society in Portland, Oregon. Helen took an active role in her society, and also served as National Federation of Mineralogical Societies Secretary and Convention Chairman, and American Federation of Mineralogical Societies Uniform Rules Chairman, Convention Chairman, and President. Helen and Richard also became charter members of the Tualatin Valley Gem Club and the Friends of Mineralogy.

Over the years they opened their collection display to many clubs, countless busloads of school children, numerous youth and senior groups, and many mineral study groups and mineralogy classes. Anyone with an interest in minerals and rocks was welcome. In 1996 they formally incorporated their collection as a non-profit museum, assuring that it will be open to all interested parties for years to comes. Helen is survived by her husband and three daughters, who will continue to operate and expand the Museum (located at 26385 NW Groveland Drive, Hillsboro, Oregon, 97124, tel. 503-647-2418).

Sharleen K. Harvey



HECK OF A STRONTIANITE

We are grateful to all of the collectors and curators who allowed their specimens to be photographed for the recent *Illinois-Kentucky Fluorite* issue. We neglected to mention in that issue that the owner of the beautiful strontianite shown on page 44 (Fig. 86) is Richard Heck, a well-known Ohio collector specializing in minerals from the American Midwest and from Mexico. Incidentally, Dick recently retired and relocated to that marvelous Mecca for mineral moguls . . . *Tucson!* Welcome to Paradise, Dick!

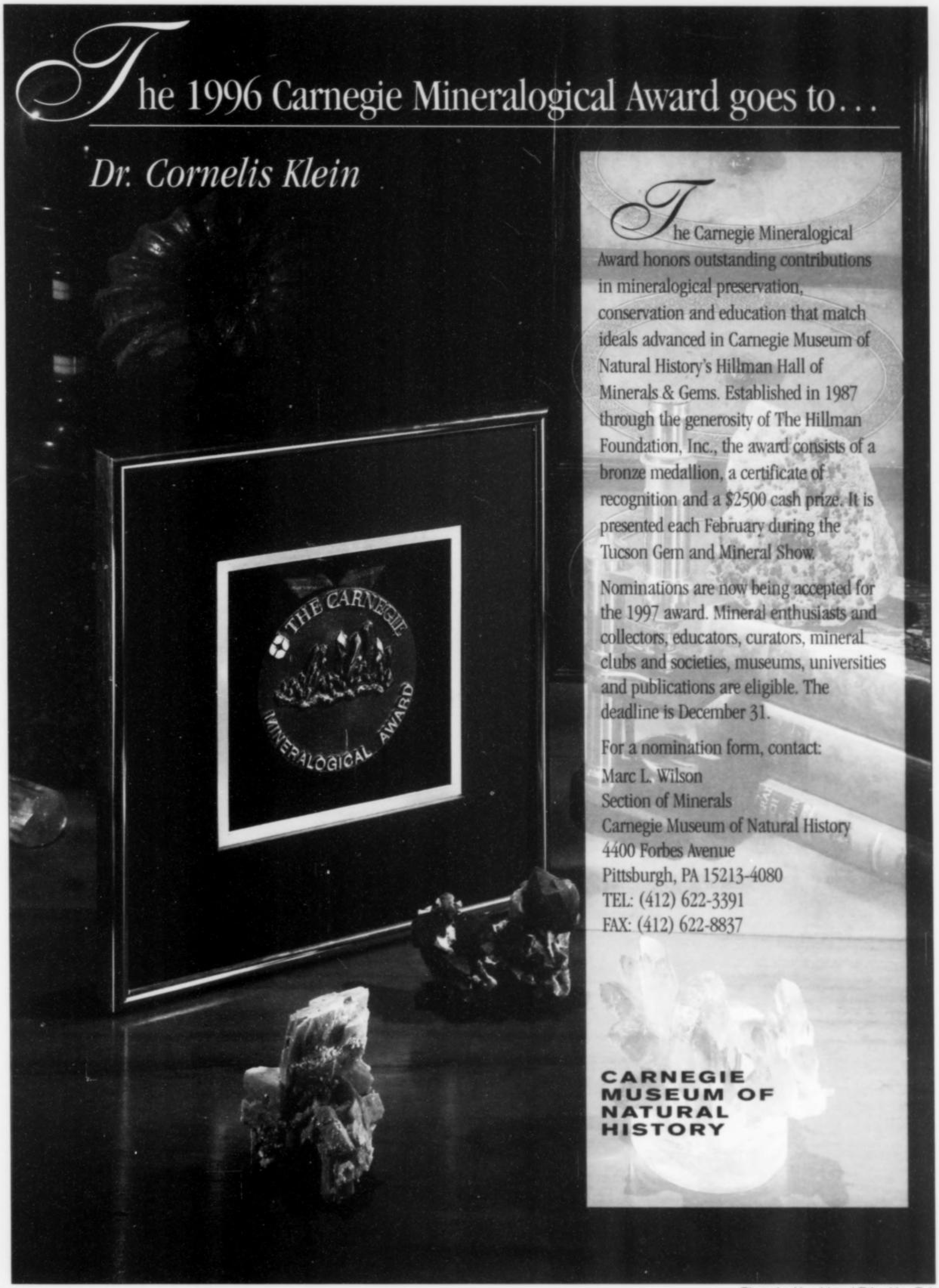


Photo by Harold and Erica Van Pelt

The Western Union Mine Cerbat Mountains Mohave County, Arizona

Mark Hay
4044 East Rancho Drive
Phoenix, Arizona 85718-1130

The Western Union mine is among Arizona's most important occurrences of display-quality vanadinite. The distinctive specimens were almost unknown to collectors until 1988, when several spectacular pockets were found there.

INTRODUCTION

It is always interesting to read early accounts describing vanadinite localities in Arizona. Often they remark on the noteworthy and unusual occurrence of such a rare mineral. However, as contemporary field collectors who have spent time poking around old Arizona localities generally agree, you can hardly turn around here without coming across another vanadinite dig. There must be hundreds! Admittedly, the vast majority of these occurrences are of no interest to the specimen collector. But diggers search them out anyway, hoping to find that rare deposit which will yield something more than just another backdrawer piece from an unusual location.

The Western Union mine is one such rare find. It is a tiny mine which never actually went into production; its workings are minuscule and its specimens were initially scarce. However, beginning with our very first visit there in 1988, I and two friends, Dick Morris and George Godas, collected a series of pockets from a small breccia zone that has yielded distinctive specimens of vanadinite which can stand shoulder-to-shoulder with the elite specimens from Arizona's better known mines such as the Old Yuma and Apache.

LOCATION

The Western Union mine lies in northwestern Arizona in Mohave County about 10 miles north of Kingman and 95 miles southeast of Las Vegas, Nevada. The mine is located high in the southern end of the Cerbat Mountains at an elevation of 4,960 feet, almost 2,000 feet higher than Kingman and the surrounding valleys. To the west lies the Sacramento Valley, which drains southwest to the Colorado River near Needles. To the east is the Hualapai Valley, which drains north into the Red Lake Playa.

The area lies on the eastern edge of the Mojave Desert and receives less than 25 cm of rain annually. Vegetation is sparse and typical of the high desert, with mainly cactus, sage, creosote, yucca and thinly scattered grasses. Juniper and piñon appear in the higher elevations.

The Western Union mine is identified by name on the *Stockton Hill* U.S.G.S. 7.5-minute quadrangle, in the southwest quarter of section 9, T22N, R17W. The mine can be reached from either the west or the east side of the range. However, due to private property restrictions on the east, the western route is preferable. Starting at Kingman, take US 93 north about 10 miles to the Cerbat historical roadside marker. Heading east from the marker a well-maintained dirt road leads to the old Cerbat townsite in the foothills of the Cerbat Range. Numerous unimproved roads lead from the old townsite to mines and prospects in the mountains. In many places these roads are almost impassable, and four-wheel drive is required. A system of trial and error will probably be needed to discover which ones will provide the closest access to the Western Union; the topographic map must serve as a guide. In all likelihood, a strenuous uphill hike of a half mile or more will be necessary to finally reach the mine.

HISTORY

The Western Union mine is near the old ghost town of Cerbat in the southern end of the Wallapai Mining District. The major mining centers of the district included Cerbat, Chloride and

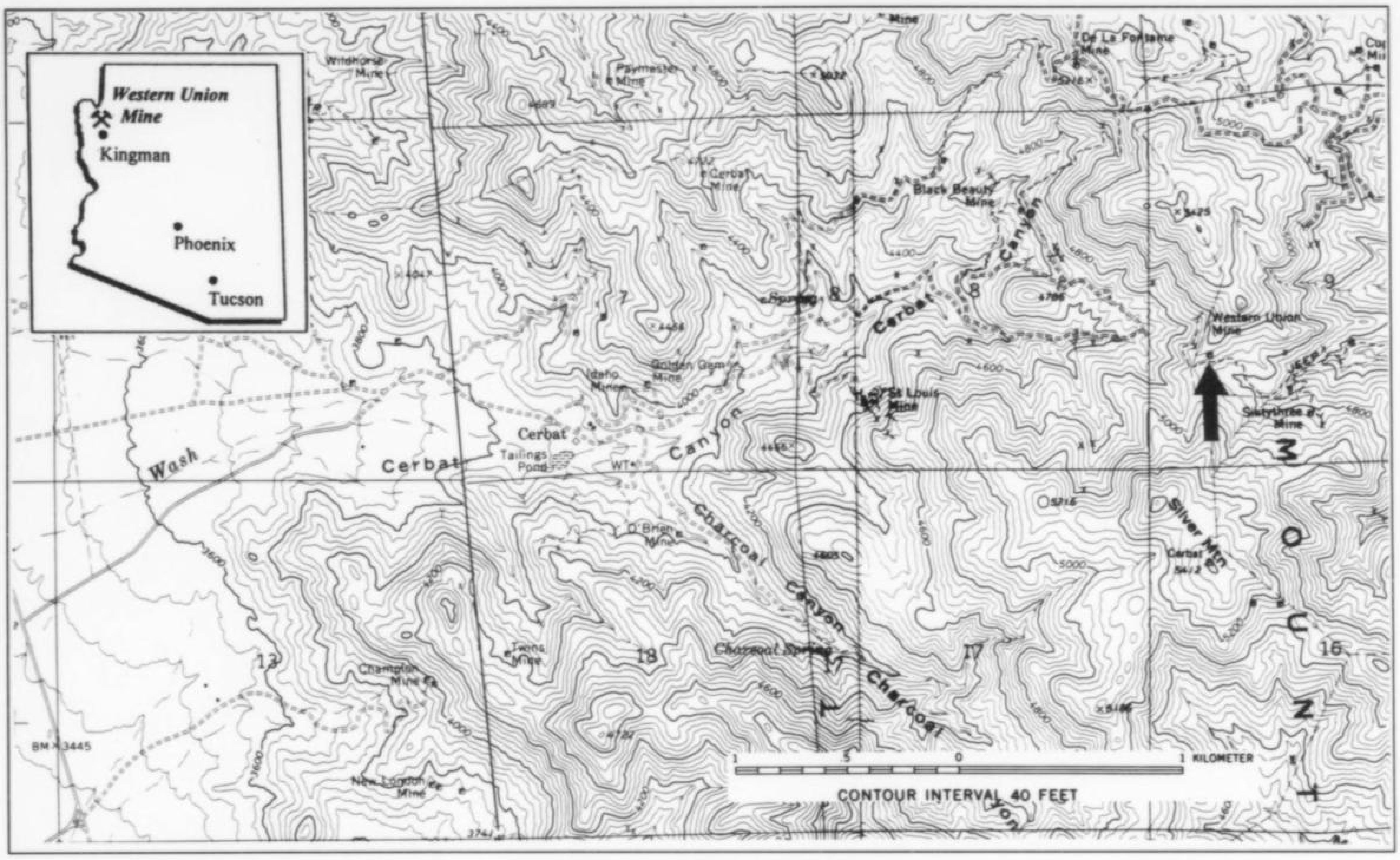


Figure 1. **Locality map.**

Figure 2. **View of the portal and small dump.**

Figure 3. **Entering the mine.**

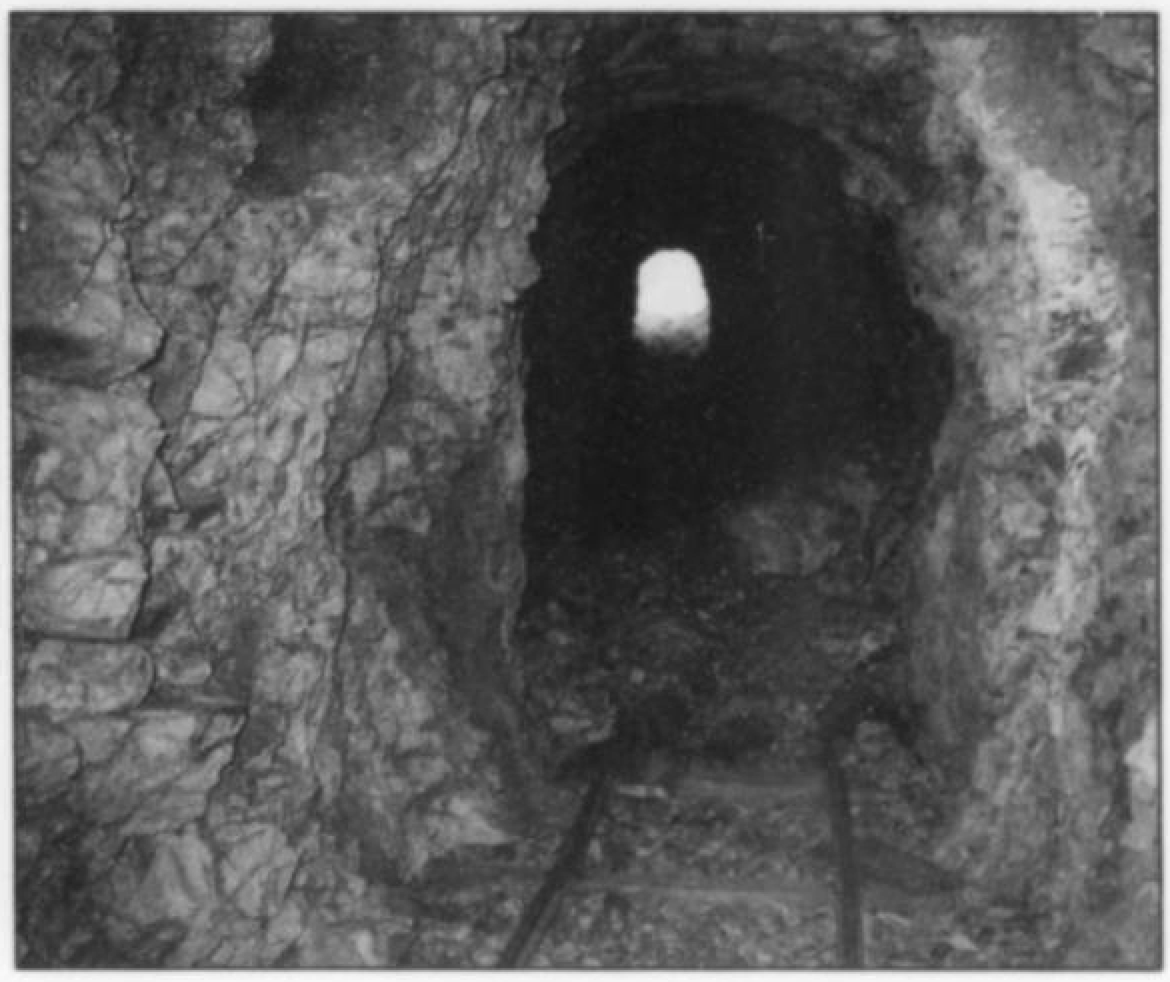


Figure 4. **The main adit.**

Mineral Park. While mining around Cerbat and Chloride took place primarily from 1863 to 1948, mining at Mineral Park continued intermittently through the early 1980's. Currently, mining is generally at a stand-still throughout the district.

The town of Cerbat played a lively role in the early history of the region. It was at its peak during the 1860's through the 1880's, even serving as county seat from 1871 to 1873. However, by the early 1900's it was slipping into decline and in June of 1912 its post office was closed. Today Cerbat is virtually gone, with little remaining to mark the original townsite. Mineral Park and Chloride still boast small communities of hardy souls who prefer the quiet life and rustic character of the old mining camps and high desert.

The history of the Western Union mine stands apart from the rest of Cerbat. While the town and its mines were fading by the first World War, interest in the Western Union deposit didn't stir for another 30 years. In 1940 the country was on the threshold of World War II and the search was on for domestic sources of strategic metals. Vanadium was one such metal, and many otherwise marginal properties were being investigated for their development potential.

In 1941, William Stapp and George Pemberton, both of Kingman, built a road up the east side of the Cerbat range from Stockton Hill to the Western Union prospect. Over the next year they drove a tunnel 43 meters into the mountain to explore the shear zones hosting the vanadium. Two mineralized shear zones were cut in the tunnel, one at 29 meters and the second at 40 meters from the portal. They sank a 12-meter-deep vertical winze (internal shaft) on the first one. The second they explored with short drifts driven each way along the structure, one 3 meters and one 5 meters. A total of 12 tons of ore were extracted to evaluate the potential of the property. The ore proved to contain 1.16 pounds of V_2O_5 per ton, but was deemed too low-grade to justify further development. No other ore was ever extracted and no further work was done.

COLLECTING

The earliest mention of the Western Union as a locality for collectable minerals is found in Arthur Flagg's *Mineralogical Journeys in Arizona* (1958). Flagg cited it as an occurrence of slender, pale brown crystals of "endlichite" (arsenian vanadinite); despite this publicity, he seems to have been the only person to visit

Figure 5. **The old windlass on the landing above the winze.**

Figure 6. **Descending the winze.**

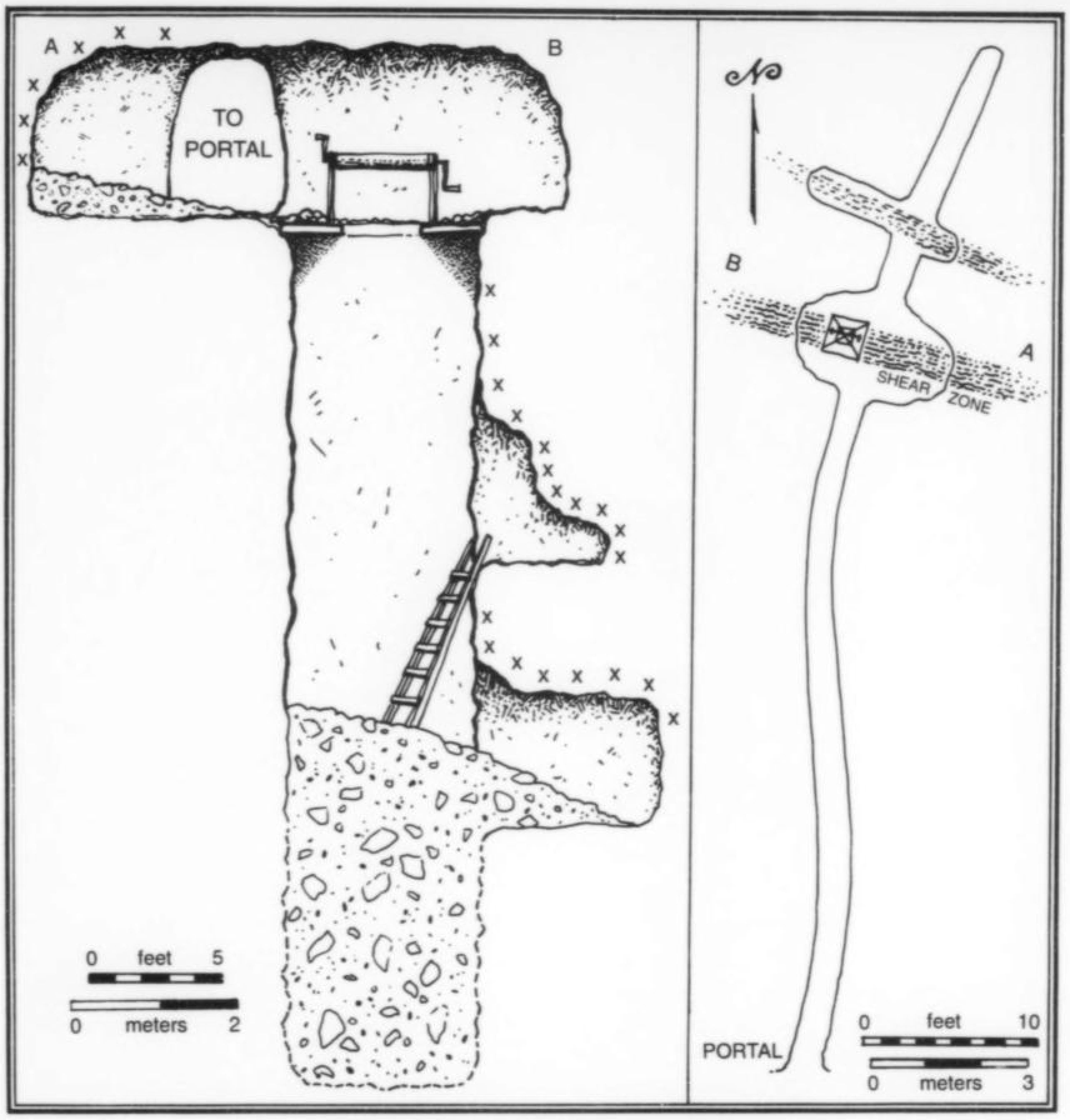


Figure 7. **Mine diagrams, section (left) and plan view (right). The X's indicate where the best vanadinite has been found in the west wall of the winze.**

the place for nearly 20 years thereafter, and even Flagg may not actually have gone underground there.

In 1974 the Western Union claim was held by the grandson-in law of George Pemberton, an old miner from Kingman named Jack Harrison. Learning about the occurrence from Pemberton, Harrison thought the mine might have some potential. Old-timers had told him that back in Pemberton's time vanadinite crystals had been found sticking up like fingers on the original outcrop. But he never attempted to work it for ore. When Harrison met Arizona field collector Andy Clark, he told him about the vanadinite at the Western Union and encouraged him to go up there and dig.

Clark, in the company of collecting partners Brad and Jeff Archer, took Harrison's advice. They visited the mine several times in 1975, taking out a total of four or five flats of specimens from the ceiling of the main adit above the windlass and from down in the winze. They gave several good specimens to Harrison, who later donated them to the Arizona State mineral collection in the Department of Mineral Resources in Phoenix. Brad Archer kept a good piece for himself, and then sold the rest from a motel room at the Desert Inn during the 1976 Tucson Gem and Mineral Show. As far as they know, no one else ever collected there before we became interested in the late 1980's.

Around 1982 Brad Archer sold his collection, including the Western Union vanadinite, to Les Presmyk in Gilbert, Arizona. That was when the material first caught our eye. The extant specimens were not especially exciting, but they were certainly scarce. They were all quite similar and distinctive, obviously from the same locality, and characterized by brown, blocky, hexagonal barrels to about 1 cm on a bleached-looking granitic matrix. To Arizona locality collectors they were unspectacular but intriguing nonetheless.

In December 1988, Dick Morris and I set out to find the Western Union and try our luck at digging some vanadinite. Our first effort to reach the mine took us up the eastern side of the Cerbats, using the USGS map as our guide. The road led us straight into the private drive of a residence that was particularly well-guarded by two large doberman pincers. The owner was not interested in our trek and left no misunderstanding that, although the road did indeed pass through his property, we would not be taking it. We had better luck on the western approach, and eventually reached a large flat area just below the mine that had apparently been leveled for a drilling pad. From there we were able to hike the remaining quarter-mile or so to the mine.

Except for a few bushes partially obscuring the entrance, the tunnel leading into the mine proved to be in excellent shape. Once inside we found the winze and other workings essentially as Stapp and Pemberton had left them in 1942. The winze is a raw or untimbered shaft extending about 10 meters straight down (see mine diagram), and there is a small tunnel at the bottom heading northwest. While the winze itself is untimbered, its top is completely squared off in 8x8-inch timbers with a wood floor and a wooden, hand-crank windlass. Everything is in excellent condition. As far as specimens were concerned, however, things were looking bleak at that point. Only traces of vanadinite were exposed on the walls and ceiling of the tunnels. Luckily we had done our homework before leaving Phoenix. In the Western Union mine file at the Arizona Department of Mineral Resources was a letter dated January 21, 1943 which stated "a winze was sunk 40 feet . . . following a veinlet of better grade vanadium." So we tied off a rope at the top and down we went.

Almost immediately we knew this was the place we were looking for. The rock was much more fractured than on the main level, and with just a cursory inspection, vanadinite crystals seemed to be everywhere. With only a few hours work we found many specimens with blocky vanadinite crystals to 1 cm. But how many such undistinguished brown vanadinites did we need? We could keep a couple, trade a couple, and maybe sell a few . . . in any case, we pretty much had a lifetime supply already. However, it was five hours back to Phoenix, so instead of rushing off we decided to poke around a little more. Looking back, that was one of those times in life when we definitely made the right choice.

Still down in the winze, we continued to check the walls, then moved into the short tunnel at the bottom. We noticed that the vanadinite in the ceiling of the tunnel and in the wall of the winze just above the tunnel had much better color and a more interesting habit. Rather than blocky, they were much more elongated and were gemmy at the tips. Also, the rock here seemed more highly fractured than the rock around it, always an important consideration when digging with hammer and chisel! We started working in the wall just above the tunnel and in 30 minutes had penetrated about 30 cm. The rock was fragmented and becoming extremely loose. Even better, the spaces *between* the rock fragments were getting larger and were totally packed with crystals forming a vanadinite hash. Our excitement was reaching a fever pitch; we just *knew* a pocket was coming!

Soon our biggest problem became controlling the loose material of the working face. It was beginning to just slough away, and had to be held back by hand. We were trying to check each rock for its specimen potential. Already we were finding pieces that far exceeded anything we had ever seen from the locality. Then, about another 30 cm in, the main pocket opened! It was flat-lying and a little over 35 cm across, about 15 cm high and 45 cm deep. It was not a pocket in the usual sense—there was no actual void. It was *totally filled* with intergrown masses of vanadinite, with loose pieces of rock breccia floating in a sea of crystals!

At this point it became a game of pick-up-sticks. It was so jumbled and confused that it was impossible to tell what was connected to what. Attempt to remove one piece, and a dozen others would either fall or shift precariously (we wish we had such problems on all our collecting trips!). After several hours we had filled about six flats with material. At the back of the pocket the rock again became tight, the vanadinite dwindled, and within a short distance it was over. In our flats we had some of the most incredible vanadinite specimens ever to come from Arizona. The best cabinet piece, now in the collection of the Arizona-Sonora Desert Museum in Tucson, has a subparallel growth of vanadinite crystals through the center which is almost 8 cm long.

From this first trip in 1988 through 1991, Dick, George Godas and I made many trips to the mine and on almost every trip some type of nice pocket was found in the same area. What had originally been a small orange-red spot on the wall was soon dug out to the size of a small car. Mention of the occurrence and our discoveries there, including a photo of a specimen, first appeared in the *Mineralogical Record* in Robinson and King (1990).

One of the best visits was in May of 1991, when George and I both hit nice pockets. (Dick made a regrettable decision not to go on that one.) George and I were working from the top of two ladders standing side-by-side, so close that we would occasionally bump or drop an errant rock on the other's foot (seemingly by accident, of course). I dug into a small flat-lying pocket about 20 or 25 cm across and 5 cm tall that yielded roughly a dozen exceedingly good miniatures and thumbnails. The crystals are a dark brick-red and up to 1.6 cm with unusual geometric forms and arranged in a separated fashion on the matrix. They range from simple barrels with pyramidal terminations to bizarre geometric growths. The best miniature has a large, wonderful crystal in the center with a pyramidal termination that ends in a reverse scepter.

While the pocket was being collected, a fine miniature was hanging inverted from the ceiling. The rock was solid with few apparent cracks. I didn't think there was much chance it would come out intact. However, in the unlikely event that it might drop while I labored to free it, I had removed one of my gloves and placed it on the bottom of the pocket, fingers curling upward. Experience has taught me that, when collecting, anything can happen and luck always plays a role. So it was on that day. With the first few whacks of my hammer something zipped through the air from the top of the pocket. I lifted the glove out, and there it sat, face up in the palm, as if I'd just plucked it from the ceiling and laid it there! George was horrified when I told him what had happened. He gives me grief about it to this day. The miniature is now in *his* collection; though I've tried to get it back many times, he says I can't be trusted with it.

About a meter above me and to my left, George was working a zone that was looking good. My pocket was finished and I was sitting on the floor taking a break. I knew he was getting into something because of the quantity of rock raining down all round me. Sure enough, within a few minutes he opened up what was probably the largest and best pocket we ever hit at the Western Union. This pocket was a vertical opening about 10 cm wide and 30 cm high, extending in for about 45 cm. Like the first pocket Dick and I had hit, it was totally filled with an intergrown mass of vanadinite crystals. I knew from past experience that in a minute there was going to be vanadinite lying everywhere, so I climbed my ladder and cleared off every flat spot I could find. It took about 3 hours for George to collect the pocket. Even with me wrapping furiously, he was forced to stop digging and help wrap many times because there just weren't enough places to put all the pieces he was taking out. In the end we probably got 150 good specimens consisting predominantly of single crystals or groups of crystals, almost none on matrix. But what was lacking in matrix was made up for in spectacular clusters. We had clusters as large as 13 cm across, with intergrown vanadinite crystals ranging from simple hexagonal barrels to large, composite crystal sheaves. Colors range from an earthy orange to a lustrous brick-red, often on the same piece. The largest crystals are subparallel composite growths to 4 or 5 cm long and 1 cm wide. The best cabinet specimen went to Les Presmyk. George and I kept many of the better pieces, though we did let Dick have an excellent small cabinet and miniature (in exchange for a hefty trade).

Jack Harrison had allowed his claim on the Western Union to lapse after five or six years. George Godas reclaimed the mine and is still owner of the claim.

GEOLOGY

The geology of the Cerbat Mountains and the Wallapai Mining District is extremely complex and beyond the scope of this work.

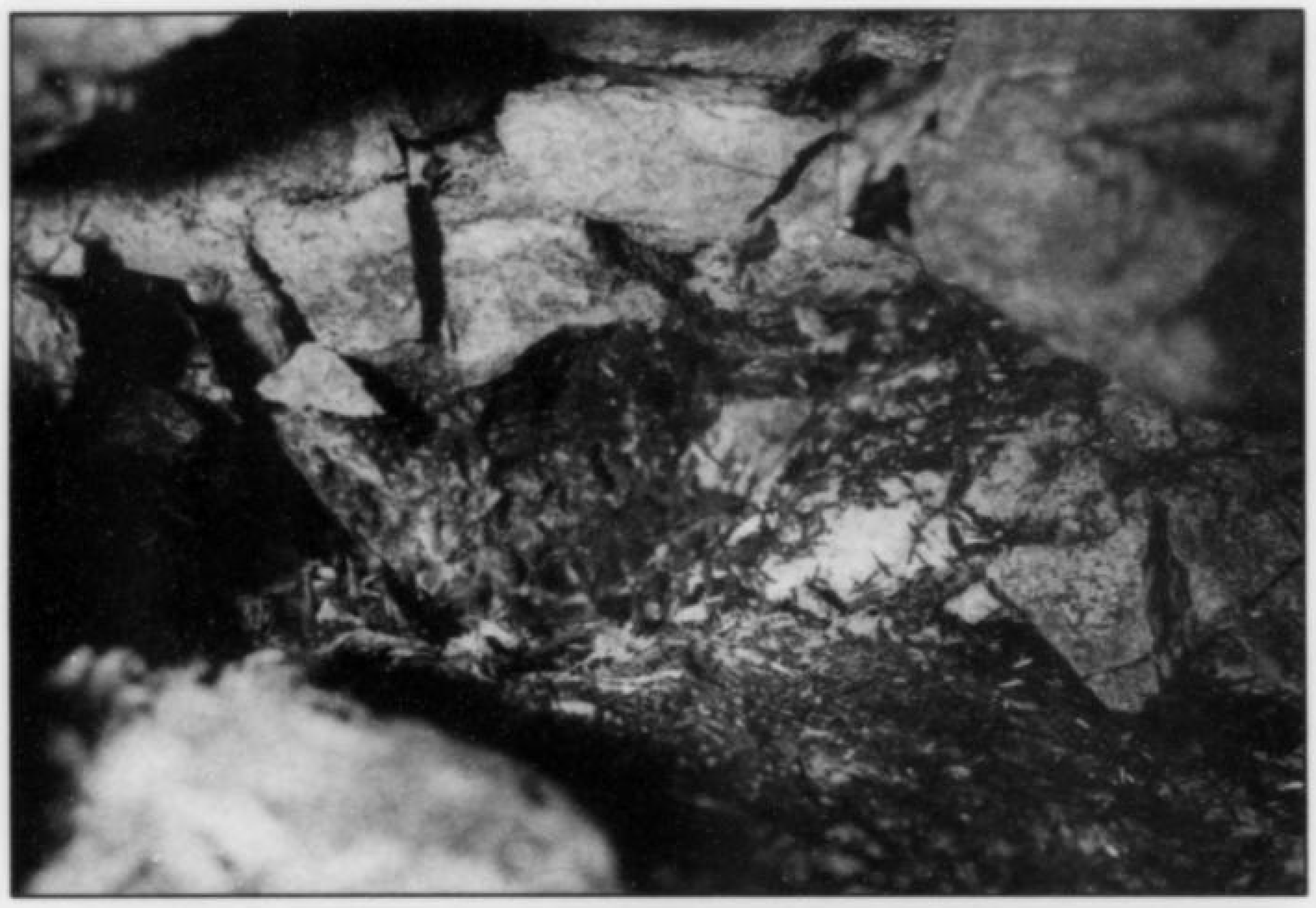


Figure 8. (left) **Brecciated rock and vanadinite in a pocket; the view is about 60 cm across.**

Figure 9. **Vanadinite crystals to 1.5 cm. Mark Hay collection.**

Figure 10. (above) **Vanadinite crystals to 2.9 cm. Morris and Hay collections.**

Figure 11. (right) **Vanadinite sheafs to 1 cm. George Godas collection.**

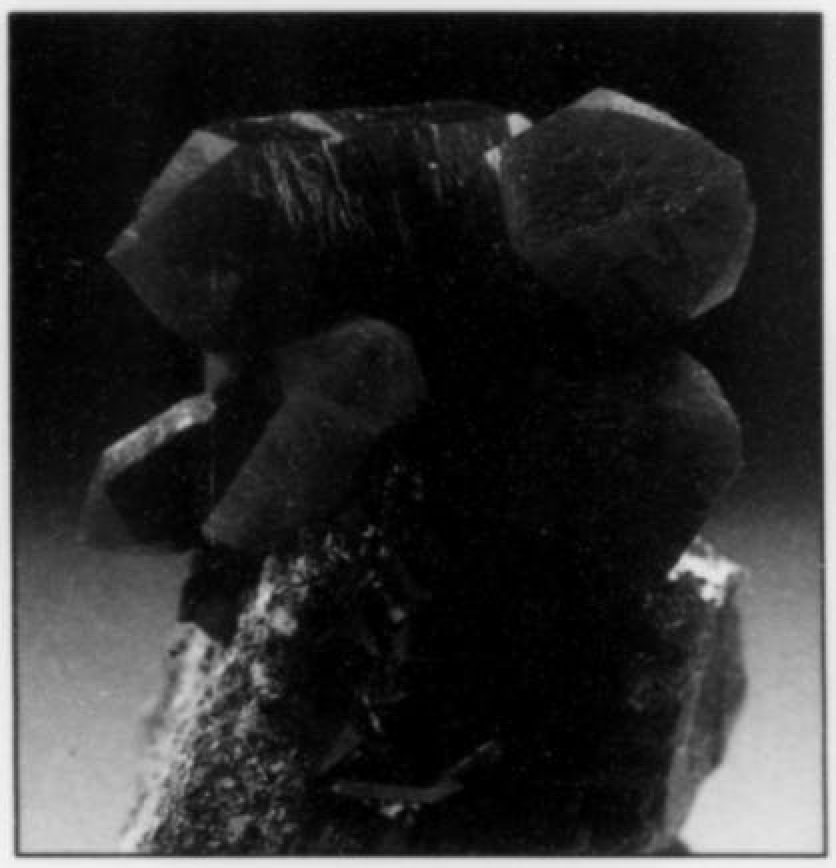


Figure 12. **Vanadinite crystal group, 1.5 cm across. Godas collection.**

Figure 13. **Vanadinite crystals to 1 cm. Dick Morris collection.**

Figure 14. **Vanadinite crystals to 1 cm, on matrix. George Godas collection.**

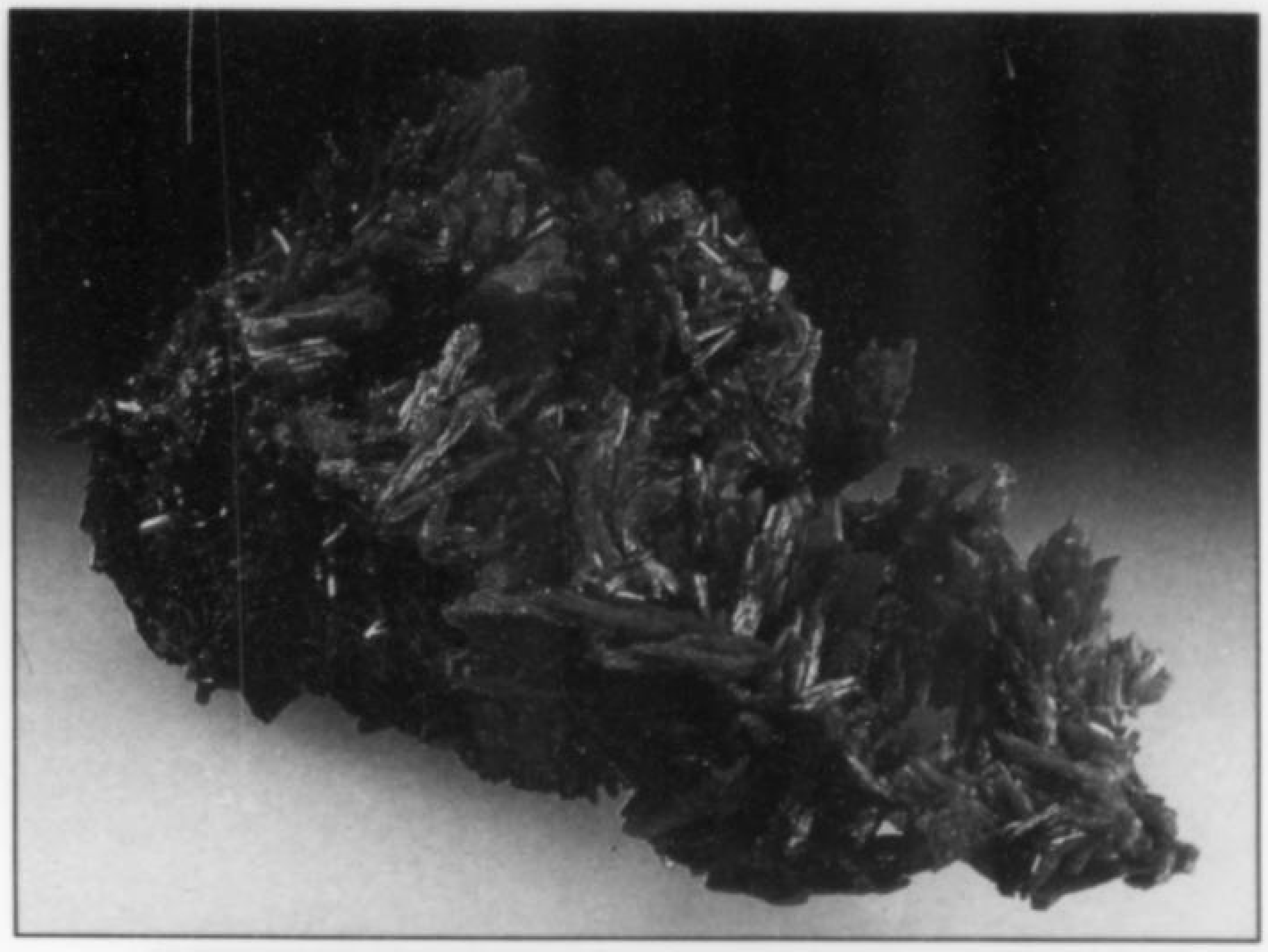


***Figure 15. (above right)* Vanadinite crystals on matrix, 10 cm. Dick Morris collection.**

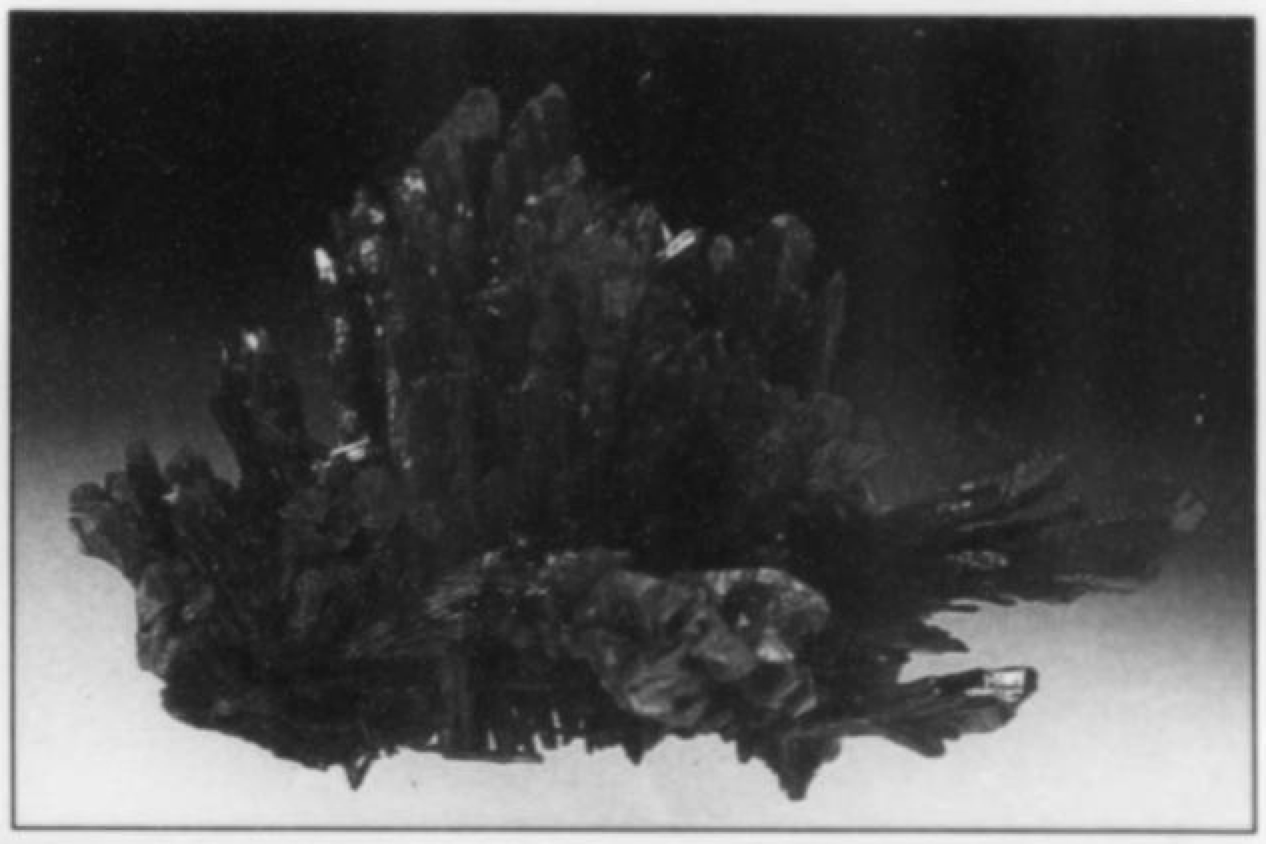


***Figure 16. (right)* Vanadinite crystal group, 4.2 cm. Mark Hay collection.**

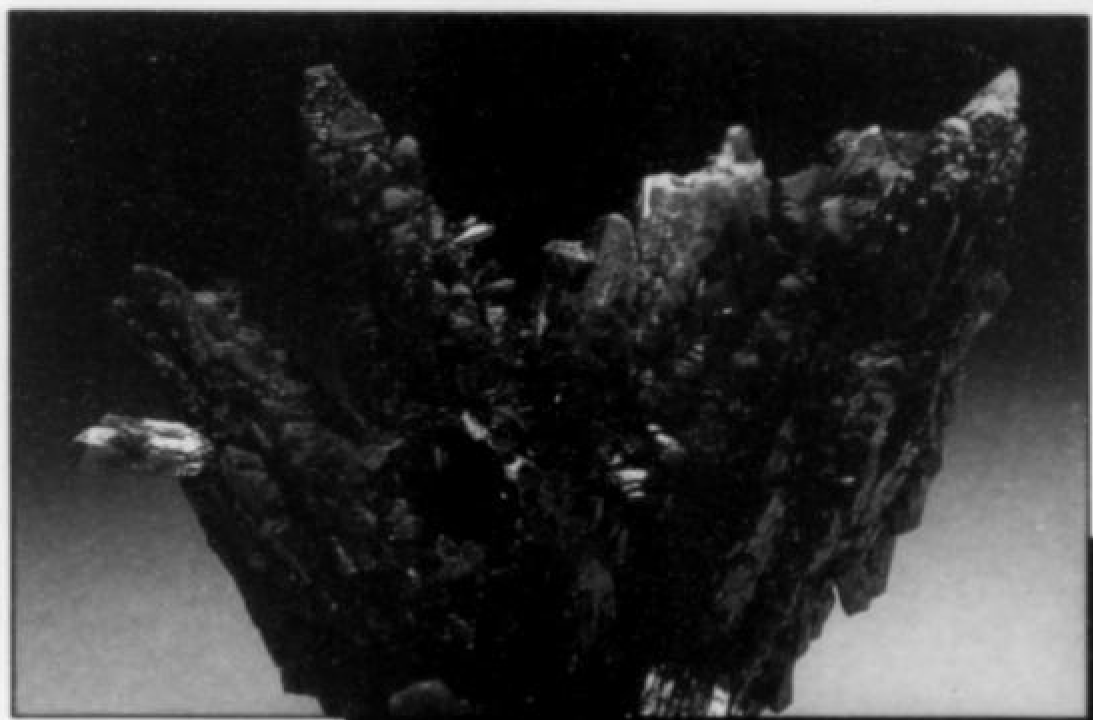


***Figure 17. (above)* Vanadinite crystal group, 3.7 cm. Mark Hay collection.**

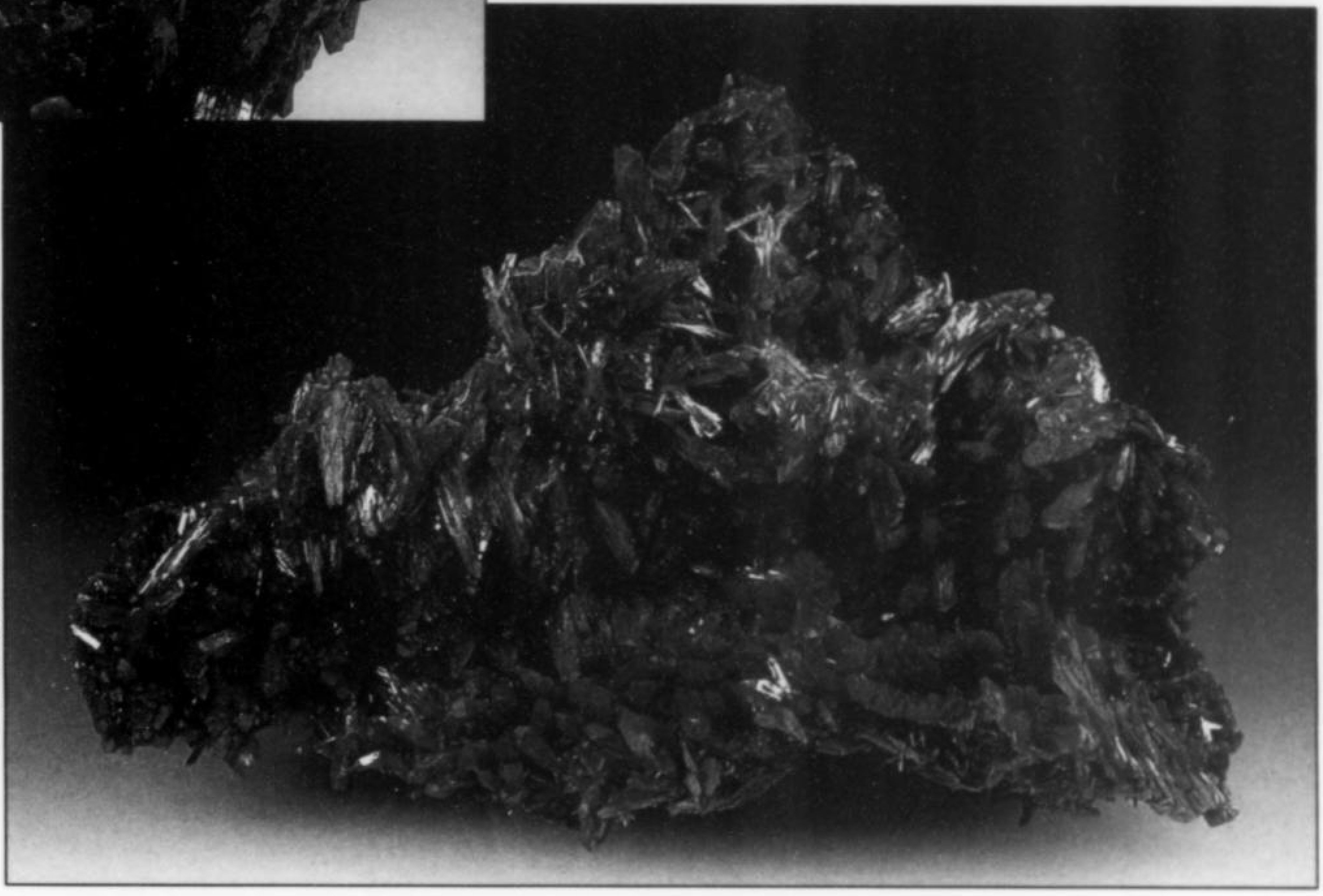


***Figure 18. (right)* Vanadinite crystal group, 7 cm. George Godas collection.**

However, for those wanting additional information, detailed discussions are contained in Schrader (1909), Thomas (1949), Dings (1951) and Wilkinson *et al.* (1982). In general, the area consists of a Precambrian complex of igneous and metamorphic rocks that has been intruded by Laramide-age porphyry and rhyolite. The metamorphic rocks show strong gneissic and schistose foliation which trends northeast. The entire area is cut by numerous high-angle faults that trend predominately northwest, roughly perpendicular to the schistosity. Many of the faults have been intruded by porphyry dikes presumably associated with the later granite. Most of the mines around Cerbat exploited high-grade base metal and precious metal deposits in fissure veins of the northwesterly trending fault system. The vanadinite in the Western Union mine occurs in a strongly sheared granitic porphyry; the general trend of the faulting is northwesterly, dipping near vertically.

VANADINITE

From the standpoint of the specimen collector, the primary mineral of interest at the Western Union mine is vanadinite ($Pb_5(VO_4)_3Cl$), occurring in a tremendous variety of colors and habits. Often different pockets located just a few feet from each other will contain crystals of totally different character.

The color of the crystals varies from brown to yellow-orange, bright fire-orange and deep brick-red. Different colors often occur on the same piece and sometimes on the same crystal. Luster varies from dull to resinous, though most crystals possess a moderate or greasy luster. Some of the small needle-like crystals from the first pocket in 1988 show a bright straw-yellow zone in the main portion of the prism and terminate in gemmy red tips. These are spectacular when viewed through a microscope or hand lens.

The crystal habit varies from simple hexagonal barrels to bizarre hoppered masses seemingly free of organized form. Between these extremes occur subparallel bundles of hoppered, skeletal crystals and sheaves of slightly divergent acicular crystals. Crystals tend to be strongly elongated along *c*, often possessing a length-to-width ratio of 10:1 or more. The simple hexagonal crystals tend to be less elongate, with a length-to-width ratio of about 3:1. The vast majority of crystals possess dipyramidal terminations; the *c* pinacoid is usually absent. The *c* face is generally only seen on the acicular sheaves and then only with the aid of a hand lens.

Vanadinite crystals from the mine occur both on and off matrix. This appears to be dependent on the ratio of vanadinite mass to pocket size. Pockets with a large amount of vanadinite tend to be packed so full of crystals that many "floaters" (unattached crystals) form toward the center of the pocket. Pockets with smaller amounts of vanadinite tend to yield specimens on matrix. One nice feature of the locality is that when matrix pieces are encountered the crystals tend to be extremely well attached. If a crystal attached to matrix is broken off, it usually means the crystal itself has broken rather than the attachment coming loose. This firm attachment to the matrix has yielded some truly stunning pieces where crystals on matrix rise from a very small point of attachment and flare to dramatic, elongated spears with pronounced beveling at the termination.

OTHER MINERALS

A small surface pit occurs on the Western Union claim about 45 meters up the slope from the main workings. The pit contains vanadinite, galena, and possibly mimetite and pyromorphite though none occur in specimen-quality pieces. Within the mine itself, however, vanadinite is virtually the only secondary mineral present.

CURRENT STATUS

The Western Union is under claim, and collecting without permission is strictly forbidden. Permission to collect there must first be obtained from the claim-holder, George Godas (6304 S. Clark Drive, Tempe, AZ 85283); George will not permit the use of power equipment or explosives unless he is on the site.

ACKNOWLEDGMENTS

I wish to thank my wife, Mary Ellen, Dr. Wendell Wilson and Dr. Steven Morehead for reviewing the manuscript and providing helpful criticism. I am particularly grateful to Jack Harrison, Andy Clark and Brad Archer for information on the early collecting history of the mine. I also wish to acknowledge the efforts of Nyal Niemuth, Diane Bain and Ken Phillips of the Arizona Department of Mineral Resources for their invaluable assistance researching mining properties. Finally, special thanks are due to Dick Morris and George Godas for helping me remember and record some of our more notable collecting experiences at the Western Union, and for friendship and camaraderie on many memorable trips into the Arizona desert.

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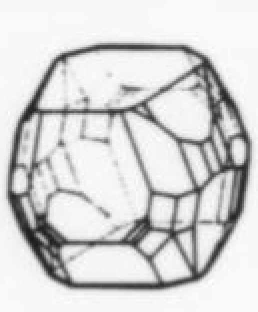

UTAHITE, A NEW MINERAL AND ASSOCIATED COPPER TELLURATES FROM THE CENTENNIAL EUREKA MINE, TINTIC DISTRICT, JUAB COUNTY, UTAH

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ABSTRACT

Utahite, idealized as $Cu_5Zn_3(Te^{6+}O_4)_4(OH)_8 \cdot 7H_2O$, is triclinic, space-group choices P1 *or* P$\bar{1}$, *with refined unit-cell parameters from powder data:* a = *8.794(4),* b = *9.996(2),* c = *5.660(2) Å,* α = *104.10(2)°,* β = *90.07(5)°,* γ = *96.34(3)°,* V = *479.4(3) Å³,* a:b:c = *0.8798:1:0.5662, Z = 1. The strongest five reflections in the X-ray powder pattern are* [dÅ(I)(hkl)]*: 9.638(100)(010); 8.736(50)(100); 4.841(100)(020); 2.747(60)(002); 2.600(45)($\bar{3}01$, $\bar{3}1\bar{1}$). The mineral is an extremely rare constituent on the dumps of the Centennial Eureka mine, Tintic district, Juab County, Utah, where it occurs both as isolated 0.6-mm clusters of tightly bound aggregates and as 0.2-mm sheaves. The former are found on drusy white quartz; the latter are on dark brown quartz. Associated minerals include cesbronite and two undefined Cu-Zn-Te-bearing secondary phases. Individual crystals of utahite are prismatic to thin tabular to blade-like, are subhedral to euhedral, and are elongate [001]. They are up to 0.3 mm in longest dimension, with a length-to-width ratio of approximately 20:1. Forms are {010} major and {001} minor. The mineral is transparent to translucent, pale blue to a deeper blue-green, with a pale blue streak and an uneven fracture. Utahite is vitreous, brittle and nonfluorescent; hardness (Mohs) 4–5; calculated density 5.33 g/cm³ (for empirical formula), 5.34 g/cm³ (for idealized formula). In polished section, utahite is slightly bireflectant and nonpleochroic. In reflected plane-polarized light in air it is very pale brown, with ubiquitous pale emerald-green internal reflections. The anisotropy is unknown because it is masked by the internal reflections. Averaged electron-microprobe analyses yielded CuO = 25.76, ZnO = 15.81, TeO_3 = 45.47, H_2O (by difference) [12.96], total = [100.00] weight %, corresponding to $Cu_{4.98}Zn_{2.99}(Te^{6+}O_4)_{3.98}(OH)_{7.98} \cdot 7.1H_2O$, based on O = 31. Both H_2O and (OH) were confirmed by infrared spectroscopy. The mineral name is for the state in which the Centennial Eureka mine is located.*

INTRODUCTION

Utahite, ideally $Cu_5Zn_3(Te^{6+}O_4)_4(OH)_8 \cdot 7H_2O$, is a newly recognized mineral species. It was first encountered during megascopic examination, scanning electron energy-dispersive study and routine X-ray powder diffraction characterization of a suite of secondary Cu-

Figure 1. **Isolated compact cluster of utahite crystals in parallel to subparallel growth, associated with green cesbronite. The magnification is 17.4x and the utahite cluster is 0.4 mm in longest dimension.**

and Te-bearing minerals. These minerals were originally collected by one of us (MCJ) in July 1992 from the mineralized dumps adjacent to the Centennial Eureka mine, Tintic district, Juab County, Utah. Utahite is the fifth of at least seven new secondary Cu- and Te-bearing phases from this locality to be characterized thus far.

The mineral name is for Utah, the state in which the Centennial Eureka mine is located; the mineral and mineral name have been approved by the Commission on New Minerals and Mineral Names, I.M.A. Cotype material (three specimens and one SEM stub) are housed in the Systematic Reference Series of the National Mineral Collection at the Geological Survey of Canada, Ottawa, under catalogue number 67415. The polished section used for both the electron-microprobe analyses and the attempted reflectance study is preserved at the Natural History Museum, Great Britain, as BM 1994, 99.

THE LOCALITY

The Centennial Eureka mine is located at latitude 39°56′38″ N, longitude 112°07′18″ W, in the Tintic mining district about 1 mile southwest of the town of Eureka, which is situated about 70 miles south of Salt Lake City in Juab County, Utah. The main shaft and dumps are in the NW¼ of Section 24, R3W, T10S, on the *Eureka, Utah* 7.5-minute quadrangle. The large and magnificent headframe, over 70 feet tall, was constructed from timbers reportedly imported from Norway.

The Centennial Eureka mine (originally known as the Blue Rock mine, probably because of the abundant copper minerals) was opened in 1876 and operated for over 50 years, until its closure in 1927. According to the Centurion Mines Corporation, the present lease-holder on the mine, it yielded a total of over 656,000 ounces of gold, 23.9 million ounces of silver, and 79.5 million pounds of copper, making it second in production among the district's mines (after the Chief Consolidated).

The large ore pipes in the mine are considered massive replacement deposits, and have been mined to a depth of 2,200 feet. The extensive workings cover 20 levels and consist of at least 20 miles of drifts, cross-cuts, raises and shafts. Some of the huge stopes are 125 feet wide and over 1,000 feet long. Ore still exists below the deep water table (about 2,000 feet below the surface), mining having ceased at an economic cut-off.

Most of the microminerals currently known from the mine were collected from the dumps, and precise original locations underground are unknown.

ASSOCIATED MINERALS

Utahite has been identified on five specimens collected from the dumps. The immense dumps of the mine were largely removed and processed for their low-grade concentrations of gold in late 1991. At this time, a wide variety of mineralized specimens were exposed, including several boulders which contain the new Cu- and Te-bearing assemblages. Additional information regarding the geology, mineralogy and history of the Centennial Eureka mine and surrounding environs can be found in Marty *et al.* (1993) and in Roberts *et al.* (1994).

Utahite was observed in two of these boulders and must be considered extremely rare; only about 10 µgm of the mineral is presently known. On the holotype material, the mineral occurs both as isolated clusters to 0.6 mm of tightly bound parallel to subparallel aggregates of numerous single crystals (Fig. 1), and as numerous 0.2-mm isolated and grouped sheaves in small vugs of crumbly, drusy white to colorless and dark brown quartz. These sheaves are, in turn, composed of numerous individual crystals that are in parallel growth (Fig. 2). Some of these sheaves

Figure 2. **Scanning electron photomicrograph of sheaves of utahite.**

are also found as bowtie-like divergent arrangements. Associated minerals are leaf-green crystals of cesbronite, UK-4 (Marty *et al.*, 1993) in spherules and botryoidal crusts, and an undefined Cu-Zn-Te-bearing pale green botryoidal crust. Additional Cu- and Te-bearing secondary minerals that have been identified by X-ray powder-diffraction methods on similar specimens include mcalpineite (Roberts *et al.*, 1994), frankhawthorneite (Roberts *et al.*, 1995; Grice and Roberts, 1995), jensenite (Roberts *et al.*, 1996a; Grice *et al.*, 1996), leisingite (Roberts *et al.*, 1996b), xocomecatlite, dugganite, quetzalcoatlite and one additional Cu-Te-As-bearing phase which is currently under investigation. A listing of many primary and secondary minerals identified at the Centennial Eureka mine has been published by Marty *et al.* (1993). The copper minerals are listed here in Table 1. Utahite is a secondary mineral that formed from the breakdown of primary Cu-, Zn- and Te-bearing sulfides.

***Table 1.* Copper-bearing minerals identified from the Centennial Eureka mine.**

Copper-Tellurates	
Cesbronite	$Cu_5^{2+}(Te^{4+}O_3)_2(OH)_6\cdot 2H_2O$
Dugganite	$Pb_3(Zn,Cu^{2+})_3(Te^{6+}O_6)(AsO_4)(OH)_3$
Frankhawthorneite	$Cu_2Te^{6+}O_4(OH)_2$
Jensenite	$Cu_3Te^{6+}O_6\cdot 2H_2O$
Leisingite	$Cu(Mg,Cu,Fe,Zn)_2Te^{6+}O_6\cdot 6H_2O$
Mcalpineite	$Cu_3^{2+}Te^{6+}O_6\cdot H_2O$
Quetzalcoatlite	$Zn_8Cu_4^{2+}(Te^{4+}O_3)_3(OH)_{18}$
Utahite	$Cu_5Zn_3(Te^{6+}O_4)_4(OH)_8\cdot 7H_2O$
Xocomecatlite	$Cu_3^{2+}Te^{6+}O_4(OH)_4$
UK-4 (Marty *et al.*, 1993)	$(Cu,Zn)(TeO)(AsO_4)Cl\cdot xH_2O$
Unnamed	Cu-Te-As
Unnamed	Cu-Te-Zn
Other Copper Minerals	
Antlerite	$Cu_3(SO_4)$
Aurichalcite	$(Zn,Cu)_5(CO_3)_2(OH)_6$
Azurite	$Cu_3(CO_3)_2(OH)_2$
Brochantite	$Cu_4(SO_4)(OH)_6$
Chalcocite	Cu_2S
Chalcopyrite	$CuFeS_2$
Chenevixite	$Cu_2^{2+}Fe_2^{3+}(AsO_4)_2(OH)_4\cdot H_2O$
Chrysocolla	$(Cu,Al)_2H_2Si_2O_5(OH)_4\cdot nH_2O$
Clinoclase	$Cu_3(AsO_4)(OH)_3$
Conichalcite	$CaCu^{2+}(AsO_4)(OH)$
Connellite	$Cu_{19}Cl_4(SO_4)(OH)_{32}\cdot 3H_2O$
Copper	Cu
Cornubite	$Cu_5(AsO_4)_2(OH)_4$
Cornwallite	$Cu_5(AsO_4)_2(OH)_4\cdot H_2O$
Covellite	CuS
Cuprite	Cu_2O
Duftite	$PbCu(AsO_4)(OH)$
Enargite	Cu_3AsS_4
Gartrellite	$Pb(Cu^{2+},Fe^{2+})_2(AsO_4,SO_4)_2(CO_3,H_2O)_{0.7}$
Jalpaite	Ag_3CuS_2
Malachite	$Cu_2(CO_3)(OH)_2$
Mixite	$BiCu_6(AsO_4)_3(OH)_6\cdot 3H_2O$
Olivenite	$Cu_2(AsO_4)(OH)$
Philipsburgite	$(Cu,Zn)_6(AsO_4,PO_4)_2(OH)_6\cdot H_2O$
Polybasite	$(Ag,Cu)_{16}Sb_2S_{11}$
Posnjakite	$Cu_4(SO_4)(OH)_6\cdot H_2O$
Rosasite	$(Cu,Zn)_2(CO_3)(OH)_2$
Strashimirite	$Cu_8(AsO_4)_4(OH)_4\cdot 5H_2O$
Tenorite	CuO
Tetrahedrite	$(Cu,Fe)_{12}(Sb,As)_4S_{13}$
Tyrolite	$CaCu_5(AsO_4)_2(CO_3)(OH)_4\cdot 6H_2O$
Zeunerite	$Cu(UO_2)_2(AsO_4)_2\cdot 10\text{–}16H_2O$

PHYSICAL PROPERTIES

Individual crystals are prismatic (in tightly bound aggregates) to thin tabular to blade-like (in sheaves), elongate [001], subhedral to euhedral, up to 0.3 mm in longest dimension (average about 0.2 mm), and have a length-to-width ratio of approximately 20:1. SEM study of several clusters of sheaves show that individual crystals average 0.5 x 15 x 75 microns in size. No obvious forms were observed megascopically; SEM photomicrographs of bladed crystals in sheaves show major {010} and minor {001}.

Single crystals are pale blue while clusters tend to be a deeper blue-green color. The streak is pale blue. Twinning was not observed megascopically, nor was it found in X-ray single-crystal studies. The mineral possesses a vitreous to pearly luster, is translucent, brittle, and is nonfluorescent under both longwave and shortwave ultraviolet light. The fracture appears to be uneven for single crystals; clusters tend to fracture parallel to the elongation of individuals. The Mohs hardness is estimated to be 4 to 5. Neither cleavage nor parting was observed megascopically. The density could not be measured owing to the small size of available specimens and the dearth of material.

X-RAY DIFFRACTION

Precession single-crystal studies, employing Zr-filtered Mo radiation, show that utahite is triclinic with space-group choices

***Table 2.* X-ray powder diffraction data for utahite.**

*I*est.	dÅ(meas.)	dÅ(calc.)	*hkl*	*I*est.	dÅ(meas.)	dÅ(calc.)	*hkl*
100	9.638	9.631	010	5	2.272	2.277	$\bar{3}21$
50	8.736	8.737	100			2.276	$13\bar{2}$
40	6.862	6.873	$\bar{1}10$	3	2.241	2.239	$\bar{3}3\bar{1}$
40	6.172	6.132	110	3	2.206	2.212	$\bar{2}12$
30	5.488	5.487	001	* 40	2.165	2.166	022
100	4.841	4.816	020	5	2.116	2.109	212
20	4.380	4.368	200	* 20	2.081	2.080	410
40	4.152	4.161	$\bar{2}10$	* 10	2.048	2.050	$23\bar{2}$
20	3.995	4.002	$\bar{1}11$	1	2.006	2.008	$\bar{3}31$
* 40	3.822	3.818	210	* 25	1.969	1.970	$\bar{3}4\bar{1}$
10	3.203	3.211	030	10	1.927	1.928	$\bar{1}50$
		3.197	$\bar{2}11$			1.926	050
* 40	3.129	3.131	$\bar{1}30$	5	1.887	1.884	$15\bar{1}$
* 10	3.030	3.035	$\bar{1}3\bar{1}$	5	1.870	1.863	$\bar{1}32$
5	2.978	2.968	211	3	1.840	1.842	$\bar{2}50$
30	2.912	2.912	300	20	1.787	1.792	$\bar{1}5\bar{2}$
		2.908	130			1.781	$34\bar{1}$
* 20	2.827	2.828	$01\bar{2}$	* 5	1.755	1.755	$\bar{3}41$
* 60	2.747	2.744	002	20	1.720	1.722	$\bar{3}5\bar{1}$
* 30	2.681	2.684	$02\bar{2}$			1.717	430
45	2.600	2.604	$\bar{3}01$	5b	1.672	1.670	203
		2.598	$\bar{3}1\bar{1}$			1.669	232
*10b	2.520	2.523	$31\bar{1}$	* 15	1.623	1.623	042
* 40	2.478	2.477	$\bar{3}2\bar{1}$	* 10	1.605	1.605	060
* 20	2.409	2.408	040	* 30	1.586	1.587	341
* 20	2.348	2.347	$\bar{1}3\bar{2}$	* 30	1.563	1.563	$06\bar{2}$
* 25	2.307	2.304	$32\bar{1}$				

* = reflections used for unit-cell refinement
— 114.6 mm Debye-Scherrer powder camera
— Cu radiation, Ni filter ($\lambda CuK\alpha$ = 1.54178 Å)
— intensities estimated visually; b = broad line
— not corrected for shrinkage and no internal standard
— indexed with a = 8.794, b = 9.996, c = 5.660 Å,
α = 104.10°, β = 90.07°, γ = 96.34°

$P1$ or $P\bar{1}$ (diffraction aspect P^*). The refined unit-cell parameters: a = 8.794(4), b = 9.996(2), c = 5.660(2) Å, α = 104.10(2)°, β = 90.07(5)°, γ = 96.34(3)°, V = 479.4(3) Å^3, $a:b:c$ = 0.8798:1:0.5662 are based on 20 powder reflections representing d-values between 3.822 and 1.563 Å for which unambiguous indexing was possible, based on visual inspection of precession single-crystal films.

The powder data (Table 2) are unique and bear no resemblance to any other inorganic phase listed in the Powder Diffraction File. Other Cu-Zn-Te oxide-hydrates known to occur in nature are quetzalcoatlite and tlalocite. As mentioned earlier, the former is also found at the Centennial Eureka occurrence.

The crystal used for the aforementioned precession single-crystal study was also used in an attempt to do crystal-structure analysis. Unfortunately, the crystal proved too small to yield any meaningful statistics, even after prolonged exposure to the X-ray beam (L. A. Groat, personal communication, 1995). No larger single crystals are currently available for structure analysis.

CHEMISTRY

Utahite was analyzed chemically by means of a Cameca SX-50 electron microprobe, using a 20-kV operating voltage, a 20-nA beam current, a 10-second count rate, and a 5-micron beam diameter. The standards employed were synthetic Cu metal (for Cu), synthetic Zn metal (for Zn) and synthetic Te metal (for Te). A wavelength-dispersive microprobe scan indicated the absence of any elements with atomic number greater than 9 except those reported here. The paucity of pure material prevented the quantitative determination of water. However, its presence as both molecular H_2O and (OH) was confirmed by infrared spectroscopic analysis; H_2O was therefore calculated by difference. The valence state of tellurium was assumed to be Te^{6+}; no secondary Te-bearing mineral from this occurrence has been shown by crystal-structure analysis to possess Te^{4+} in its structure. Crystal-structure analysis of cesbronite from this locality indicates a probable revision of its chemical formula, symmetry and cell parameters will be required (T. S. Ercit, personal communication, 1995). These results indicate that cesbronite is most likely a tellurate.

The average result of six analyses gave CuO = 25.76 (range 24.21–26.51), ZnO = 15.81 (range 14.78–16.92), TeO_3 = 45.47 (range 44.16–46.42), H_2O (by difference) = [12.96], total = [100.00] weight %. The empirical formula, on the basis of O = 31, is $Cu_{4.98}Zn_{2.99}(Te^{6+}O_4)_{3.98}(OH)_{7.98}\cdot7.1H_2O$. The ideal formula, $Cu_5Zn_3(Te^{6+}O_4)_4(OH)_8\cdot7H_2O$, requires CuO = 25.78, ZnO = 15.83, TeO_3 = 45.54, H_2O = 12.85, total = 100.00 weight %. The density, calculated for the empirical formula with Z = 1, is 5.33 g/cm^3 and the calculated density for the idealized formula is 5.34 g/cm^3. Utahite is the third reported Cu-Zn-Te-bearing oxide hydrate, after quetzalcoatlite and tlalocite.

INFRARED-ABSORPTION STUDY

The equipment and procedures for acquiring the infrared-absorption spectrum for utahite are identical to those used to obtain the spectrum for mcalpineite (Roberts *et al.*, 1994) and need not be repeated here. The spectrum (Fig. 3) clearly shows absorption bands for both (OH) and H_2O. A very strong, broad absorption, which peaks at 3090 cm^{-1} with shoulders at about 3550, 3090 and 2925 cm^{-1}, is due to O-H stretching in both the (OH) groups and the H_2O molecules. A peak of medium intensity at 1645 cm^{-1} is due to H-O-H bending in the H_2O molecules.

OPTICAL PROPERTIES

A single grain of utahite, prismatic in habit and 70 by 220 microns in plane section, was polished with difficulty. Though prismatic, it appears that individual layers run diagonally across the length of the prism. In plane-polarized reflected light (in air) it is a very pale brown except where pale green internal reflections appear. The mineral is slightly bireflectant and nonpleochroic. Between crossed polarizers, it is clearly translucent and, in oil, its pale greenish brown surface color is obscured by pale emerald-green internal reflections. It does not extinguish, and rotation tints are imperceptible. The anisotropy is unknown; it is masked by the internal reflections.

The largest polished area sufficiently free from scratches for reflectance measurement was about 20 microns in diameter. However, part of this area contained internal reflections, and thus the reflectance spectra and refractive indices calculated from them must be considered as little more than approximate. These internal reflections contribute an unwanted component of diffuse reflectance to the spectral reflectance. In air, this would have a significant effect on the reflectance and on the refractive indices derived from them; in oil, this effect would be greater still. Measurements were made relative to a silicon carbide reflectance standard (Zeiss

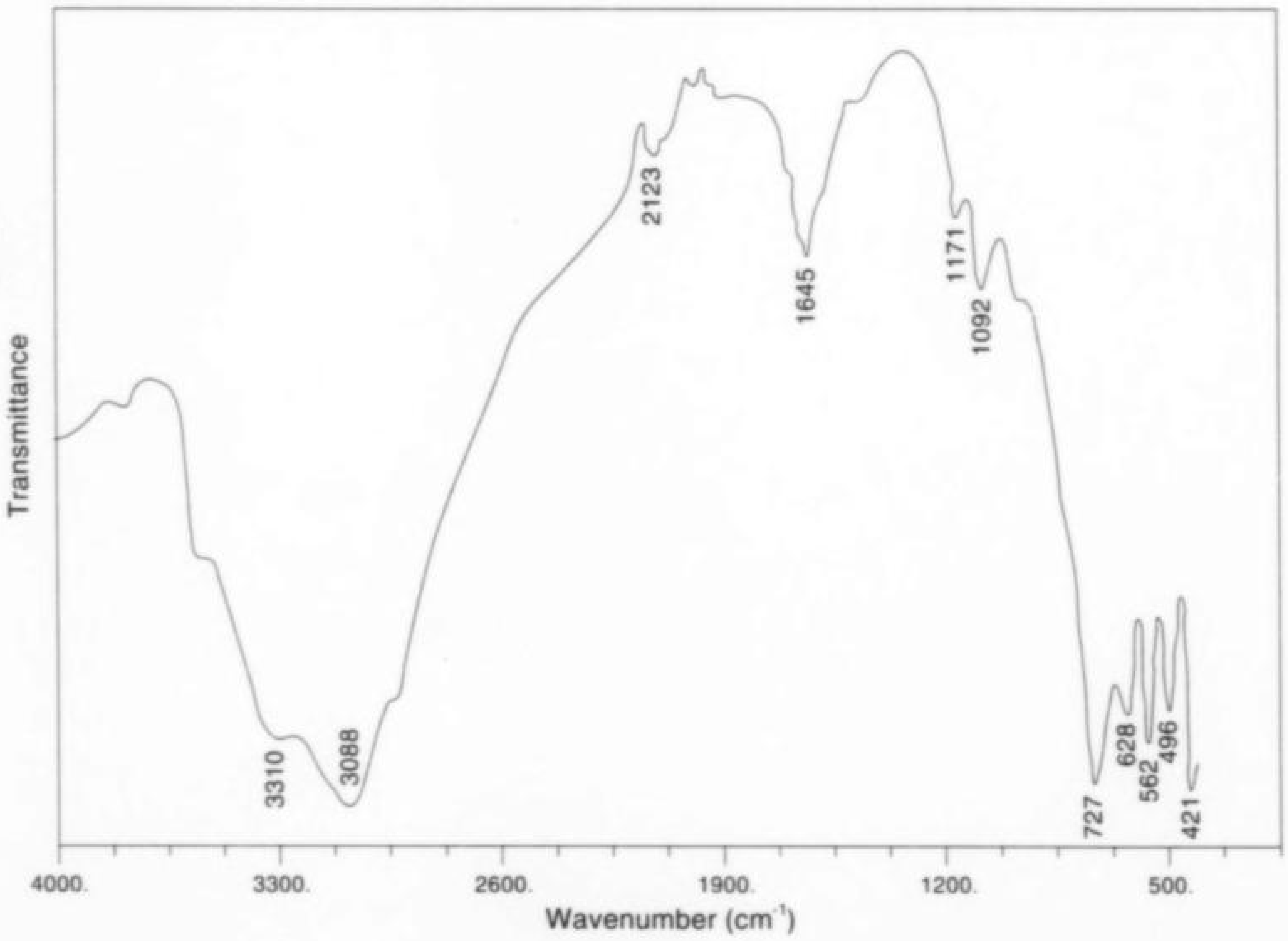

***Figure 3.* Infrared-absorption spectrum for utahite.**

no. 472) and a secondary standard of cubic zirconia (polished and calibrated at the NHM) using a Zeiss microscope-spectrophotometer MPM 800. They have not been reported, since we feel, for the reasons noted above, they serve no useful purpose. Because the mineral did not extinguish, and because of the very low light levels reflected from its surface, measurements were made across and along the prism axis. The precision of the measured reflectances was reasonable: the refractive indices calculated relative to SiC at 590 nm were 1.84–1.90 and those relative to cubic zirconia were 1.83–1.88.

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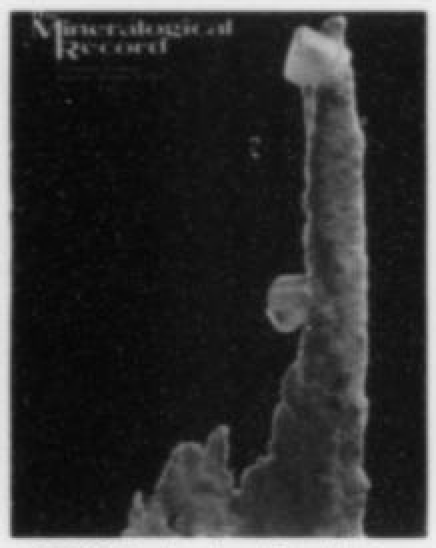

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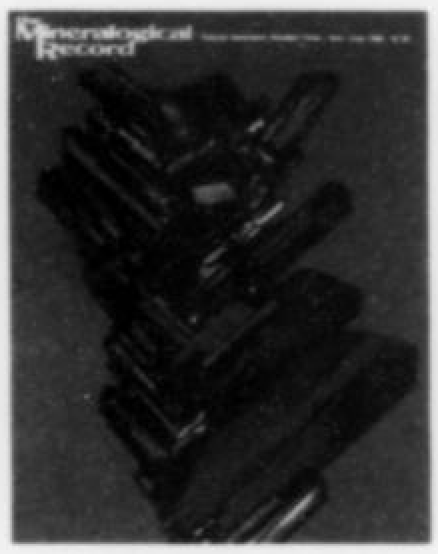

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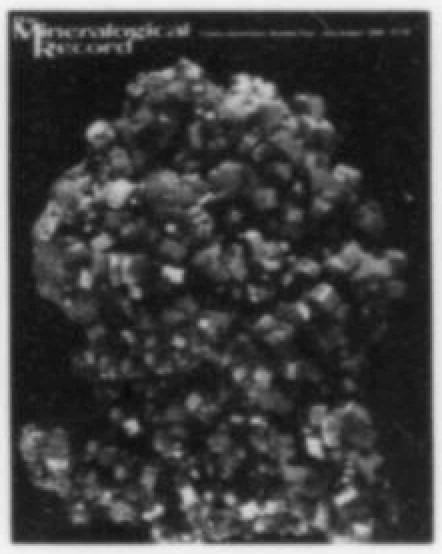

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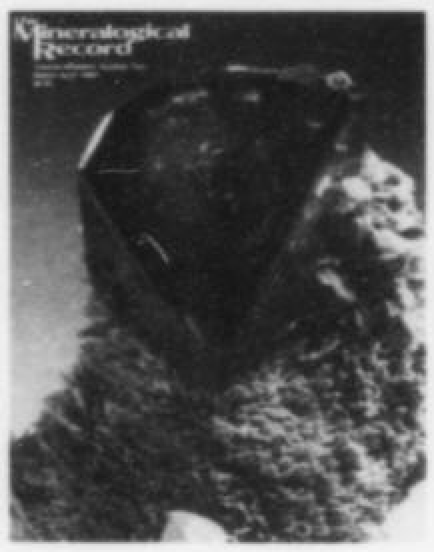

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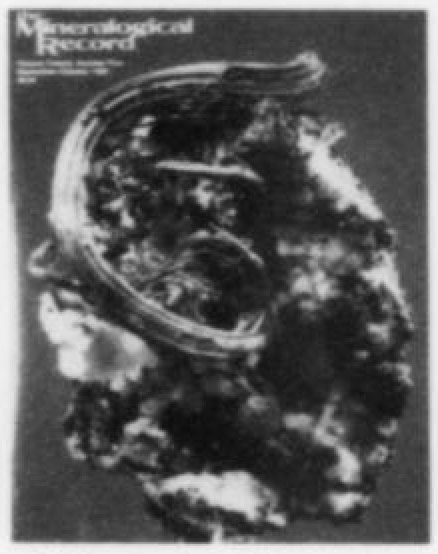

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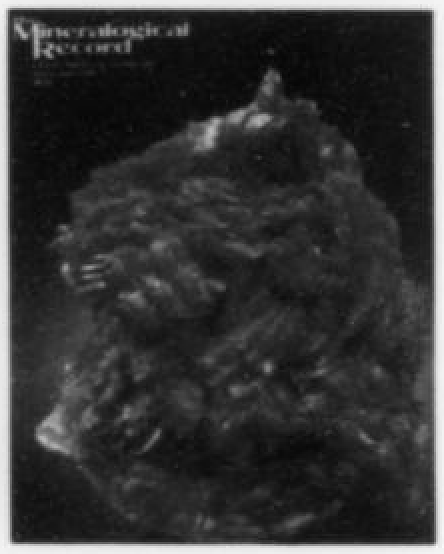

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A Guide to the Mineral Localities of the Northern Areas, Pakistan

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*The past decade has seen a plethora of new mineral discoveries in northern Pakistan. Unfortunately, the specimens found do not always reach the market accompanied by enough information to allow assignment to their proper localities. This article provides a guide to correct labeling.**

POLITICAL GEOGRAPHY

The Islamic Republic of Pakistan is divided into four autonomous provinces, plus a number of areas administered directly by the central government. The four provinces, Sindh, Punjab, Balochistan (sometimes: Baluchistan), and North West Frontier Province (NWFP), contain the bulk of the land and most of the people of Pakistan. The Provinces have significant self-government powers, so that Pakistan may be considered a federal republic. The provinces are divided into "divisions," which are further subdivided into "districts," and finally into "tahsils" (roughly, subdistricts).

The remainder of Pakistan is divided into approximately 11 regions or tribal areas, plus the Islamabad Capital Territory. The central government has remanded considerable autonomy to some of the local tribal units, but Islamabad retains the final authority. The subjects of this article are the mineral localities of one such region, officially known as Northern Areas; though written as plural, the usage is singular. This is not to imply that minerals occur nowhere else in Pakistan, but only that the famous pegmatitic and metamorphic minerals found recently have been largely confined to Northern Areas. (Notable exceptions are the pink-red topaz locality in the Mardan district, North West Frontier Province, and the Shamuzi emerald deposit, 12 km from Mingora, Swat Valley, NWFP). We have also included the Kaghan Valley, NWFP, with the

*For information on geology and descriptive mineralogy see the excellent review by Kazmi *et al.* (1985).

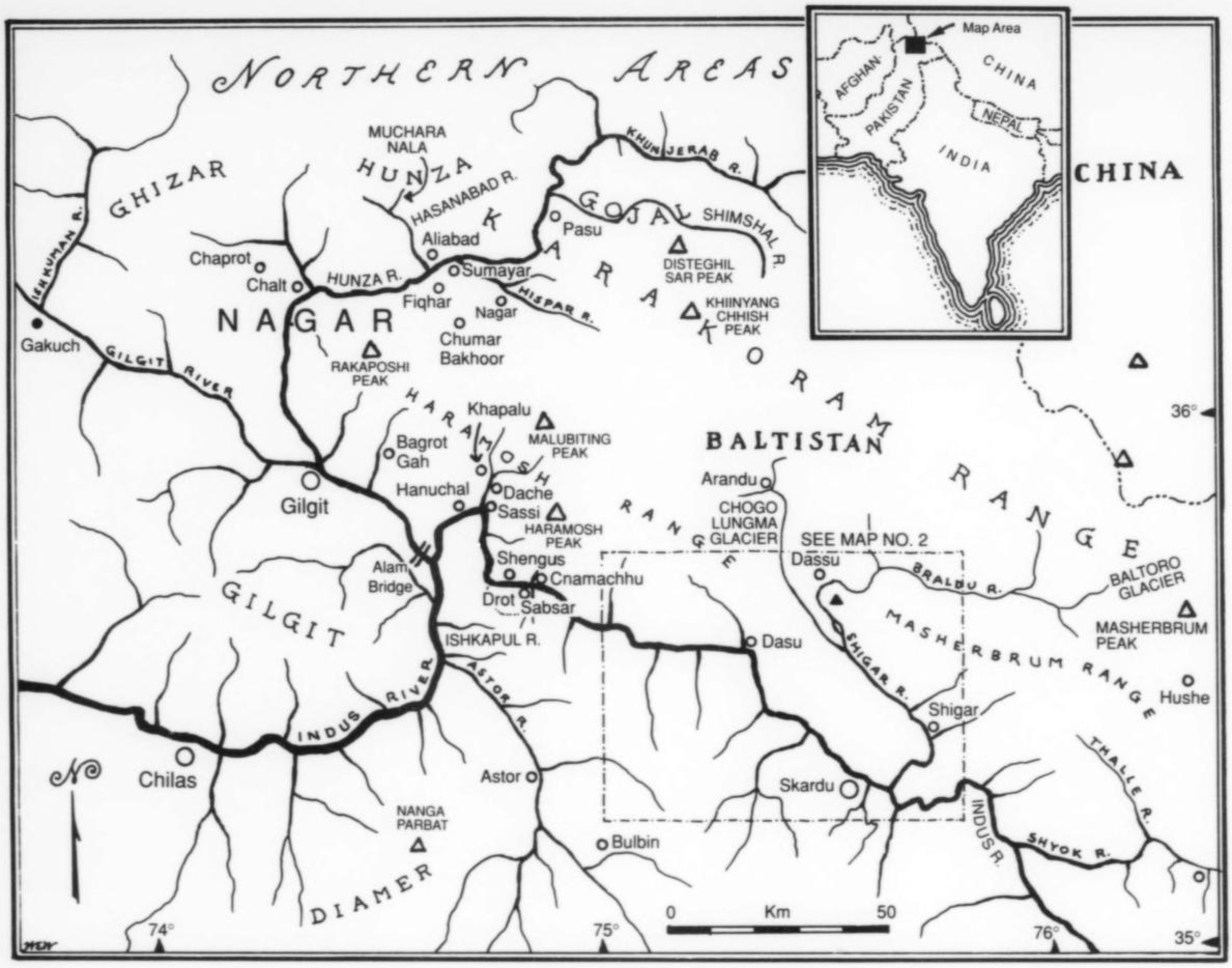

Figure 1. **Location map.**

nearby peridot locality, Sapat, because of its proximity to Northern Areas.

Most of Northern Areas and much of the adjacent regions are part of the former princely state of Jammu and Kashmir (one unit); the Prince and his dynasty were Hindu, but the great majority of his subjects were Muslim. When the Viceroyalty of India received independence from Great Britain in 1947, the princely houses were allowed to elect whether to join India or Pakistan; after some procrastination the ruler of Jammu and Kashmir opted for India, a decision from which innumerable troubles flowed. Fighting immediately ensued; mutual exhaustion led in 1949 to a United Nations–brokered truce, which established an entirely arbitrary "line of control" dividing Jammu and Kashmir between India and Pakistan. This "line of control" or "line of demarcation" remains as the de facto boundary today, despite much internal unrest, "terrorism," and three periods of outright war. From 1961 to 1974 Pakistan banned all foreigners from the Baltoro region. In the Vale of Kashmir (under Indian control), there has been heavy fighting recently between Indian forces and the Muslim irredentists; Western tourists have been kidnaped and, in at least one instance, murdered, and as of this writing one American is currently a prisoner. Since the closest mineral locality on the accompanying map (Khapalu) is only about 40 km by air from the line of control, it behooves Western travelers to be aware of its location and **stay away.** This is not to imply that the line of control is an agreed upon, permanent international boundary; both nations regard it only as a temporary expedient, subject to later negotiations. The boundary of the Northern Areas with China is also subject to revision. Formal permits are required to travel in most areas within 48 km of the line of control, and within a similar distance of the borders with China and Afghanistan.

Northern Areas is bordered on the south by Azad ("Free") Kashmir, under Pakistani control, and Kashmir, Zanskar, and Ladakh, all three under Indian control. China borders Northern Areas on the east and northeast, with Afghanistan forming the northern border. Northern Areas is bounded on the northwest by Chitral (a district of the North West Frontier Province), with the western boundary separating Northern Areas from Swat Kohistan and Indus Kohistan. On the southwest lies the Kaghan Valley, also part of the NWFP.

Northern Areas is divided into five administrative districts: Baltistan (administered from Skardu), Gilgit (Gilgit), Ghanche (Khapalu), Ghizar (Gakuch), and Diamer (Chilas). There are further local or tribal subdivisions, some formally acknowledged, and others not. A famous one is Hunza, a part of the Gilgit district, but there are many others such as Astor, Shigar, and Nagar; where we have this information, we will provide it. There are also obsolescent political titles from bygone days such as "Wazarat" and "Agency." Since Northern Areas (and Azad Kashmir) were not part of the original (1947) Pakistan, they are not yet, strictly

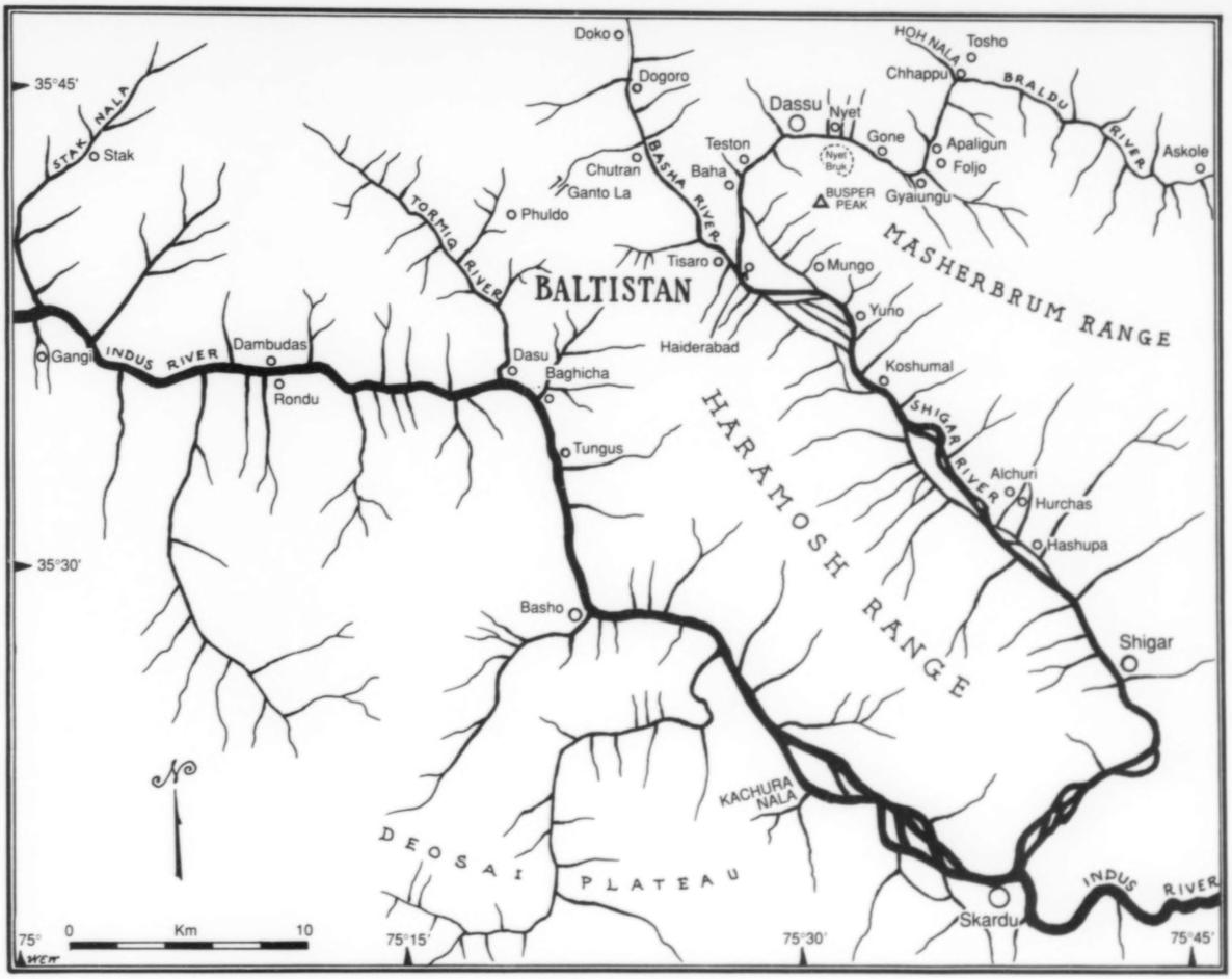

Figure 2. **Location map.**

speaking, constitutionally part of Pakistan, and thus have not yet been given the national vote, so it is easy for the central government to unilaterally reconfigure the administrative units, and the designations used here could easily be changed.

MAPPING

The most readily available maps (in the U.S.) that cover the Northern Areas (and neighboring areas) are the AMS (Army Map Service) U502 series, drawn to a scale of 1:250,000 with contour lines every 500 feet (usually). Unfortunately, the measurements in feet, versus metric units, warn you that the details are perhaps 50 years out of date; since the original mapping, roads have collapsed into the Indus, bridges have been washed out and re-sited, and villages have been abandoned. Spellings for the U502 series often differ, sometimes drastically, from local pronunciation. There are a variety of other maps, some in Japanese and Russian, but these are expensive and difficult to obtain. We have found no maps that display district boundaries within Northern Areas, and precious few that show the boundaries with neighboring regions. We have been forced, therefore, to assume that the district boundaries coincide with the drainage divides. At least the boundaries with China and Afghanistan are, for the time being, unambiguous.

If you find yourself lost in Northern Pakistan, the best advice is to climb quickly to the top of the nearest high peak and study the terrain. It should be easy to find a high peak, since Pakistan has 108 mountains over 7,000 meters high.

LANGUAGES

Abandon hope, all ye who enter here

The local place names are almost exclusively derived from the local languages. The dominant local languages in Northern Areas are *Balti*, *Shina*, *Burushaski*, and *Wakhi*. *Balti*, the language of Baltistan (but *not* the village of Baltit), is a member of the Bodic (western) branch of the Tibeto-Burman stock, of the Sino-Tibetan family. *Shina*, the language of the area surrounding the town of Gilgit, the Indus Valley above the Alam Bridge, the valleys above Chalt, the Ishkoman Valley, parts of the Darel and Tanger Valleys, and other localities mostly in Gilgit district, is an Indic language, part of the great Indo-European family. *Burushaski* (sometimes spelled *Burushuski* or *Boorishki*) is a language apparently unrelated to any other; it is the primary language of the Hunzakuts, and dialects of *Burushaski* are also in use, with *Shina*, in many of the Nagar villages. Additionally, *Burushaski* dialects are found in the upper Darkot Valley, and in the Yasin Valley ("Werchikwar"). *Wakhi*, an archaic Iranian Pamiric tongue (of the Indo-European family), is spoken in the upper Hunza Valley ("Gojal"), the Chapursan Valley, and the upper Ishkoman, Yasin, and Yarkhun Valleys.

Another Indic language, *Khowar*, is largely spoken in Chitral, but it also occurs west of Gilgit town, and in the Ishkoman Valley; the upper classes in Yasin Valley also use *Khowar*. Northern Areas lands near Kohistan hear *Khohistani*; *Gujar* is spoken by migrant

***Figure 3.* Pakistani gem sellers, Skardu Road.**

Gujar herders, who are scattered through many high valleys, tending their goats, yaks, sheep, and pegmatites, while *Hindko* is used in the Kaghan Valley, Diamer district. Mominabad is a musicians' village between Altit and Ganesh in Hunza; the musicians speak *Dumaki*, which may be related to the Gypsies' *Romany*. Most of the local languages have not been expressed in writing; what has been set down consists of mere word or phrase lists, with no written expression of the oral traditions and history.

The lingua franca of Pakistan, including Northern Areas, is *Urdu*, despite being the first language of less than 10% of the Pakistani population. Urdu is now used as the primary language of many of the nation's public schools, and it is widely understood throughout Pakistan; most signs in Northern Areas are in Urdu. One of us (DB) regularly uses Urdu while traveling in Northern Areas, as well as elsewhere in Pakistan. Urdu is an Indo-European tongue and is closely related to *Hindi*, the semi-official language of India, but it is written in a *Farsi* (Persian) script, as opposed to the *Devanagari* expression of Hindi. Urdu has many words borrowed from Arabic, Farsi and English (e.g. "computer," "table").

English remains an important language in Pakistan (as also in India); it is widely understood by the well-educated, and much governmental and commercial business is transacted in English. It is not widely understood in Northern Areas, and except for a very few place names (like "K2," the world's second highest mountain, in eastern Baltistan), English does not figure in the local geography.

Unlike, say, the United States or Russia, Pakistan seems to have no publicly available, agreed-upon spelling for most place names in Northern Areas. The U.S. Board on Geographic Names lists only a few such localities, and these often have several apparently admissible spellings. The spellings we have selected as primary are only the best effort of one of us (DB) to render the local expression into the Latin alphabet.

INTERPRETING THE TABLE

Pop designates a place name associated with human habitation such as a village, town, or even a single farm. "Admin" indicates a name associated with a governmental administrative unit. The names *Nala*, *Lungma*, *Gah*, *Gol*, and *Go* denote a stream, gulch or ravine. *Gali*, *La* and *Lah* denote a mountain pass. *Bruk* and *Brak* mean "mountain" or "high pasture" (much like the Swiss *alp*).

All variant spellings have actually been encountered, on labels, in reports, on maps and in guidebooks. Variants have been accumulated in the column "Alternate Spellings," next to the recommended spelling, *provided* both versions begin with the same Roman letter; if the two versions differ at the initial letter, the variant refers to the recommended version by "See . . ." If you encounter a spelling not found on our list, check the entries beginning with the initial character of your spelling. Watch out for *k* versus *q*, *p* versus *b*, etc.

Kilometrage, in the column "Kilometers," is taken from markers along the Indus River (Gilgit-Skardu) Road, measuring southeasterly from the zero point: the Alam Bridge over the Gilgit River near its confluence with the Indus. The bridge is a little more than 1 km from the junction with the Karakoram Highway (KKH), the major artery connecting Pakistan with China.

Latitude and longitude are from the *Times* (London) *Atlas*, and the *Pakistan* volume of the U.S. Board for Geographic Names.

The distances provided under "Higher Order" are only approximations.

The reliability of the association of specific minerals to a particular locality is both mixed and uncertain. Many of the associations have been provided by one of us (DB), but he usually has had to rely on whatever information local residents choose to release. A variety of other sources, most of indeterminate reliability (e.g., "What's new in Minerals" citations) have provided the remainder of the locality information; such data has been rejected only when it seemed clearly incorrect or so vague as to be useless (e.g., early reports ascribed almost all specimens as being from either Skardu or Gilgit).

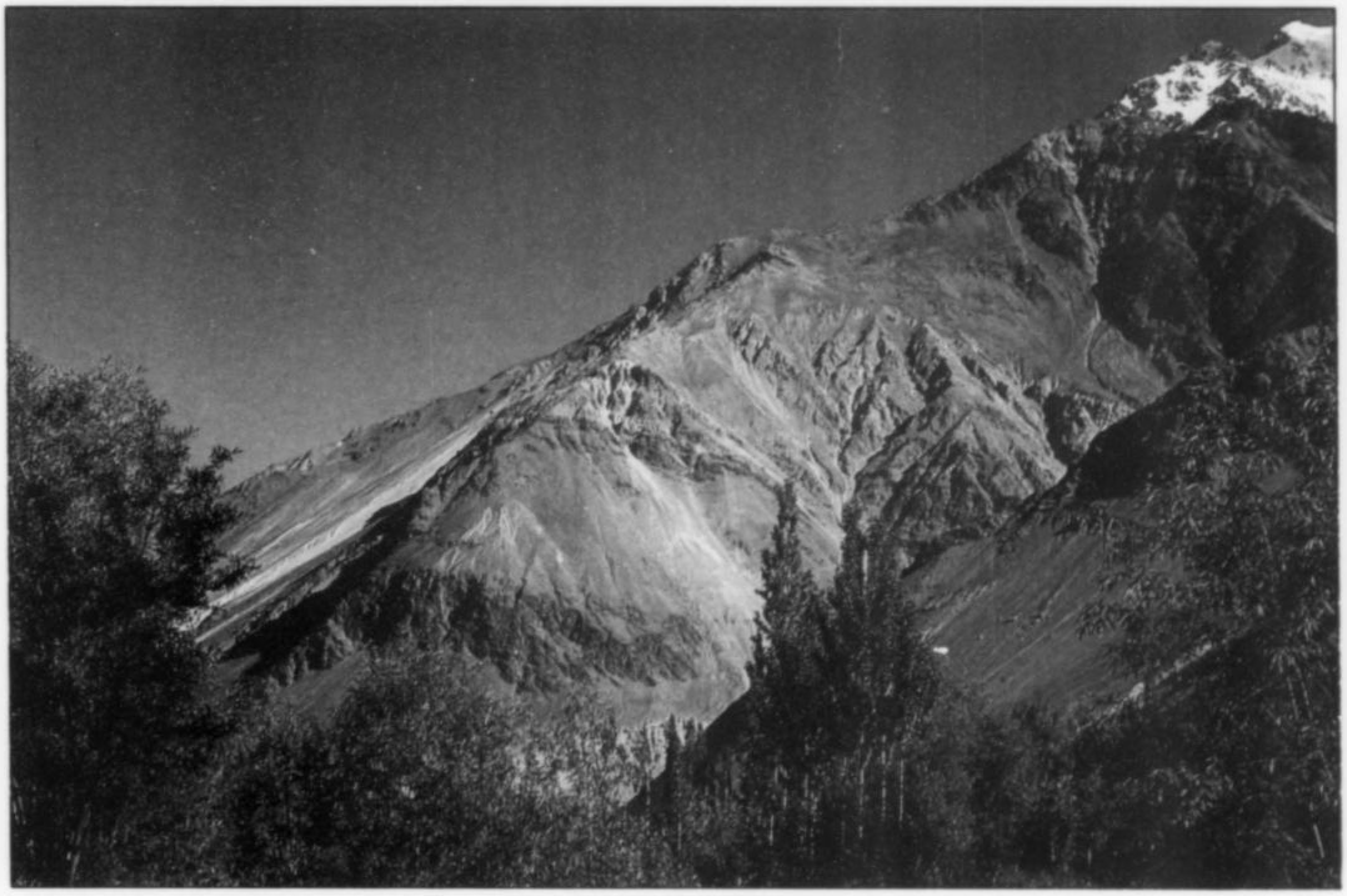

Figure 4. **Alchuri.**

PROBLEM LOCALITIES

Within a 160-km radius of Gilgit there are at least four different villages that are sometimes pronounced "Dassu"; all have variant spellings (and maybe variant pronunciations). Four of them are listed below, spelled as in the table.

(1) *Dassu, Braldu Valley, in Baltistan.* This is the classic Baltistan locality; many specimens from elsewhere in the Braldu Valley are ascribed to this Dassu.

(2) *Dasu, Baltistan, Indus Valley.* This is at the mouth of the Tormiq Valley, the locality of some notable specimens.

(3) *Dassu, Kohistan.* No specimens are known from nearby, although the Sapat peridots pass through here on the way to Peshawar.

(4) *Dache, Gilgit District, Indus Valley,* near *Hanuchal.* This village is often pronounced "Dasu." Fine specimens also come from here. There is also a "Dache" in the Astor Valley, Diamer (with no known specimens).

Drot/Drot Balachi/Bulochi

Drot can be used as a generic name for a collection of tiny villages in the Indus Valley, Gilgit District, that lie across the Indus from Shengus to Chamachhu, at kilometer 50 to kilometer 65 of the Gilgit-Skardu road. These include Sabsar, Bulochi, Bulachi, Khar, Juche, and others, some of which are included in the table. It is impossible to determine a more specific locality if only the name "Drot" is provided.

We suggest that labels for specimens from Northern Areas be phrased like the following two examples:

Ruby Hasanabad, Hunza, Gilgit District Northern Areas, Pakistan	Aquamarine Nyet, Braldu Valley, Baltistan Northern Areas, Pakistan

ACKNOWLEDGMENTS

A very special mention must be made of Mr. Amir Ullah, of Peshawar. He is the close friend of one of us (DB), who has accompanied him on every trip to the Northern Areas (at least 18 times); without his patience, perseverance and knowledge this article could not have been produced. John Mock, linguist, currently working in Northern Pakistan, provided both information and expertise on the regional languages. Kevin Ringer, *Mountain Minerals International,* drew the base maps, and has provided information and analysis on the geography and linguistics of the region; he is also the master of the felicitous phrase.

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Locality	*Alternate Spellings*	*Type*	*Lat/Long Kilometers*	*Higher Order*	*Minerals*
Alchuri	Alchori	Pop	35°32′ 75°39′	Baltistan: Shigar Valley, 15 km northwest of Shigar	Yellow apatite, aragonite, axinite, barite, byssolite, calcite diopside, epidote, prehnite, orange and green titanite, zircon, zoisite
Aliabad		Pop	36°18′ 74°37′	Gilgit District; central settlement in Hunza, on Hunza River. Note: there are other Aliabads in northern Pakistan.	Ruby, spinel
Apaligun	Apaligon, see also Foljo	Pop		Baltistan, on Braldu River, 9 km east of Dassu	Apatite, aquamarine, fluorite, blue phenakite, quartz, schorl, sherry topaz, etched topaz
Arondu	Arundu, Arandu	Pop		Baltistan, Basha River at foot of Chogo Lungma Glacier	Quartz, adularia, calcite, titanite
Astor		Pop, river	35°22′ 74°51′	Gilgit District, east of Nanga Parbat	Diopside, pink tourmaline
Baghicha	Bughicha, Byicha	Pop	km 116	Baltistan, Indus River, nr. mouth of Tormiq River, 21 km east of Rondu. Not the Bagicha on the Indus near the line of control.	
Bagrot Gah	Bagrot	Stream, ravine	35°50′ 74°28′	Gilgit District, 14 km downstream from Gilgit	Biotite, titanite
Baha		Pop		Baltistan, Braldu Valley, 10 km southwest of Dassu	Aquamarine, biotite, fluorite, topaz
Balachi	See Bulochi, Drot Balachi				
Balti		River		To Ghizar River (upper Gilgit River), not in Baltistan	
Baltistan		Admin		District of Northern Areas	
Baltit		Pop, admin	36°20′ 74°40′	Hunza region, Gilgit District (not in Baltistan!) Sometimes called "Hunza," 5 km east of Aliabad	
Baltoro		Glacier		Baltistan: enormous glacier in high Karakoram	
Basha	Basna	River	35°40′ 75°29′	Joins Braldu River to form Shigar River; from Chomo Lungma Glacier. Not the Basho River below.	Adularia, aquamarine, quartz, schorl, green apatite, titanite
Basho	Basha	Pop, river	35°29′ 75°22′ km 132	Baltistan: southern tributary of Indus between Tormiq and Shigar rivers; village is 42 km northwest of Skardu	

Locality	Alternate Spellings	Type	Lat/Long Kilometers	Higher Order	Minerals
Braldu		River	35°39′ 75°28′	Joins Basha River to form Shigar River; from Baltoro Glacier and high Karakoram (There is a smaller Braldu River on the NE side of the Karakorams)	
Bulbin	Bubind	Pop		Gilgit District, due east of Nanga Parbat, 30 km southeast of Astor	Titanite, zircon
Bulochi	Balche, Balochi; see Drot Balachi	Pop		Gilgit District: 7 km south of Shengus, 4 km from Indus	Aquamarine, cassiterite, cleavelandite, hambergite (?), helvite, lepidolite, "mica," morganite, quartz, schorl, spodumene, topaz, tourmaline
Bungla Bridge, Boungla, Bangla, Bunglai, Bengalai	See Haiderabad			Bridge is near the junction of Basha and Braldu Rivers, forming the Shigar River	
Busper	Buspar	Peak		Baltistan; north of Haiderabad Bridge	Includes many localities described as Mungo, Yuno, Haiderabad (southside), Nyet Bruk, Byansahpi, and Gone (northside)
Byansahpi		Pop		Baltistan, Braldu Valley; between Nyet and Apaligun	Topaz; see also Busper
Chalt		Pop	36°14′ 74°20′	Gilgit District, at the junction of Chaprot and Hunza Rivers; in lower Nagar region	
Chamachhu	Changmachhu	Pop		Gilgit District: Indus Valley, 10 km east of Shengus	Albite, aquamarine, garnet, microcline, muscovite, quartz, schorl
Chaprot		River, pop	36°15′ 74°17′	Into the Hunza River from the northwest	
Chhappu		Pop		Baltistan, junction of Hoh and Braldu Rivers, 7 km east of Apaligun	Aquamarine, yellow (cesium rich) beryl, herderite, lepidolite, microlite, quartz, star muscovite, topaz, yellow and bi-colored tourmaline
Chilas		Pop, admin	35°26′ 74°05′	Administrative center for Diamer	Diopside, kyanite, vesuvianite, zircon
Chogo Lungma		Glacier		Baltistan; north of Haramosh Range	Quartz, titanite
Chumar Bakhoor		Pasture for Mir of Nagar's mares	4618 m elevation	Lower Nagar, 2200 meters above and south of Sumayar	Adularia, albite, apatite, aquamarine, axinite, calcite, pink and green fluorite, microcline, muscovite, twinned pericline, quartz, schorl
Chutran	Chu Tron (= "Hot Springs")	Pop	35°43′ 75°24′	Baltistan, Basha River, 8 km from junction with Braldu River. (Not the Chutran in the Indus Valley near Chamachhu.)	Adularia with rutile, siderite, schorl

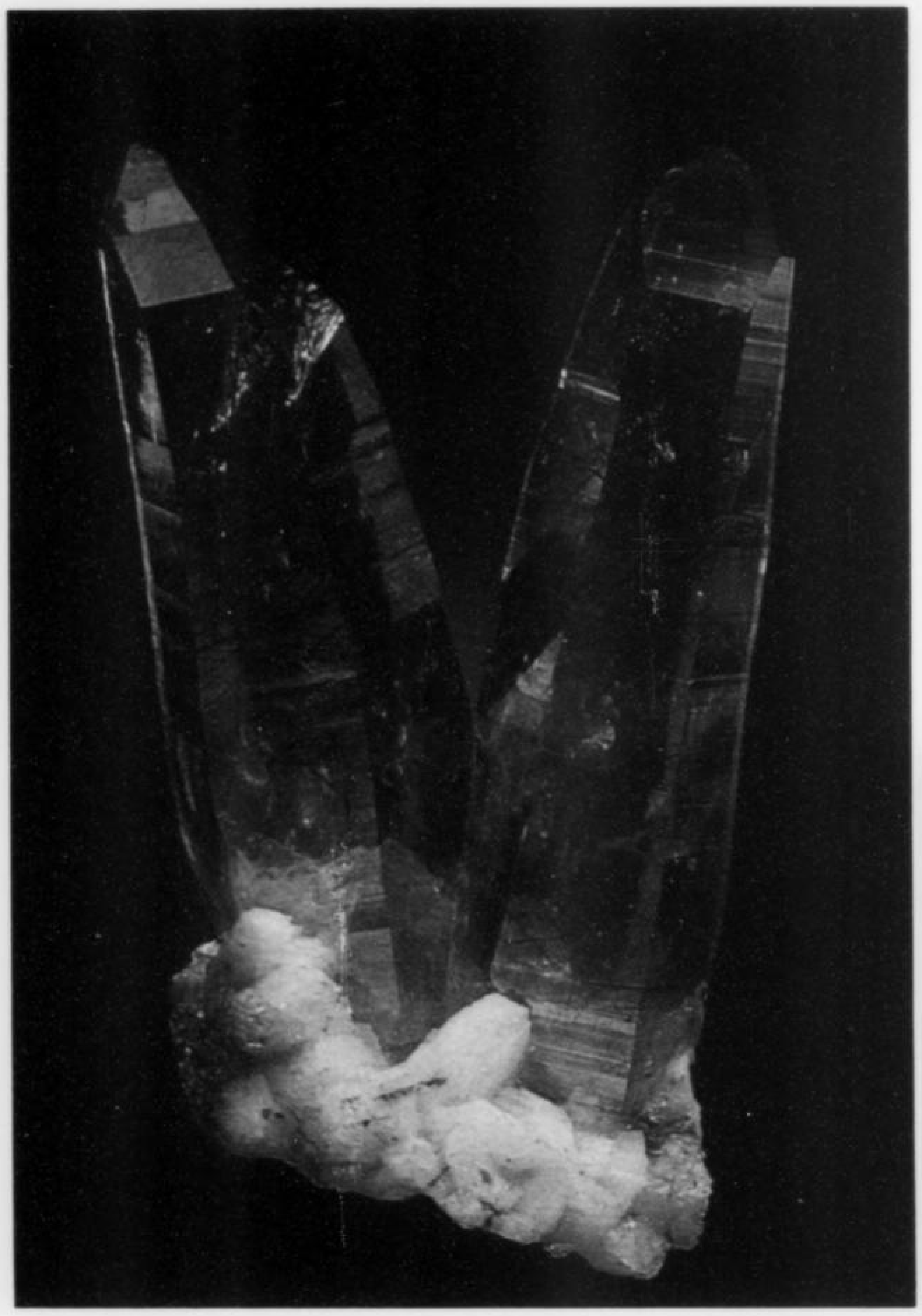

Figure 5. **Quartz with actinolite and albite, 12.6 cm, from Alchuri, Shigar Valley, Pakistan. Dave Bunk specimen, Jeff Scovil photo.**

Figure 6. **Zoisite crystals to 3.9 cm, from Alchuri village in the Shigar Valley north of Skardu, between Shigar and Dassu, Baltistan, northern Pakistan. Mountain Minerals International specimens.**

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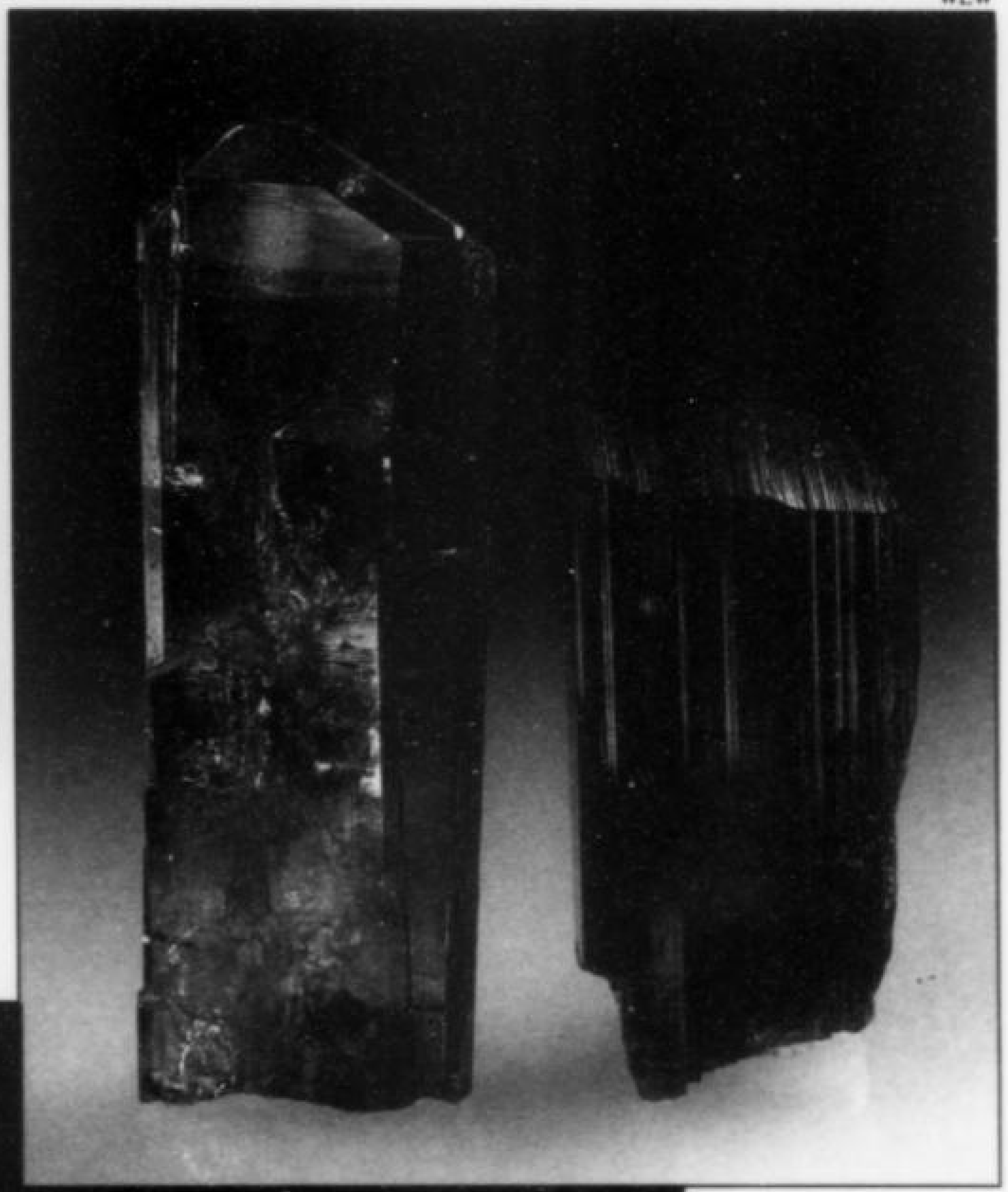

Figure 7. **Epidote crystals in a parallel grouping, 6.2 cm across, from Hashupa, Shigar Valley, Pakistan. François Lietard specimen; L. D. Bayle photo.**

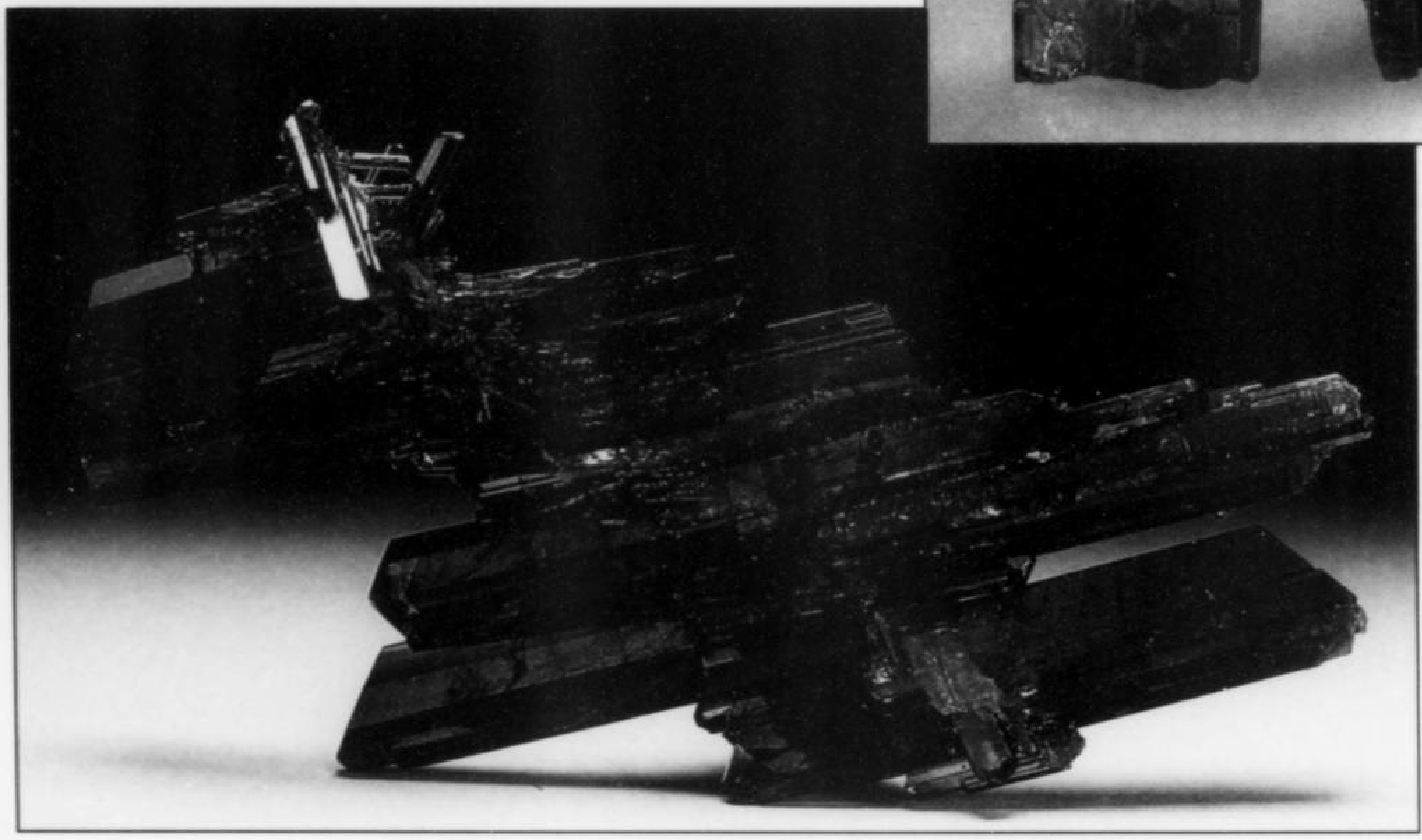

Figure 8. **Apaligun village; Foljo is at the top of the cliff.**

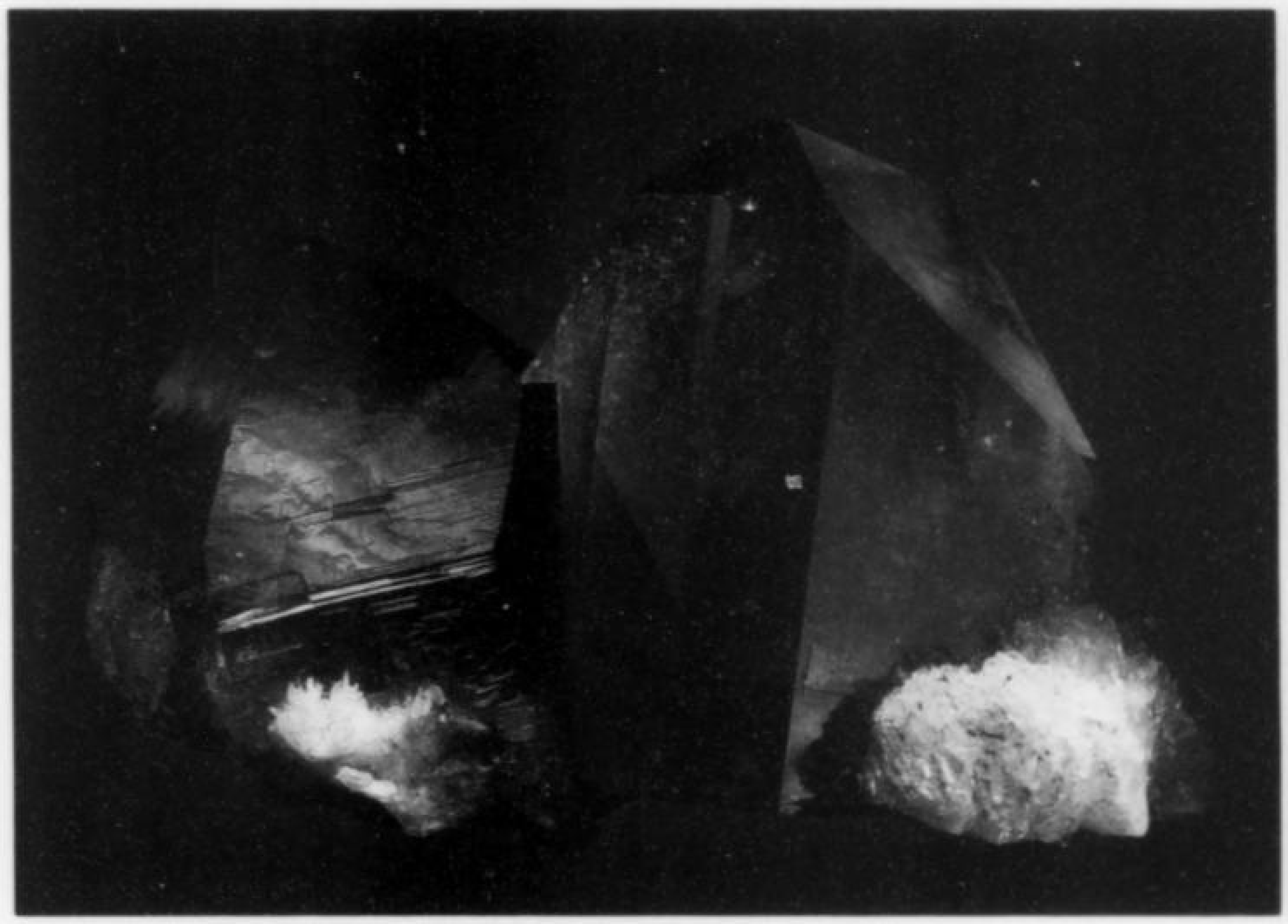

Figure 9. **Topaz crystal, 5.5 cm, with smoky quartz, from epigenetic pegmatite near Dassu, Braldu Valley, Baltistan, Pakistan. Michael M. Scott collection; Harold and Erica Van Pelt photo.**

Figure 10. **Viitaniemiite crystal, 8 mm, perched on brown topaz from near Dassu, Braldu Valley, Pakistan. William Pinch collection, now in the Canadian Museum of Nature collection; photo by George Robinson.**

Locality	*Alternate Spellings*	*Type*	*Lat/Long Kilometers*	*Higher Order*	*Minerals*
Dache	Dacha, often pronounced "Dasu"	Pop		Gilgit District, 10 km northeast of Hanuchal. Not the Dache in the Astor Valley. See "Problem Localities"	Albite, aquamarine, garnet, topaz
Dambudas		Pop	km 103	Baltistan: Indus Valley between Dasu and Shengus	Schorl
Dassu	Dasso, Dusso; see also Dacha, Dasu	Pop	35°43′ 75°31′	Baltistan, on Braldu River; 11 km from Shigar River; 16 km north of Yuno. See "Problem Localities"	Classic locality; pre-1940. Albite, apatite, aquamarine, biotite, garnet, goshenite, manganotantalite, microcline, morganite, star muscovite, orthoclase, quartz, schorl, stellerite, titanite, topaz, viitaniemiite on topaz
Dasu		Pop	35°37′ 75°19′	Baltistan, on Tormiq River, near Indus River (not Dasu in Kohistan)	
Diamer	Diamir	Admin		District of Northern Areas	
Dogoro		Pop		Baltistan, lower Basha Valley, 4 km north of Chutran	Smoky quartz
Doko		Pop	35°49′ 75°24′	Baltistan, on Basha River, 17 km from Shigar River	Albite, aquamarine, quartz, schorl
Drot	See also Bulochi	Pop		See "Problem Localities"	Apatite, aquamarine, cassiterite, cleavelandite, dravite, elbaite, garnet, goshenite, helvite, columbite, herderite, lepidolite, morganite, tantalite, quartz, schorl, spodumene, tapiolite, topaz. Specimens attributed to Shengus may come from here.
Dusso	See Dassu				
Fiqhar	Fighar	Pop		Gilgit District, Lower Nagar, across Hunza River from Aliabad	Apatite, aquamarine, muscovite
Foljo	Folji, Pulji, Fuljo, Phuljo	Pop		Baltistan, 200 meters above Apaligun, Braldu Valley	Aquamarine, topaz
Gakuch	Gahkuch	Pop, admin	36°10′ 73°50′	Administrative center for Ghizar; on Ghizar/Gilgit River, 13 km from Gilgit	
Ganto La	Holtoro La		Pass	between Tormiq and Basha Rivers	Baltistan: Pass
Ghanche		Admin		District of Northern Areas on Shyok River and its tributaries	
Ghizar		Admin		District of Northern Areas	
Ghizar		River		Upper reaches of Gilgit River	
Ghulmat	Gulman	Pop		Nagar, 14 km east of Chalt; not the same as Gulmit in Gojal	

Locality	*Alternate Spellings*	*Type*	*Lat/Long Kilometers*	*Higher Order*	*Minerals*
Gilgit		Pop, admin district	35°55′ 74°98′	District of Northern Areas; Administrative center	
Gilgit		River		To the Indus; upper reaches called Ghizar River	
Gojal	Gujal, Guhjal	Area, subdistrict		Name for the upper Hunza Valley; Subdistrict begins 6 km below Gulmit	
Gone		Pop		Baltistan, 5 km east of Dassu	Aquamarine, muscovite, orthoclase, plagioclase, quartz, schorl, topaz
Gulmit		Pop, admin	36°22′ 74°51′	Administrative center for Gojal Subdistrict, 12 km south of Pasu. Not the same as Ghulmat	
Gyaiungu	Goyungu, Goyangu	Pop		Baltistan; on Braldu River between Gone and Apaligun; 7 km east of Dassu	Topaz
Haiderabad	Hyderabad; previously Bangla Bridge. Not the Hyderabad in Hunza.	Pop	35°45′ 75°41′	Baltistan, 5 km north of Yuno, at the junction of the Braldu and Basha Rivers; recent (1994) name change from Bungla Bridge	Topaz (probably from Mungo or Yuno). See also Busper
Hanuchal		Pop	km 25	Gilgit District; on Indus, 28 km northwest of Shengus	Adularia, titanite
Haramosh		Range	35°40′ 75°22′	Baltistan, north of Indus River, west of Shigar River	Almandine, calcite, elbaite, epidote, fassaite, feldspar, mica, quartz, schorl, spessartine, titanite, topaz, uvite
Haramosh		Peak (7406 m) W end of Haramosh Range	35°50′ 74°54′	Gilgit District	(between peak and Shengus): apatite, aquamarine, fluorite, topaz
Hasanabad	Hassanabad	Pop, river		Hunza region, above and 2 km west of Aliabad	Ruby
Hashupa	Hashupi	Pop		Baltistan, Shigar Valley, between Alchuri and Shigar	Barite, byssolite, diopside, epidote, orange and green titanite. See also Alchuri and Hurchas.
Hispar		Pop, river, glacier, pass	36°10′ 74°57′	Upper Nagar; village is 30 km southeast of Nagar town	Aquamarine, green beryl, topaz
Hoh		Pop, river		Baltistan; 5 km north of Apaligun, 15 km east of Dassu	Yellow and green tourmaline
Hopar	Hupar	Pop		Upper Nagar, Gilgit District; 7 km south of Nagar village	Green beryl
Hunza		Admin		Region of Northern Areas in Gilgit District; on north bank of Hunza River. Greater Hunza includes Gojal.	

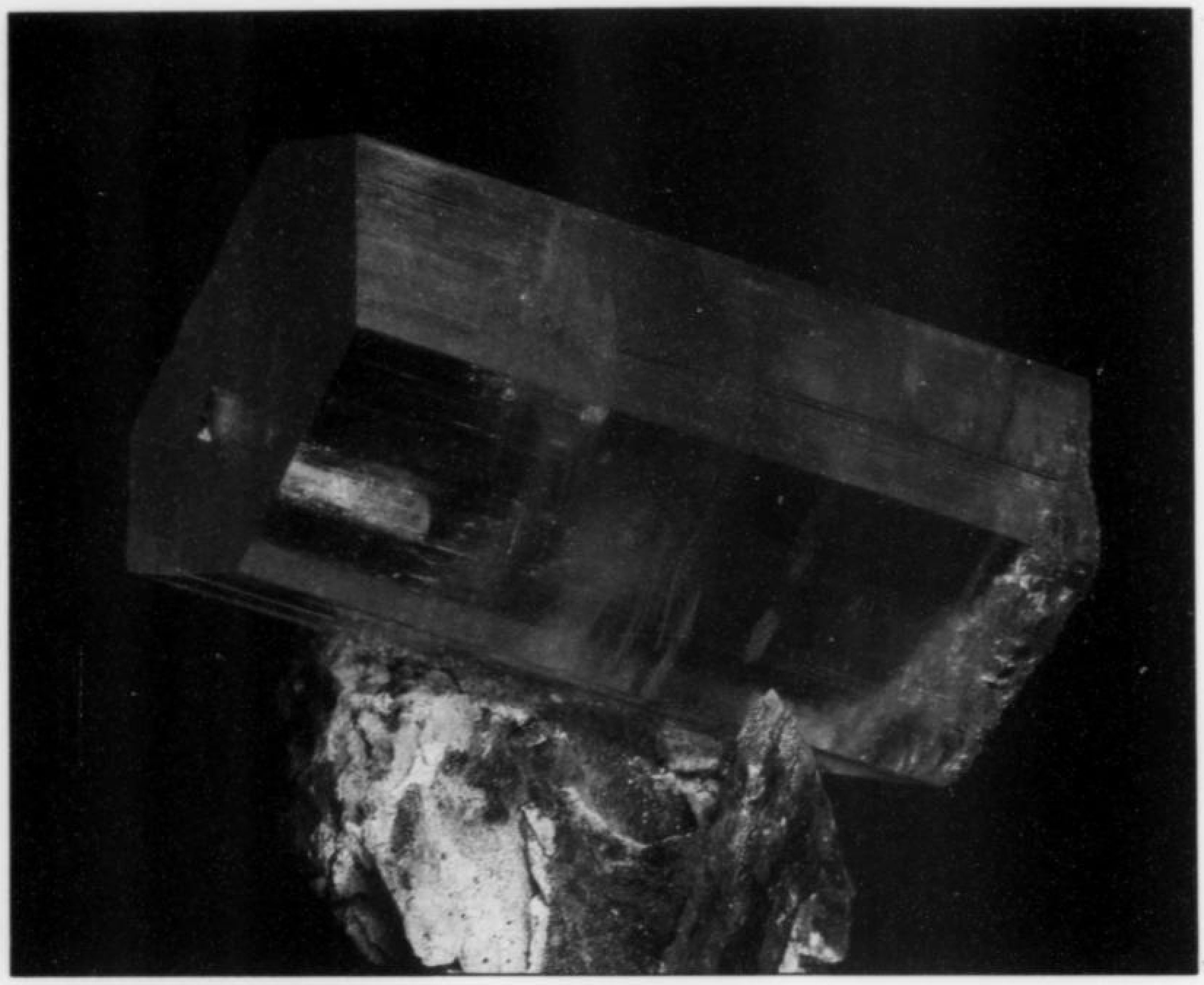

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Figure 11. Beryl crystal, 4.8 cm, from near Dusso, Gilgit division, Pakistan. Gene Schlepp speciman.

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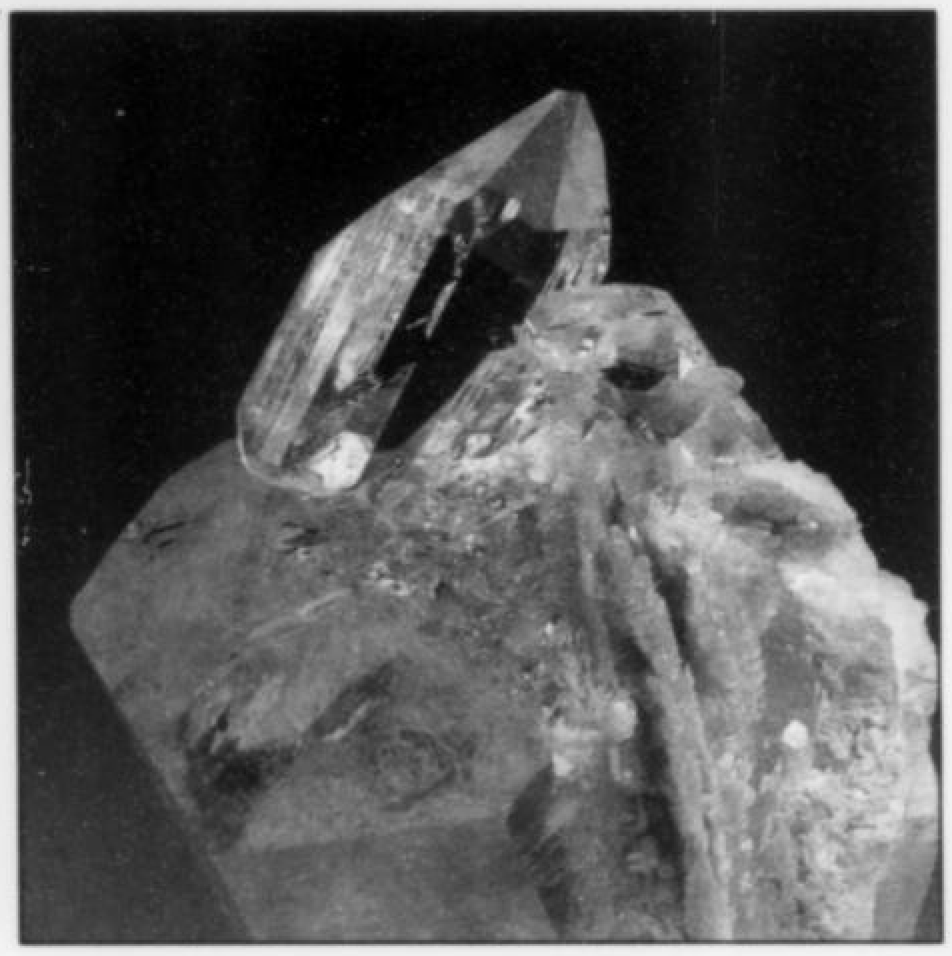

Figure 12. Topaz crystal, 1.5 cm, with an uncommon pointed termination, on pinacoid of aquamarine crystal. This unusual association is from an epigenetic pegmatite, Shigar (probably Dusso), Gilgit Division, Pakistan. Mel Bersch collection; Wendell Wilson photo.

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Figure 13. Beryl crystal, 26.7 cm, from Chhappu, Braldu Valley, Baltistan, Pakistan; held by Dudley Blauwet (*Mountain Minerals International*).

Figure 14. **Chumar Bakhoor, Nagar, Pakistan.**

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Figure 16. **Diopside crystals to 4 cm from Khapalu, Pakistan. François Lietard specimen.**

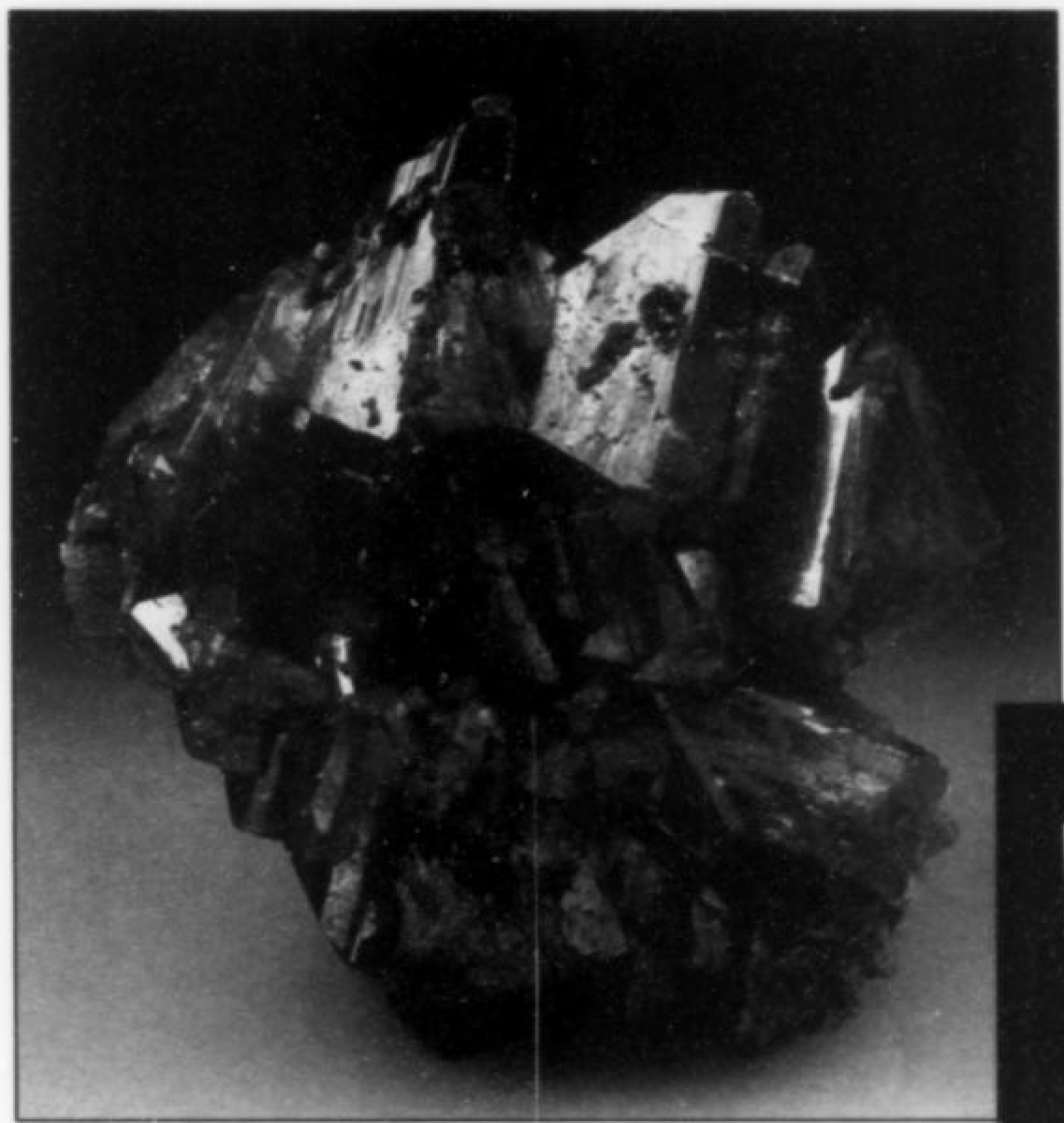

Figure 15. **Scheelite crystal group, 5.3 cm, from near Skardu, Pakistan. Kurt Hefendehl collection; Jeff Scovil photo.**

Figure 17. **Beryl crystal (4 cm) from near Skardu, Pakistan. Primary Gems specimen; Jeff Scovil photo.**

Locality	*Alternate Spellings*	*Type*	*Lat/Long Kilometers*	*Higher Order*	*Minerals*
Hunza		River	35°55′ 74°22′	Hunza region; northern tributary of Gilgit; drains northem Karakoram	
Hunza	Another name for Baltit				
Hurchas	Hurchus	Pop		Baltistan, 1 km east of Alchuri	Diopside, epidote, schorl, titanite
Hushe		Pop, river	35°28′ 76°22′	River into Shyok River above Khapalu, Ghanche District; 36 km north of Khapalu	Topaz (sometimes pale green)
Ishkapul	Ishkapal	Valley, glacier	km 30	Gilgit District; joins Indus River at Shatot village	Aquamarine, cubic pink fluorite, ilmenite, topaz
Kachura Nala		Stream	km 145	Baltistan, 27 km northwest of Skardu	Scheelite (unreliable source)
Kaghan		Valley		Northwest Frontier Province; Valley for south-flowing Kunhar River	
Karimabad	Kareemabad	Pop	36°20′ 74°40′	Hunza, Gilgit District; next to Baltit, 1 km east and above Aliabad	
Khaibar		Pop, gulch	36°37′ 74°48′	Gojal, on Hunza River, 19 km north of Pasu	Rock crystal
Khaltaro	Kaltoro	Pop		Gilgit District, 6 km north of Sassi	Albite, allanite, emerald (some inside pale aquamarines), pink fluorite cubes, quartz, muscovite, oligoclase, prismatic schorl, titanite, dark brown and needle tourmaline. K-feldspar is rare. Chrome-rich amphibolite contains zoisite.
Khapalu	Khaplu, Kghaplu	Pop, admin	35°12′ 76°21′	Administrative center for Ghanche on Shyok River, 103 km from Skardu. NOTE: Travel east of Khapalu requires official permission.	Amethyst (pale)
Koshumal	Kashmal	Pop		Baltistan on Shigar River, 28 km northwest of Shigar	Aquamarine, green fluorite, bronze mica, microcline, schorl, yellow topaz
Mendi	See Rondu		km 104		
Morkhun		Pop	36°37′ 74°52′	Gojal, on Hunza River, 24 km north of Pasu	Rock crystal
Muchara Nala	Muchu Har, Machara, Muchiohul	Glacier, ravine		Hunza, northwest of Hasanabad, into the Hasanabad River	Apatite, tabular aquamarine, schorl
Mungo	Mango, Munyo	Pop		Baltistan, 4 km northwest of Yuno, Shigar Valley	Apatite, aquamarine, cleavelandite, fluorite, manganotantalite, schorl, topaz. See also Busper.

Locality	Alternate Spellings	Type	Lat/Long Kilometers	Higher Order	Minerals
Nagar	Nagir	Admin		Gilgit district. Upper Nagar: Hispar Valley and further east. Lower Nagar: South bank of Hunza River below Hispar River, and north bank of Hunza around Chalt	
Nagar	Nagir	Pop	36°16′ 74°44′	Above Hispar River; center of Upper Nagar region; 16 km from Aliabad	Virtually all specimens ascribed to Nagar are from Chumar Bakhoor and Fiqhar
Nanga Parbat	Diamir	Mountain (8125 meters)	35°15′ 74°36′	Gilgit District; northwestern limit of Himalaya Range	
Naran		Pop	34°54′ 73°39′	North West Frontier Province, south of Diamer District; major center in upper Kaghan Valley. Approx 100 km S of Chilas.	See Sapat, whose peridots are sometimes ascribed to Naran
Nieosla	Niesolo	Pop		Baltistan, Basha Valley, betw. Chutran and Doko	Green apatite
Nyet Bruk				Across Braldu River from Nyet	Apatite, aquamarine, beryllonite, herderite, muscovite, plagioclase, quartz, schorl, topaz. See Busper
Nyet	Niit, Niyit, Niyil	Pop		Baltistan, on north side of Braldu River; 2 km east of Dassu	Albite, aquamarine, muscovite, quartz, schorl, topaz
Pasu	Passu	Pop	36°28′ 74°54′	Gojal (Hunza), at the juncture of the Hunza and Shimshal Rivers	Schorl
Phuldo				Baltistan, Basha Valley; near Ganto La	Topaz
Pulji	See Foljo				
Rondu	Ronda, Mendi	Pop, region	35°35′ 75°15′ km 104	Gilgit District, on Indus, 70 km downstream from Skardu	Aquamarine, schorl
Sabsar	Supsar, Sapsir, Sabsir, Sabsan, Subsar	Pop	km 67	Gilgit District, 14 km east of Shengus	Apatite, aquamarine, cleavelandite, dravite, orange garnet, goshenite, herderite, schorl, tapiolite, topaz, bi-color tourmaline. Specimens attributed to Shengus may come from here. Aquamarines with spiral growth are from near km 60.
Sapat, Sapat Gali	Sumpat, Suppatt	Locality, peak, stream		Locality is 24 km NE of Naran, in the upper Jalkot Valley, in the Indus-Kohistan region of the Northwest Frontier Province	Magnetite, peridot. The peridots are often brought to market via the Jalkot Nala, through Indus-Kohistan to the KKH at Dassu (Kohistan). This route is *not* recommended to non-residents.
Sassi	Sasli	Pop	35°52′ 74°45′ km 27	Gilgit District: at the great northern bend of the Indus	
Shatot	Shabatot	Pop	km 30	Gilgit District; between Sassi and Shengus	

Figure 18. **Pink apatite crystal, 2.6 cm, on muscovite from Chumar Bakhoor, Nagar, Pakistan. François Lietard specimen.**

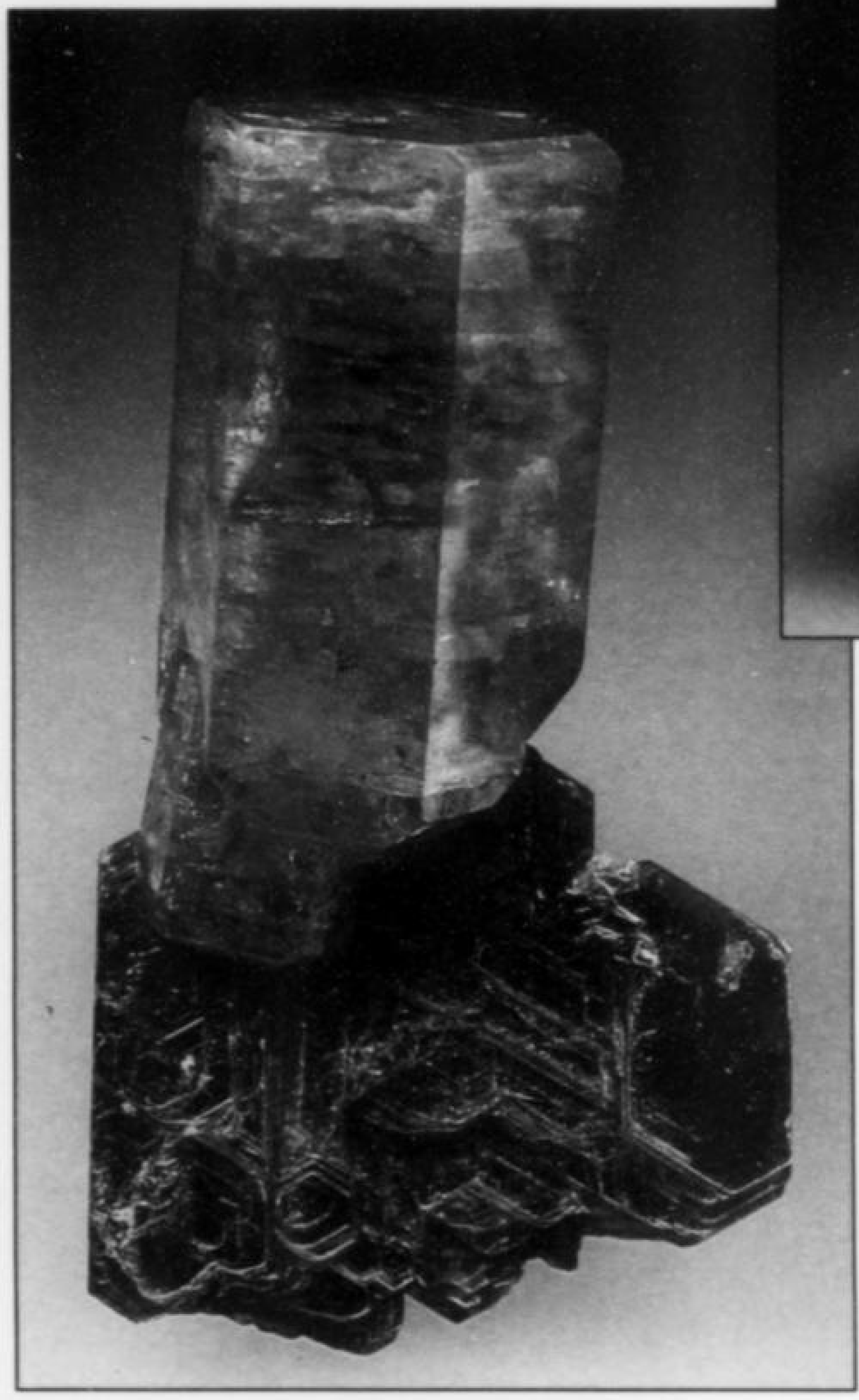

Figure 19. **Fluorapatite crystal, 3.2 cm, on muscovite from Nagar district, Gilgit, Pakistan. Cal Graeber specimen. Jeff Scovil photo.**

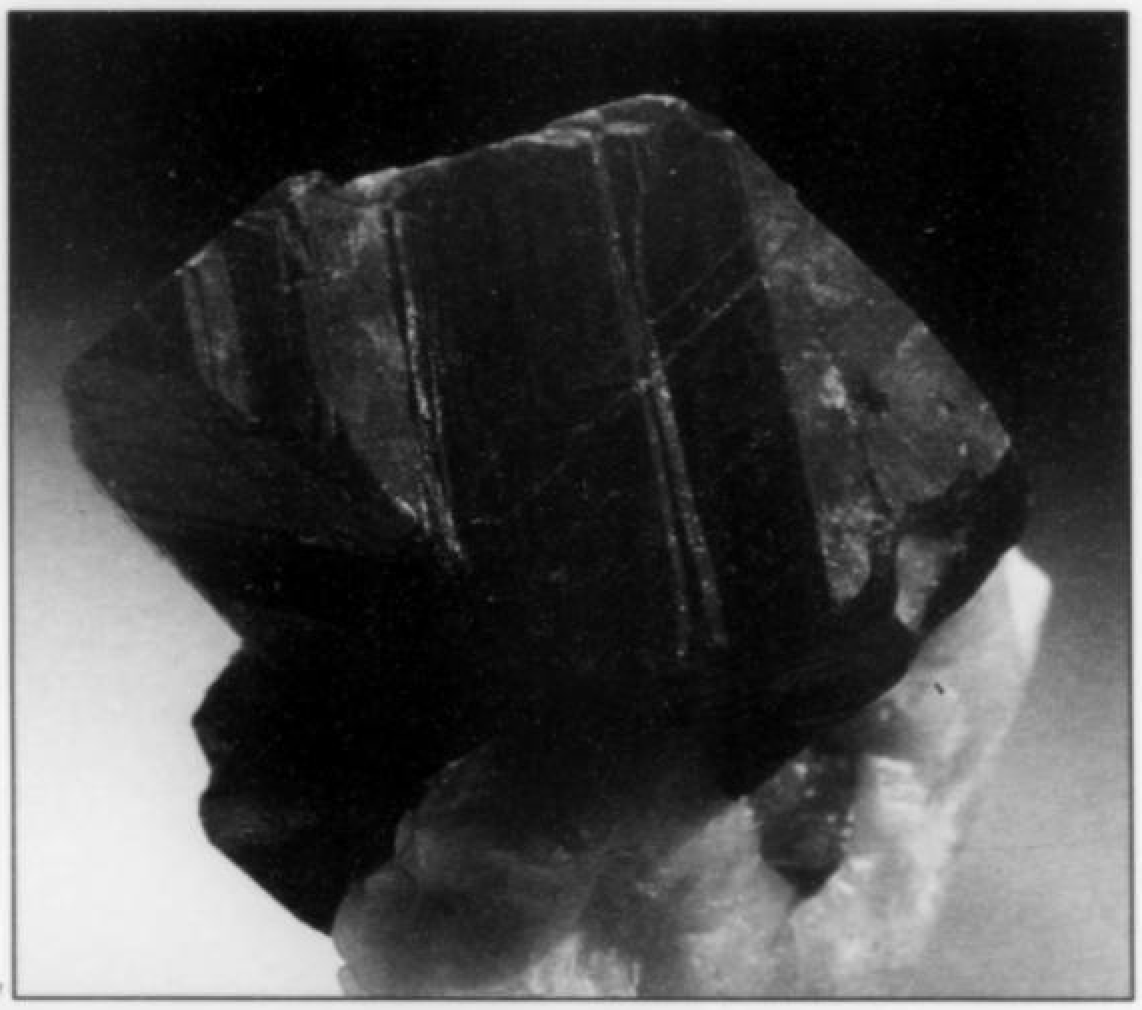

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Figure 20. **Ruby crystal, 2.4 cm, from the Hunza Valley, Pakistan. Simon Harrison specimen.**

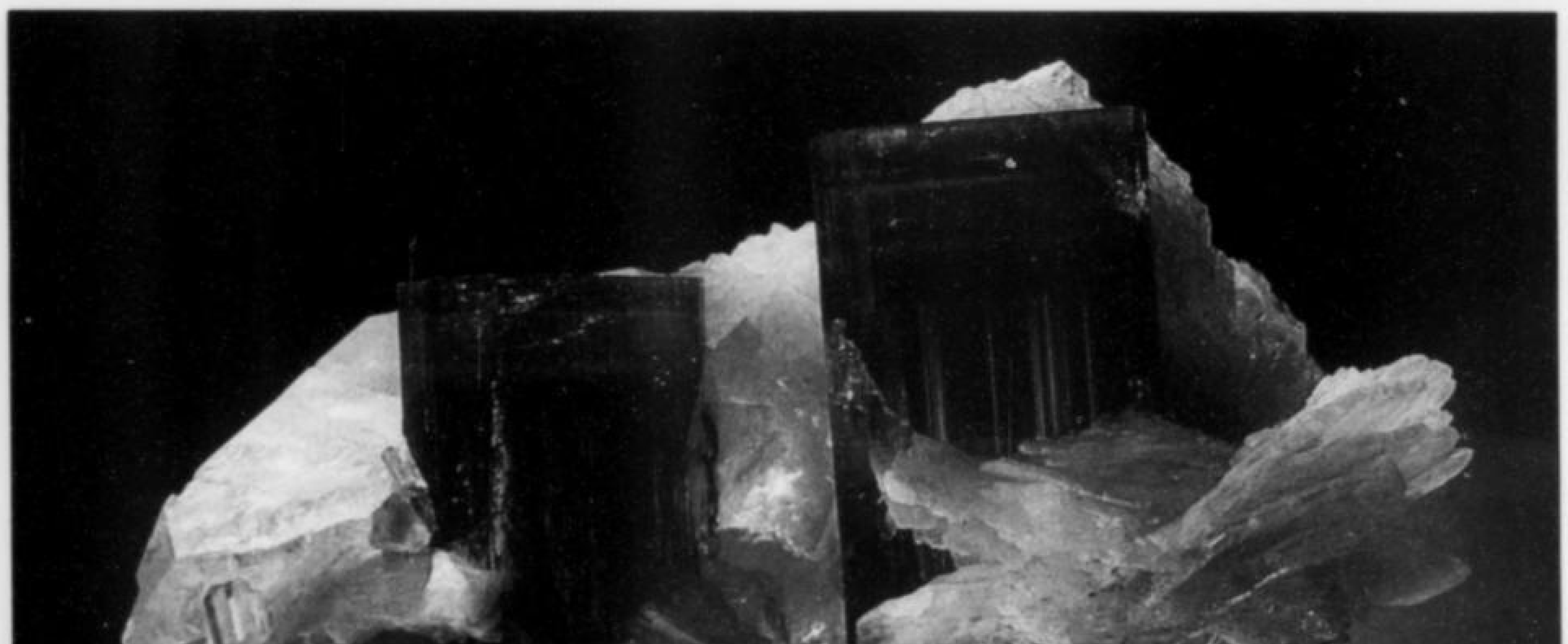

Figure 21. **Elbaite with albite, 9.3 cm, from Stak Nala, Pakistan. Jeff Scovil photo.**

Figure 22. Forsterite crystal, 5.1 cm, from Sapat, Kohistan, Pakistan. Wayne Thompson specimen; Jeff Scovil photo.

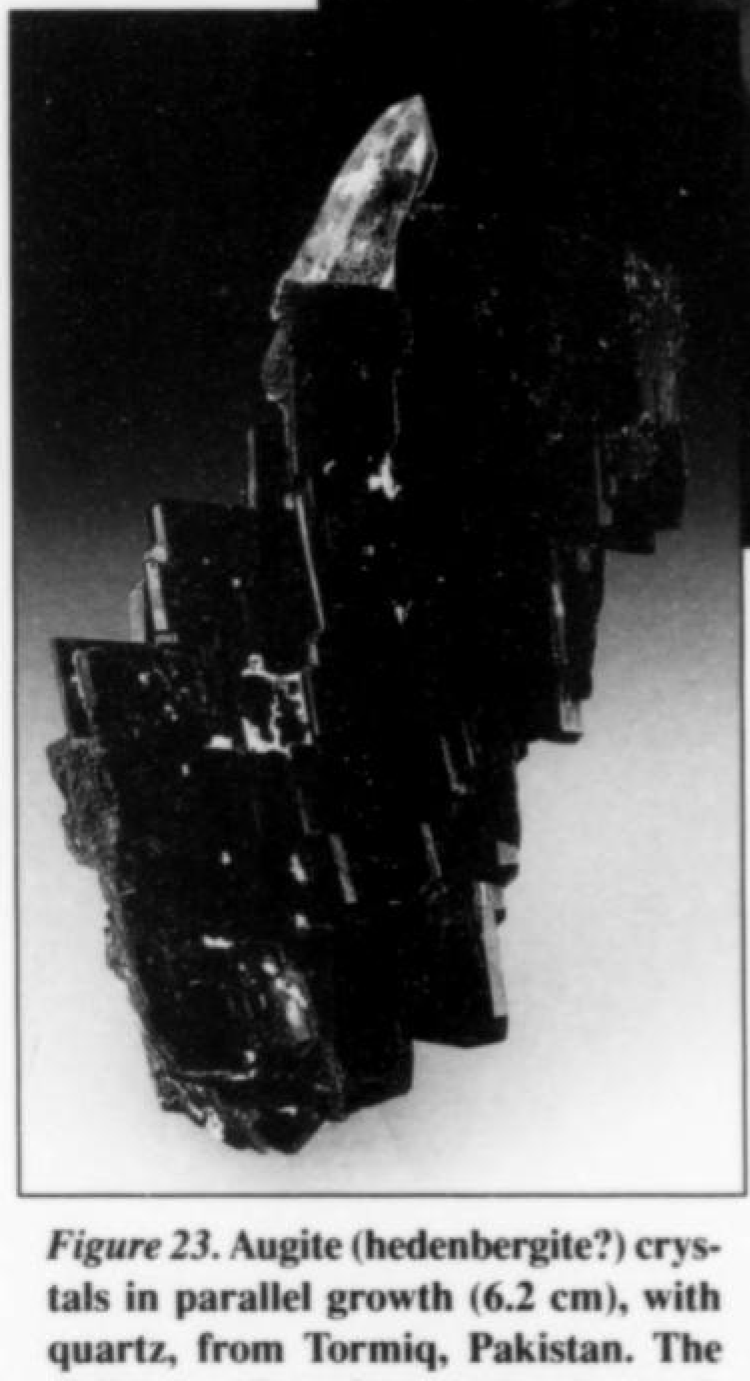

Figure 23. Augite (hedenbergite?) crystals in parallel growth (6.2 cm), with quartz, from Tormiq, Pakistan. The Collector (Pala International) specimen; Jeff Scovil photo.

Figure 24. Spessartine crystals to 2.4 cm, from near Shengus, Gilgit district, Pakistan.

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Locality	Alternate Spellings	Type	Lat/Long Kilometers	Higher Order	Minerals
Shengus	Shingus; see also Sabsar	Pop	35°49′ 74°49′	Gilgit District between Sassi and Stak River	Albite, almandine, apatite, aquamarine, columbite, elbaite, fluorite, manganotantalite, mica, microcline, pollucite, quartz, schorl, spessartine, stibiotantalite, titanite, water clear topaz
Shigar		River	34°39′ 75°51′	Union of Basha River and Braldu River; joins Indus at Skardu. Not the Shiggar River of southern Baltistan.	
Shigar		Region		Includes Shigar, Braldu, and Basha valleys	
Shigar	Shagar	Pop	35°26′ 75°44′	Baltistan, 32 km north of Skardu.	Often cited, probably as a generic locality for Shigar Valley localities.
Shimshal	Shingshal	River	36°30′ 74°53′	Gojal: Major tributary from east to Hunza River	
Shuut Nala	Shuta	Ravine		Gilgit District, 3 km above and east of Hanuchal	Diopside, epidote (some twinned)
Skardu		Pop, admin	35°18′ 75°37′ km 174	Administrative center for Baltistan	
Stak Nala		Gulch, ravine	km 79	Gilgit District, near Stak	Almandine-spessartine, aragonite twins, betrandite, cassiterite, cleavelandite, columbite-tantalite, bi- and tri-color elbaite, fluorapatite, green fluorite, hambergite, lepidolite, löllingite, mica, microlite, monazite, montmorillonite, perthite, pyrochlore, plagioclase, quartz, topaz, tourmaline, zircon. Beryl is very rare.
Stak		Pop	35°42′ 75°04′	Gilgit District, Rondu region; 11 km above Indus, 28 km from Rondu	
Sumayar	Sumariyar, Sumaiyar, Sumair	Pop		Lower Nagar, Gilgit District; 5 km east of and across the Hunza River from Aliabad	See Chumar Bakhoor
Teston	Tigston, Tisgtung, Tekston	Pop		Baltistan on Braldu River 5 km west of Dassu	Aquamarine, biotite, garnet, quartz, muscovite, plagioclase, schorl
Tormiq	Tormic, Tormik, Tormig	River		Baltistan: tributary to Indus between Shengus and Skardu, above Baghicha	Yellow apatite, axinite, byssolite, calcite, dolomite, epidote, hedenbergite, ilmenite, rutile, siderite, titanite, topaz
Tosho	Tosha	Pop		Baltistan, 300 meters above and 2 km south of Chhappu	Approximately the same species list as Chhappu.
Warshigum	See Yasin				
Yasin ("Warshigum")		River	36°15′ 73°24′	Ghizar district; flows into Ghizar River	
Yuno	Yunau, Yunas	Pop		Baltistan, on Shigar River, 8 km below Braldu and Basha River junction, and 45 km northwest of Shigar Workings at 3,000 to 3,700 meters.	Cleavelandite, cassiterite with ixiolite/wodginite-like coating, green and phosphorescent fluorite, microcline, quartz, rutile, schorl, topaz (some with garnet ⊠ inclusions). See also Busper

What's New in Minerals

California Show 1996

by Jeff Scovil

[November 15–16]

The California Show (also known as the Pomona Show) was the last of the big shows for 1996. It did not provide quite the excitement that some people had hoped for, but there were some interesting new things to be had.

Scott Kleine of *Great Basin Minerals* specializes in the minerals of that region and is an avid field collector. In July of 1996 he was hard at work in the Rawhide district of Mineral County, Nevada. There he found some very interesting **barite** crystals with yellow **orpiment** inclusions that give the barite a pale yellow color. There were also some orange hemispherical inclusions of an as-yet unidentified arsenic-antimony sulfide. The barites occur as tabular, diamond-shaped crystals up to 3.5 cm across in specimens to 26 cm.

In the Carlin Trend of Eureka County, Nevada Scott collected more **barite**. These crystals are of the same habit as at the previous location but a bit smaller, only reaching about 2 cm in length. What makes them showier is their amber-yellow color, high luster and association with abundant small sprays of **stibnite**. Specimens were available up to 17 cm. Unfortunately not for sale (as per the collecting agreement with the owners) were some very nice **galkhaite** crystals from the Getchell mine, Humboldt County, Nevada. The rich red cubes are up to 3 mm across and sprinkled upon a gray matrix. The material was collected in September 1996.

Two years ago I remember seeing the first specimens out of the Red Dome mine, Chillagoe, Queensland, Australia—superb **cuprite**, **azurite** and **malachite**-included **calcites**. Something a little different from this locality was available in the booth of *Tom Wolfe Minerals*. Tom's specimens are composite **calcites** of two generations of growth: blackish brown, flattened rhombohedra with oriented overgrowths of transparent, colorless, acute rhombohedra. Some are complex twins. The crystals, up to 15 cm in length, were mined during the winter of 1996.

From the well-known Wolfram Camp mine, Queensland, Australia, Tom had obtained some nice **molybdenite** crystals. Most are loose crystals in thumbnail sizes, but some reach 9 cm across.

It seems that China has an inexhaustible supply of **fluorite** from numerous localities, and these were one of the most attractive new things at the show. Several dealers had the new material, including *Roberts Minerals*, *Dan Weinrich Minerals*, *Debbie Meng's Minerals* and new dealer *Gavel International* (15-348 Zephyr Ave., Ottawa, Ontario, Canada K2B 6A1; 613-829-9183). The specimens consist of pale blue to lavender octahedra to 10 cm perched on pale green cubes of fluorite. Some of the specimens have nicely contrasting white, discoidal rhombohedral calcites attached. The surfaces of all the fluorites are rather rough. Several localities were cited on labels, but the problem seems to be one of transliteration. Dan Weinrich gives the locality as Hsiangua Ridge, Hunan, China.

I was told that Debbie Meng was selling some nice **hemimorphite** from a new, unspecified locality in Yunnan, China. The material is somewhat reminiscent of the botryoidal Sardinian material, but a less intense blue. Debbie had pieces up to 25 cm.

Ken Roberts, Debbie Meng and Dan Weinrich also had the beautiful, gemmy **sphalerites** that have been coming out of Shizhuyan, Changning, Hunan, China. I first saw this material at the Costa Mesa Show in the spring of 1996, and it just keeps getting better and better. The crystals (up to 2.5 cm) occur on drusy quartz with cuboctahedral **galena**.

Gochenour's had something for the collector of rarities and oddities—**natrojarosite** from Palos Verdes, Los Angeles County, California. The dark red-brown crystals to 1 mm occur as druses and sprinklings of single crystals on a rusty "limonite" and gray agate matrix.

There has not been much new out of South Africa, so it was nice to see some **gaudefroyite** from the N'Chwaning No. 2 mine in the booth of *Ordway's Minerals*. The black prismatic crystals associated with andradite, hausmanite and barite were found in August of 1996. The crystals form clusters to 12 cm.

Dave Bunk recently returned from a trip to Pakistan with a lot of nice material. There were some impressive **fluorapatites** from Niaslo, Shigar Valley, Baltistan—to 5 cm long and yellow in color. He also had **rutilated quartz** crystals to 4 cm on matrix to 15 cm from Hashoopi, Northern Areas; and nice **elbaite** with the typical albite jackets from the classic locality of Stak Nala, as singles and fine clusters. Fine **schorl** crystals with albite were available from Balachi, Northern Areas, along with very attractive **quartz** with actinolite inclusions from Alchuri, Shigar Valley, Baltistan. Dave also managed to return with some very fine **elbaites** from Nuristan, Afghanistan. The crystals are very gemmy and bicolored pink and green.

Sandor Fuss (who works for the *Collector's Edge*) showed me a fine sample from the latest **rhodochrosite** finds at the Sweet Home mine, Alma, Colorado. It seems that several pockets were hit during the 1996 collecting season, including the "Hedgehog pocket" which produced the beautiful specimen that Sandor showed me. The crystals are quite gemmy and sharp, with a good red color, and on the typical matrix of quartz and sulfides.

I am sure there are a few things I missed, or forgot. In reading other people's reports on the same shows that I have been to, I am always amazed at the differences in what was seen. I sometimes wonder if we were at the same show. It just shows that we all have a different focus, and I am sure that serendipity plays a role too.

Tucson Show 1997

by Thomas Moore

[Feb. 1—16]

It's hard to over-describe how much pure pleasure showgoers generally find at Tucson each year, how much pure fun they have—

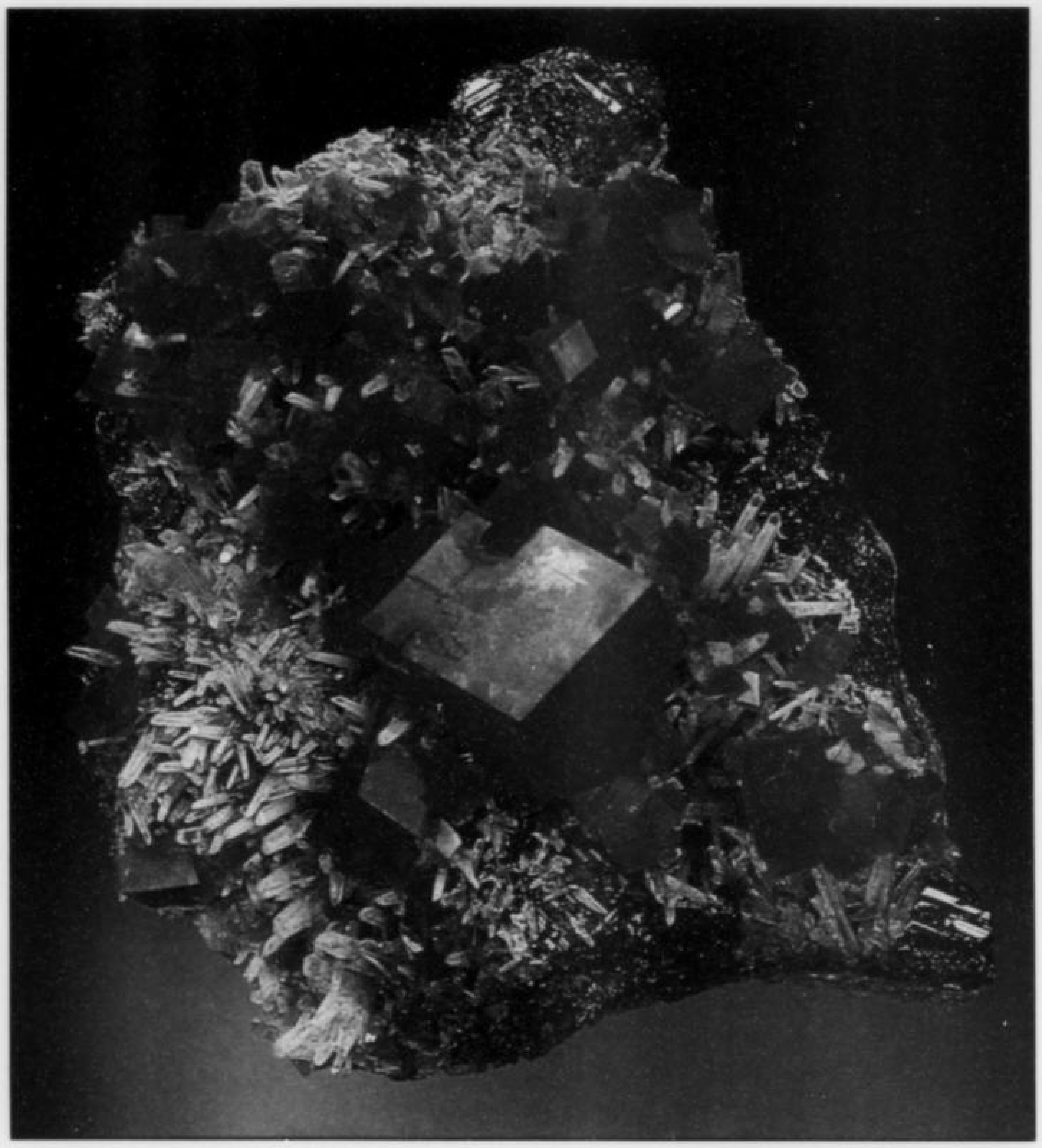

Figure 1. Rhodochrosite with quartz, 11.3 cm, from the Sweet Home mine near Alma, Colorado. Collector's Edge specimen, Jeff Scovil photo.

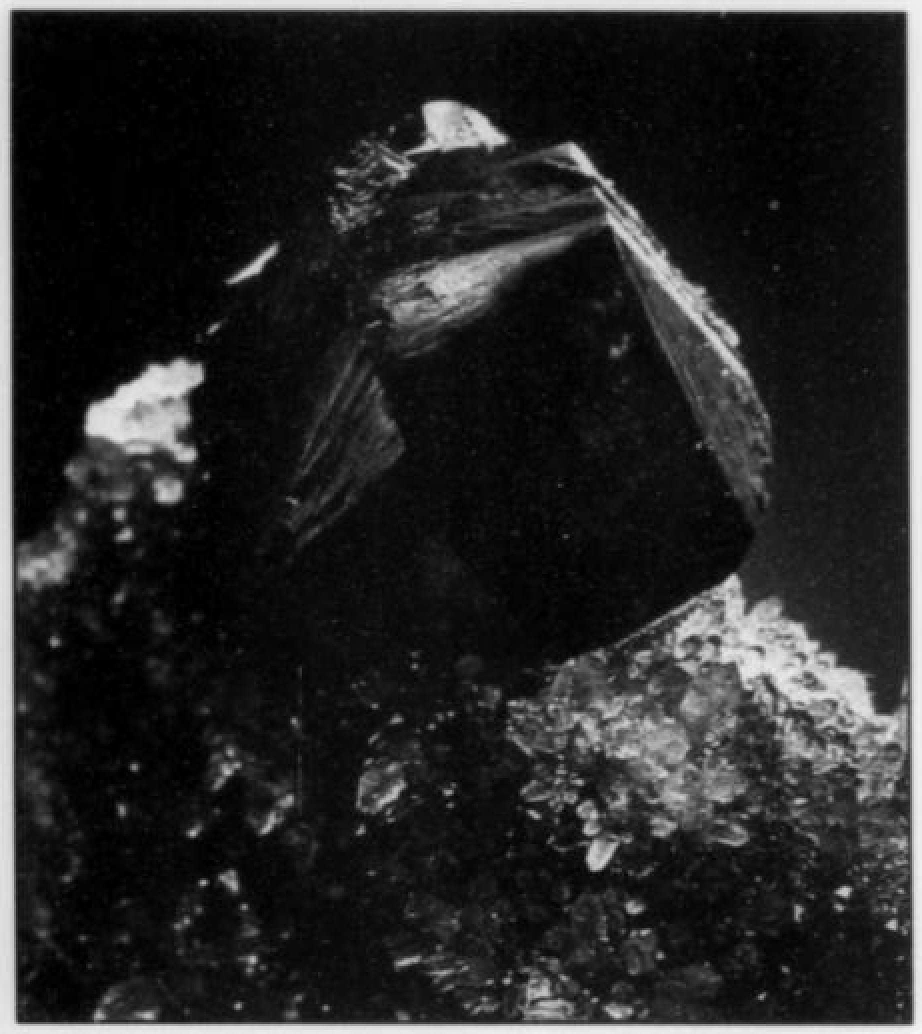

Figure 2. Sphalerite crystal, 1.4 cm, from Shizhuyan, Chiangning, Hunan Province, China. *Roberts Minerals* specimen, Jeff Scovil photo.

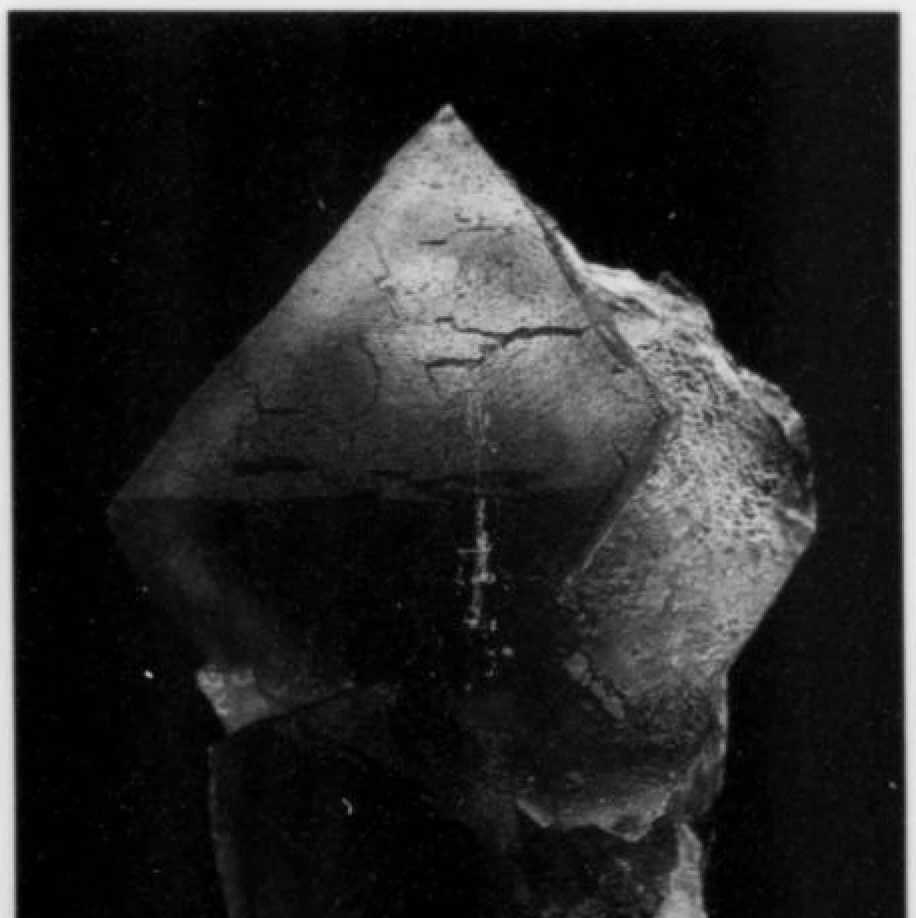

Figure 3. Fluorite, 6.2 cm, from Hsianghua Ridge, Hunan Province, china. *Roberts Minerals* specimen, now in the George Holloway collection, Jeff Scovil photo.

Figure 4. Gaudefroyite crystal group, 4 cm, from the N'Chwaning No. 2 mine near Kuruman, South Africa. *Ordway's Minerals* specimen, now in the John Watson collection, Jeff Scovil photo.

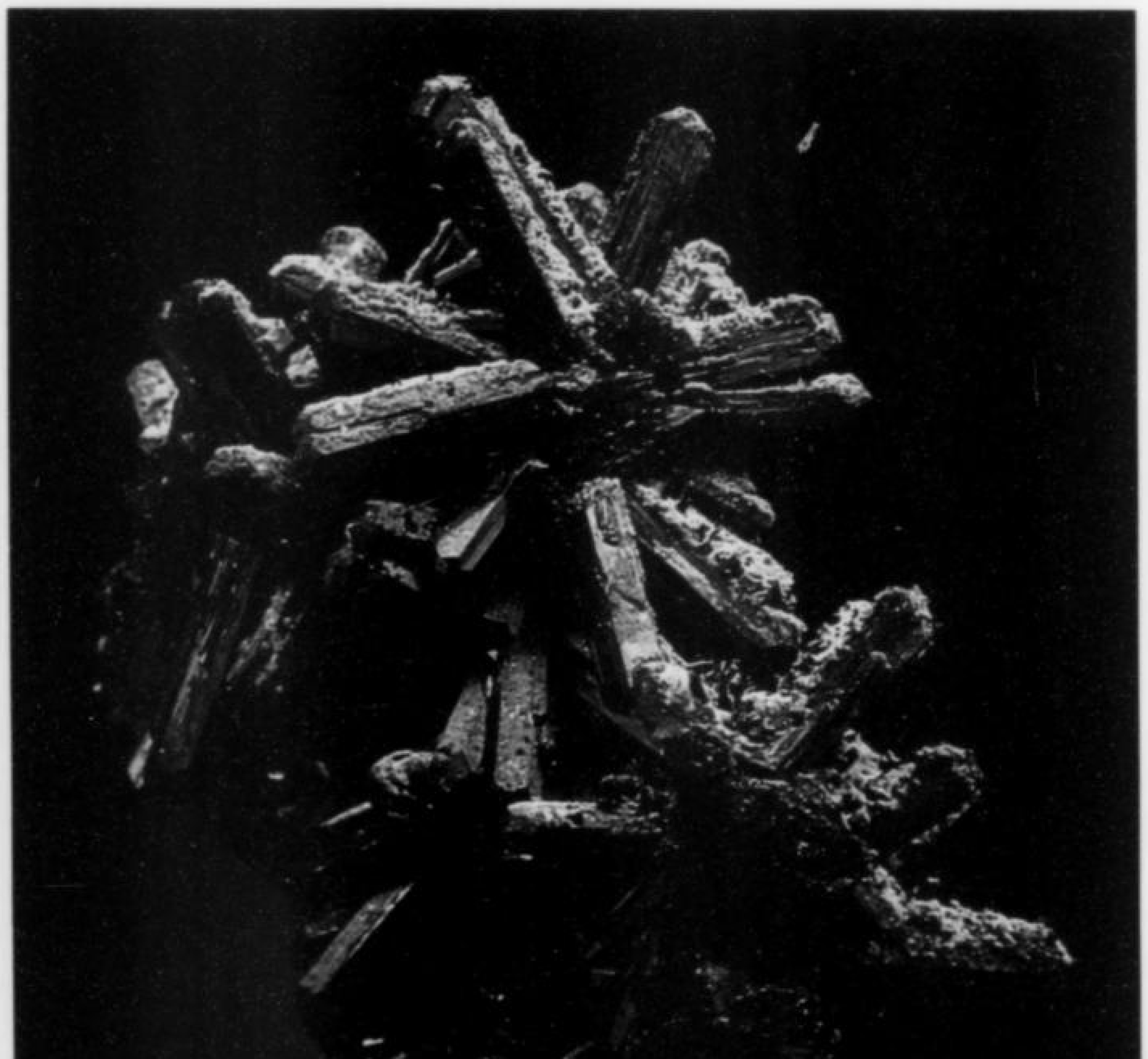

Figure 5. Galkhaite crystals to 3 mm from the Getchell mine, Humboldt County, Nevada. *Great Basin Minerals* specimen, Jeff Scovil photo.

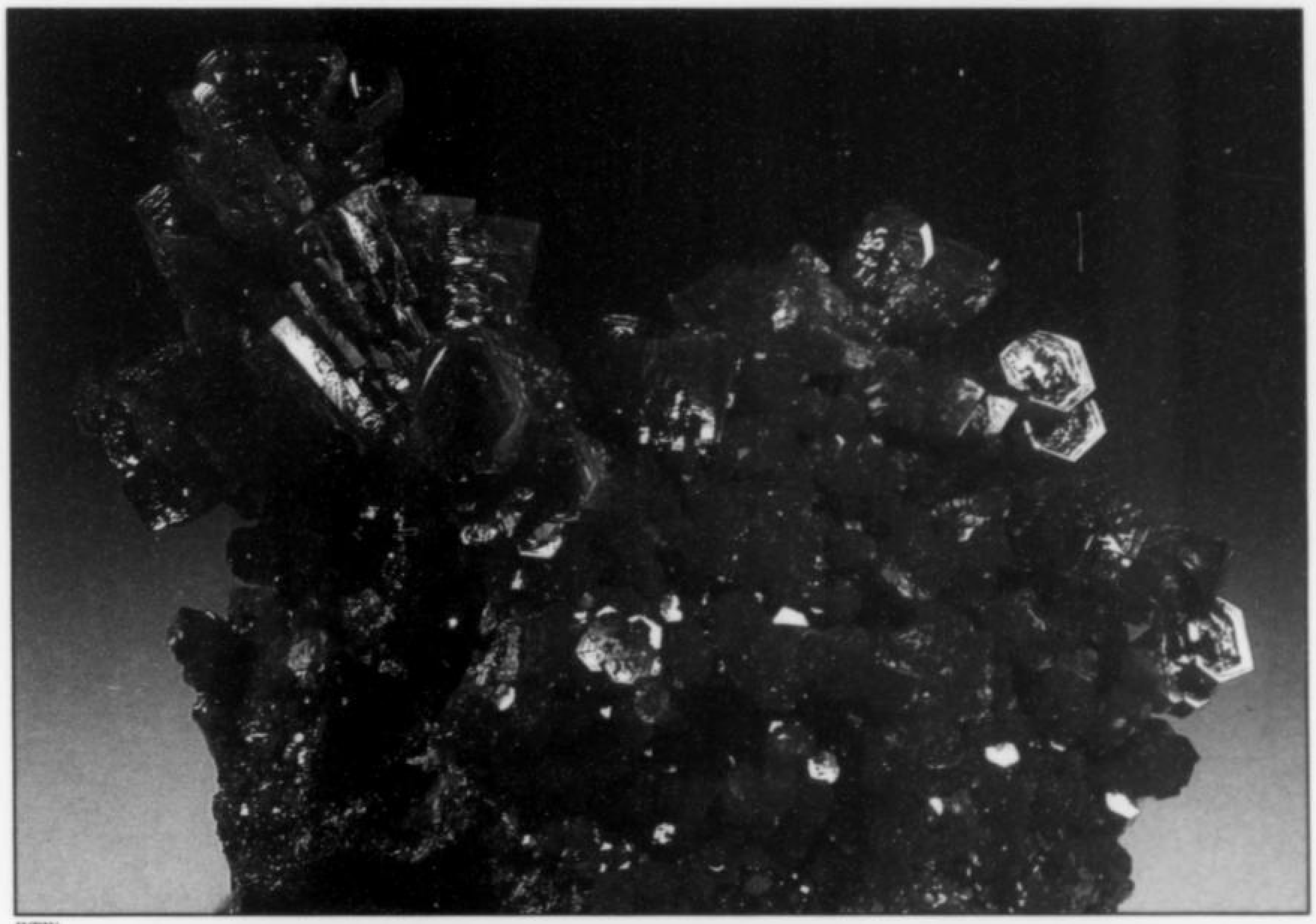

Figure 6. Vanadinite crystal group, 5 cm across, collected in late 1996 by George Godas at the North Geronimo mine, La Paz County, Arizona.

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Figure 7. Vanadinite crystals to 1.4 cm, collected in late 1996 by George Godas at the North Geronimo mine, La Paz County, Arizona.

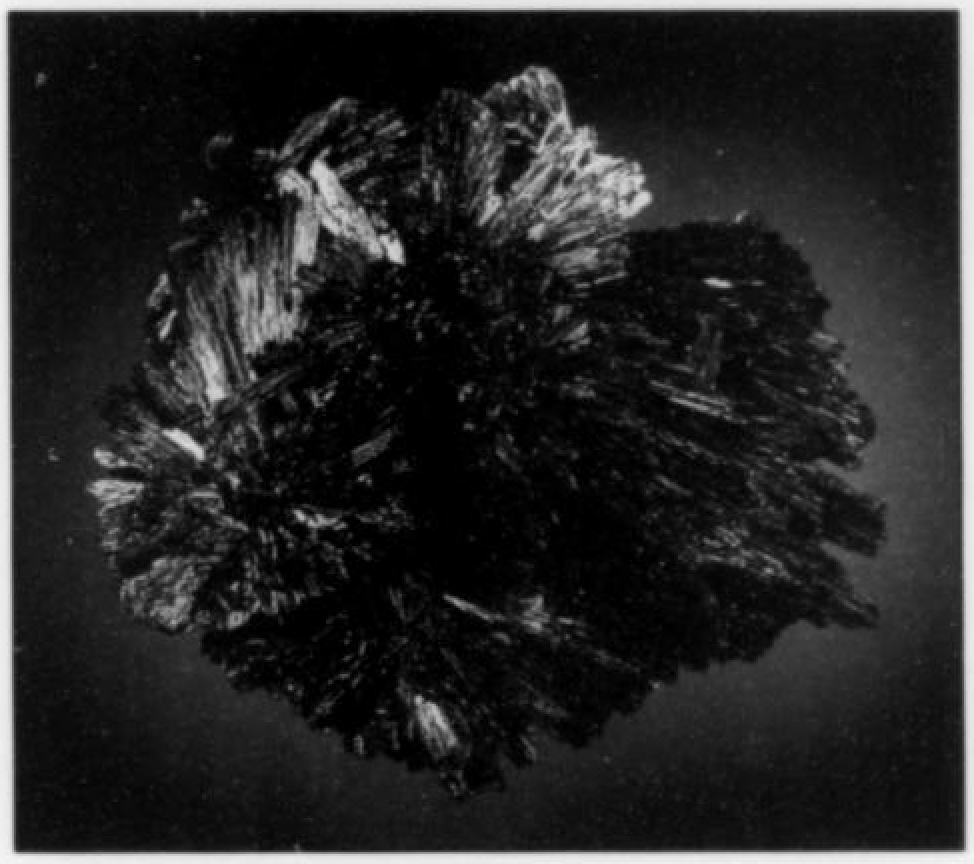
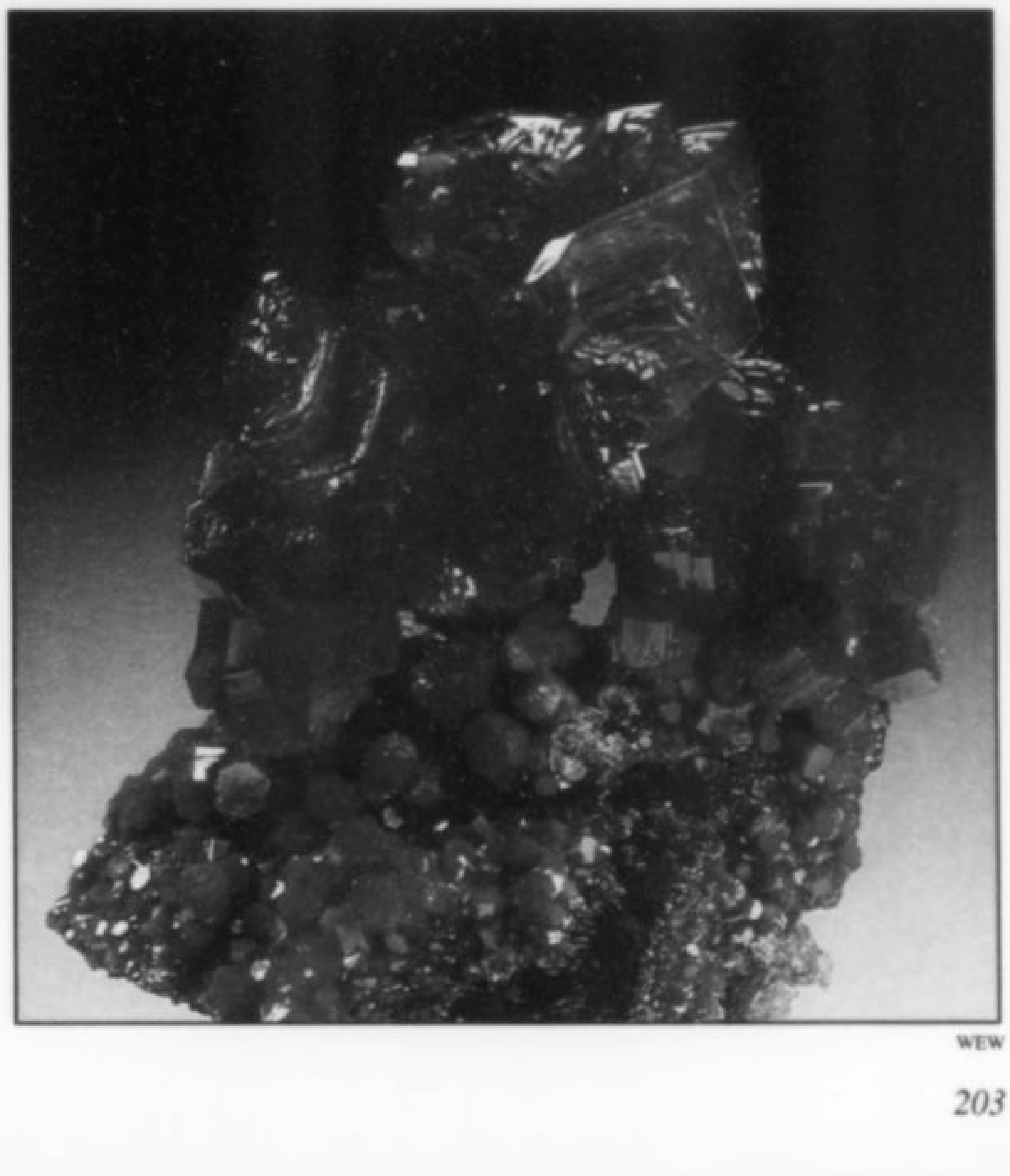


Figure 8. Goethite crystal sprays bounded by the rhombohedral shape of a 3.9 cm siderite crystal mold, collected in 1996 by Jack Buckner at the Saw Log Hold, Qui-Buc No. 1 mine, Florissant, Colorado. *Glacier Peak Minerals* specimen, George Witters collection, Jeff Scovil photo.



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and I'd stop trying, except that even the effort to do the describing is fun. I get to bang at my typewriter in this very comfortable room at the Executive Inn, while outside in the hallway I can hear mineralshow happytalk flow and ebb; and outside the building there's that dreamily dry, benign weather, and at daybreak and sunset there are exquisite washes of tourmaline light all over the brown mountains rimming the city. The sense of the impending Main Show's carefree pleasure is nice, too—carefree, that is, unless you think too closely about your budget. No show anywhere that I know of (the much smaller Ste.-Marie-aux-Mines possibly excepted) offers a more soothingly beautiful physical and social ambiance than this one.

Keep these basic premises firmly in mind while I mention a problem that intruded upon many people's Tucson Show Experience this year: the fact that the Show was more widely dispersed in time than in earlier years. Grumblings were frequently to be heard. I capitalize "Show" above because, of course, "Tucson" is many separate shows and even for those whose interest is strictly minerals there is the double feature of the Executive Inn show and the downtown "Main Show." Normally the former starts six days earlier than the latter, and the two end more or less together, but this year the motel show formally began five days earlier than usual (on Tuesday, February 4), going on for almost two weeks before ending as it always has on Sunday of the Main Show (February 16). Some earlybird dealers in the motel opened their doors earlier still, during the last week in January. Such a stretch of time made planning hard for dealers and their patrons alike, and most motel dealers were to be heard complaining of very slow business and mounting expenses during the lull between the opening rush and the period of overlap with the Main Show. This extension of showtimes was happening all over town: when I cruised out as usual to some outlying motel shows, I found that the Pueblo Inn show, having actually "jump started" sometime in January, had already closed, six days before the Main Show was to begin! And floor traffic was a little slow at the Tucson Gem and Mineral Society wholesale show, which also had begun very early, and was located in a hard-to-find corner of the Convention Center.

Promoters of the big AGTA (American Gem Trade Association) Show at the Convention Center had moved their show up on the calendar to avoid any overlap with the TGMS wholesale and retail shows. They apparently believed that "cross-over traffic"—people coming for one show and deciding to visit the other as well—would be negligible. This proved to be a serious miscalculation; the AGTA Show reportedly suffered a significant drop in attendance. Meanwhile, retail dealers at the TGMS Show worried about the same thing happening, that too many buyers would come to town early and then be forced to leave before the Main Show even opened. As it turned out, however, most were pleasantly surprised and enjoyed very good sales. Attendance at the Convention Center was about equal to the previous year, something over 30,000. Of course, more cross-over from gem buyers would have boosted sales even more. Negotiations are no doubt under way regarding an adjustment in next year's dates for the Gem shows. We'll have to wait and see what happens.

This seems a good place at which to recognize and salute the vast, tricky organizational efforts that necessarily go into making any *one* large show succeed. A lot of unpaid labors of love by folks of the Tucson Gem and Mineral Society, for example, lie behind every thrill a customer gets buying a good specimen, and every peak experience a visitor enjoys in front of a display case.

In the all-important *What's New in Minerals* department, anyway, all's well, and more than well. Accounts, below, of the abundances of new things at both major mineral shows will follow a geographical tour route starting, naturally, in Arizona.

Last October, i.e. since Wendell Wilson wrote his article in Vol. 25 No. 5, a new **vanadinite** pocket was hit at the North Geronimo mine (also lately called the Pure Potential mine), La Paz County, Arizona. These vanadinite crystals, taken out by George Godas, are of very high luster, their vivid red color contrasting attractively with their brown-black matrixes. And they have a degree of transparency exceeding that of previous specimens. Individual crystals range up to 1.5 cm, the larger ones showing hopper growth such that each crystal looks like a little benched opencut mine of hexagonal outline; some thumbnails consist of several "opencut" crystals flaring up and out from a point of mutual attachment. Mark Hay and Dick Morris of *Arizona Minerals* (phone 602-840-5552) had more than 20 flats of specimens of all sizes, including many showing the more conventional simple hexagonal prisms on matrix.

From August through November of 1996, at the 900-foot level of the old Yellow Pine mine near Goodsprings, Nevada, some excellent specimens of **hydrozincite** were recovered. This species is normally of little specimen interest, since it usually forms unattractive white coatings, or white massive lumps. But these new specimens feature dense, artinite-like coatings of shining acicular microcrystals, such that a 10 x 20-cm matrix specimen is fairly nice-looking. Jordi Fabre had a handful of such cabinet pieces, and these are all we are liable to see, as the Yellow Pine, a lead-zinc mine, ceased operations in about 1950. The matrix pieces also contain small crystals of hemimorphite, calcite and plattnerite.

Joe Dorris of *Glacier Peak Minerals* is very proud of some dozen pseudomorph specimens collected last year by Jack Buckner at the Saw Log Hole, Qui-Buc No. 1 mine, Florissant, Teller County, Colorado. They are **goethite pseudomorphs after siderite**, in floater clusters, mostly of miniature size; they consist of loosely interlocked sprays of lustrous red-brown acicular goethite. Of course, goethite of this type is long familiar from Florissant, and at first glance these specimens don't look too special—but you have to regard them carefully and at some distance to see that the *overall* exterior shape or boundary is unmistakably rhombohedral. These are probably filled-in solution cavities left when large siderite crystals dissolved away, and goethite infiltrated through the enclosing clay to do its own, very separate thing. A 4 x 4-cm specimen went for about $100.

In another Executive Inn room, Kevin Ponzio of *Earth Prospect & Mining Company* (P.O. Box 44, Plymouth, WI) was displaying Colorado **diamonds** from the Sloan 2 Diatreme, State Line District, Laramie County. Exactly 8,842 diamond crystals, 327 carats all together, had been recovered by processing 2,710 metric tons of kimberlite as of September 1994, when the mining company, Royalstar Resources Ltd., went bankrupt and ceased operations. The diamonds are 1-mm to 2-mm octahedrons, most of them of cutting quality. On display in the flat glass showcase was a faceted 2.17-carat stone from a 5-carat crystal, by far the largest found.

Although the Commodore mine at Creede, Colorado, has long been closed, some nice material collected in the 1960's was being marketed at the Main Show by the *Columbine Mineral Shop* (P.O. Box 541, Ouray, CO 81427). Five flats held miniature and small cabinet-sized matrix specimens of **sphalerite** in resinously translucent orange-brown crystals to 5 mm, with **chalcopyrite** crystals. Two flats held peculiar-looking specimens of hopper **galena** crystals from the Commodore mine. The simple cubes reach 3 cm, and occur intergrown in loose groups or on crystalline sphalerite matrix; all galena crystals are fairly lustrous but a bit rounded, looking a little melted, with light hoppering on most faces. Finally, a single flat held miniatures of an odd kind of **siderite** recently mined at the Black Cloud mine, Leadville: the crystals are flat, slightly rounded and earlike, hexagonal tablets to 4 mm, sometimes grown in little rosettes, sometimes scattered singly over massive pyrite. They are translucent down the short axis but have a thin frostedness on their edges. A cute 4 x 4-cm piece costs only about $15.

Tom Loomis (*Matrix Minerals*, 31 S. Evelyn, Tucson, AZ 85710), who specializes in Black Hill minerals, had a new find in his room at the Ramada Inn which generated some excitement among species collectors: self-collected **sincosite** with **minyulite** from the Ross Hannibal mine, Lawrence County, South Dakota. Sincosite, a calcium-vanadium phosphate, is not usually found in collector-quality specimens, but Tom had flats of gray matrix pieces covered on fissure faces with dense sprinklings of square, medium green tablets to 2 or 3 mm looking *exactly* like pale green metatorbernite. Adding some extra class to the occurrence are the occasional sprays of white acicular minyulite (a potassium-aluminum phosphate) to 5 or 8 mm. Among his other stock Tom also had a fine **mimetite** crystal group from the Mt. Bonnie mine, Northern Territories, Australia; the pale yellow, blocky hexagonal crystals measure up to 1.5 cm across.

I have reported before on the large, dark greenish black crystals of **spinel** from Macdonald Island, Northwest Territories, Canada, near the south coast of Baffin Island—but as collecting there is infrequent, the remote site being one of the most formidable of the mineralized ends of the earth, a new lot found by Brad Wilson in the summer of 1996 is noteworthy. The spinel crystals are dodecahedron/octahedron combinations, slightly rounded but really quite sharp at their best, in miniature to small cabinet-sized clusters with sharp gray-green **diopside** crystals to 2.5 cm. They were ushered to Tucson by Beau Gordon of *Jendon Minerals*.

Canadian dealer Rod Tyson (*Tyson's Minerals*) had a classic from farther south: **wire silver** from the old Keeley mine, South Lorraine Township, Ontario—a locality closed in the mid-1930's. This was a pre-mortem lot, collected in 1930 and just surfacing onto the market. The loose, thumbnail-sized single curls of silver average about 3 mm thick; if straightened out with pliers (ugh), many of the wires would perhaps be 10 cm long, but in fact they are beautifully, classically looped and twisted and curled. The luster is medium-bright, there are no associated species, and prices for the best pieces are in the low three figures.

Jendon Minerals (again) had a few—fewer than ten—lovely thumbnails and small miniatures of an association I'd not seen before: **citrine quartz** crystals clinging onto the prism faces of **danburite** crystals of the typical colorless, transparent, chisel-terminated type, from La Aurora mine, Charcas, Mexico. Both species are pretty, the citrine being palest yellow-orange and transparent, its sharp crystals reaching 2 cm.

Epidote from Castro Virreyna, Huancavelica, Peru, is now plentiful on the market, and comes in all sizes. The typical habit is as long, subparallel sprays of bright, thin crystals (though not so thin as to fail to show good terminations with visible twinning planes); but the monster matrix pieces covered with epidote sprays, fans, and coxcomb-crests over large quartz crystals are the real aristocrats. At this show, the biggest (and lowest-price-scaled) hoard of this epidote was to be found in a red-and-white-striped tent outside the Days Inn, where a Frenchman had many flats of thumbnails and miniatures, plus a tabletop full of matrix specimens up to 40 cm across. Each of the two best of these giants was priced at $15,000, which didn't even seem excessive to me, as both easily rank with any world-class "museum" specimens of epidote from other places.

Also down in a circus-like tent in these nether areas of Showland were Felix Rocha and Gladys Reyna of *Mining Center* (Diagonal 380-308, Kennedy Building, Lima 18, Peru), with some surprising and promising *new* Peruvian items. From the Lily mine in Ica Province have lately been coming huge masses of **axinite** crystals, dull of luster and color (an opaque grayish brown), but with axinite blades in parallel-growth aggregates to 8 cm long, some standing up nicely from massive and mashed-crystal matrixes. Much of this stuff had been sold by the time I arrived, and much, therefore, is probably better, more colorful and translucent than what I saw; "more to come," Felix vouches. From another (undisclosed) locality in Peru have been coming a few large, gemmy orange **scheelite** crystals, sharp and to 6 cm across, resembling the Chinese specimens; Felix had a huge faceted gem cut from one of these crystals, and a beautiful object it is.

One of the names which has appeared most frequently in this publication over the years is that of Terry Szenics, mineralogist and career field collector, who seems to have been everywhere that *is* anywhere, mineralogically, over the past four decades or so. Recognition came, in 1994, with the preliminary description of **szenicsite**, the beautiful deep green copper analog of wulfenite (chemically, if not structurally), from material collected by Terry at the Jardinera #1 mine, Inca de Oro, Chile. The mine is now closed, and no new material has come out since Terry's original find on January 11, 1993—but at the wholesale show this year he was selling the rest of the best of the original lot. The szenicsite comes in lustrous, zeunerite-colored blades to 1 x 3-cm, these growing in platy bundles on a brown matrix of altered chalcocite ore, with brochantite, and **powellite** in crystals and as 1-cm pseudomorphs after molybdenite "books." The cabinet specimens reach up to 12 cm across. [Ed. Note: The formal description of szenicsite has been submitted to the *Mineralogical Record* and will be published shortly.]

For rare-mineral devotees (like himself), Terry also was offering a few small miniatures with robin's-egg blue areas of 1 mm crystals of **christelite**—a copper-zinc sulfate with chlorine, described in 1996—with microcrystallized **zincian paratacamite** on the same pieces, from the San Francisco mine, Antofagasta, Chile. And from the Veta Negra mine, Pampa Larga district, Tierra Amarilla, Chile, he had a single 6-cm matrix with **schneiderhöhnite** (normally thought of as strictly a Tsumeb species), in lustrous black microcrystals covering a 3-cm area in an open seam in altered ore. Only four or five pieces with schneiderhöhnite were found, Terry said, on the dump of this mine, which closed in the mid-1960's. Terry's partner is Harvey G. Siegel (*Aurora Mineral Corporation*, 679 S. Ocean Ave., Freeport, NY 11520); an inquiry there will bring further information on rare minerals from Chile.

A one-of-a-kind old specimen from Bolivia begs mention: it is a 15 x 17-cm cluster of **siderite** crystals from Tazna, collected about 80 years ago, in the keeping of John Attard of *Attard's Minerals* (P.O. Box 17263, San Diego, CA 92177). On this great beast, two siderite crystals, each about 6 cm across with almost equal development of the positive and negative rhombohedrons, rest on a solid bed of 2.5-cm siderite crystals on rock matrix. The color is a very attractive dark yellowish brown, with translucency and even some gemminess along the edges of the big crystals; all faces are slightly rough with waxy-looking growth hillocks. This has to be one of the finest siderite specimens of all time.

One of this year's only major mentionables from Brazil is a teasing trickle of fine new **milarite** crystals from Jaguaraçu, Minas Gerais. An article in Vol. 25, p. 165 showed how dramatic these can be: both the older examples and these new crystals are very pale, slightly bulging, yellow-green hexagonal prisms, often with clinging bits of white pegmatitic matrix, sitting up smartly alone or in groups of two or three. A topmost zone of each crystal, just under the flat basal face, is often transparent, while the rest is milky inside but silkily lustrous outside. Bryan Lees (of *Collector's Edge*) had the biggest milarite crystal around: 4.5 cm high and 2 cm thick.

Figure 9. Diamond crystals to 5 mm from Sloan 2 diatreme, Sloan Ranch, Larimer County, Colorado. *Earth Prospect and Mining* specimens, Jeff Scovil photo.

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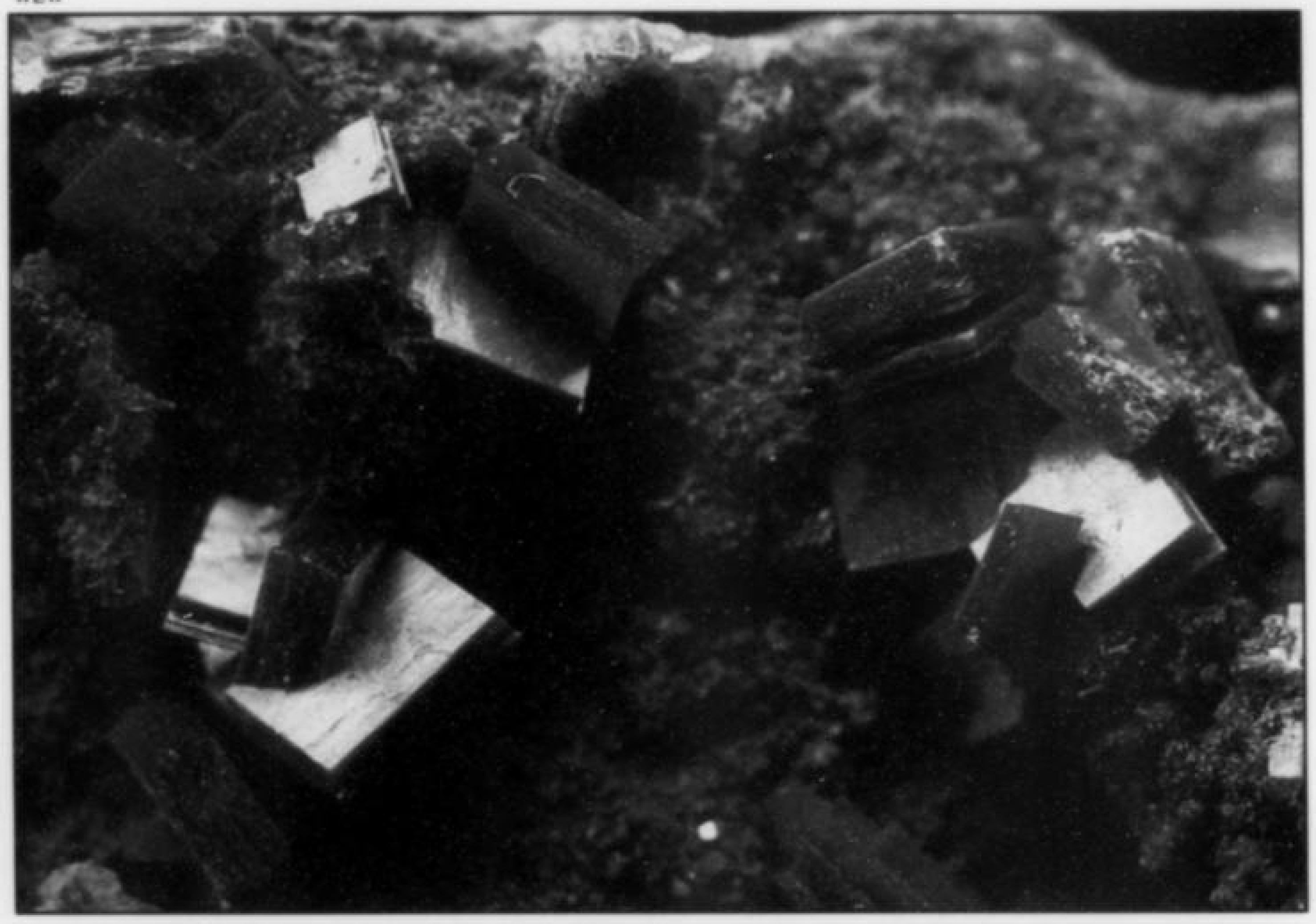

Figure 10. Sincosite crystals to 1.5 mm from the Ross Hannibal mine, Lawrence County, South Dakota. Thomas Loomis collection.

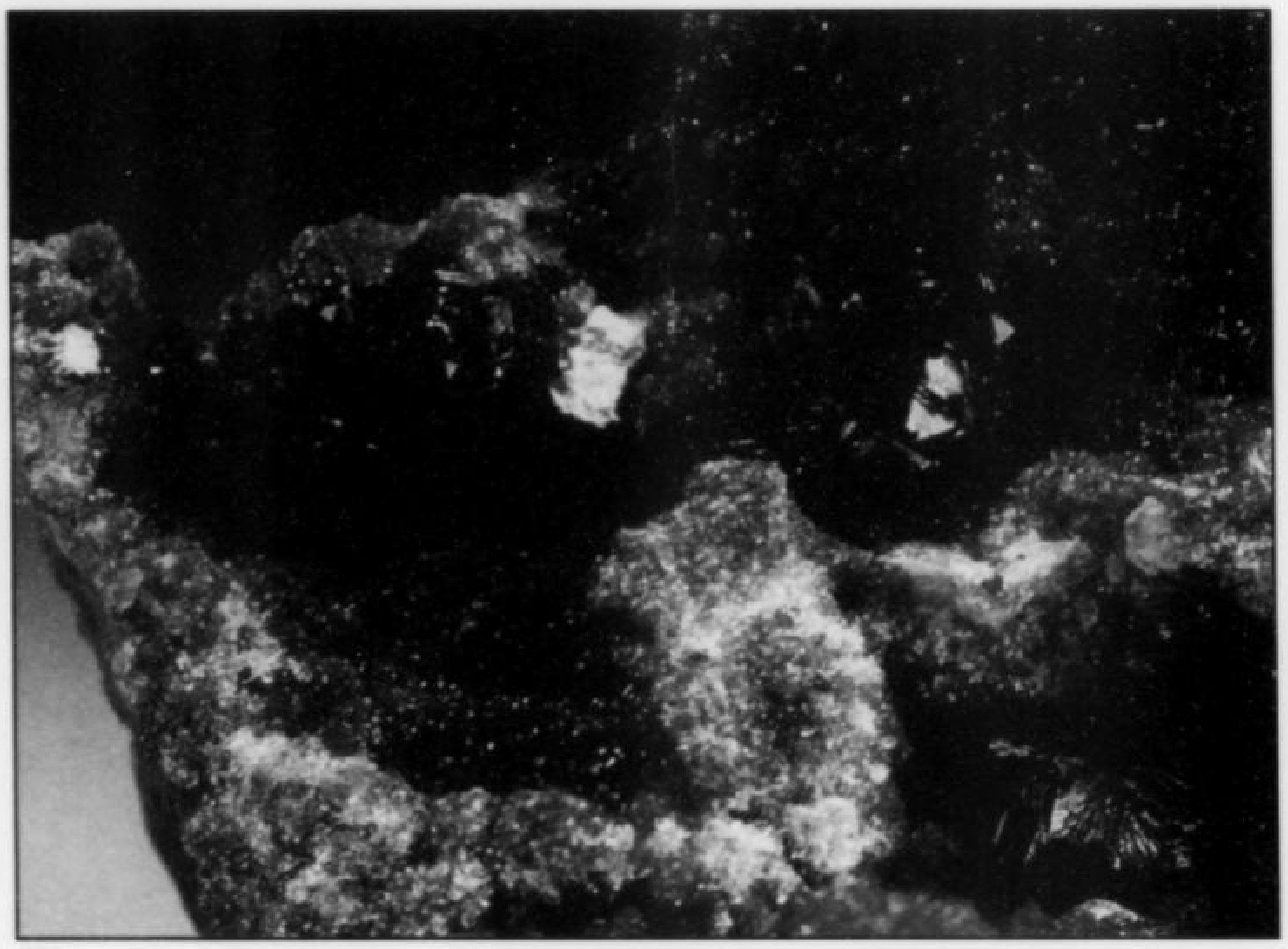

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Figure 12. Black schneiderhöhnite crystal clusters to 1 cm, on matrix, from the Pampa Larga district, Tierra Amarilla, Chile. Terry Szenics specimen.

Figure 11. Ferroaxinite crystal group, 5.9 cm, from Ica, Ica Province, Peru. *Blue Sky Mining* specimen, Jeff Scovil photo.

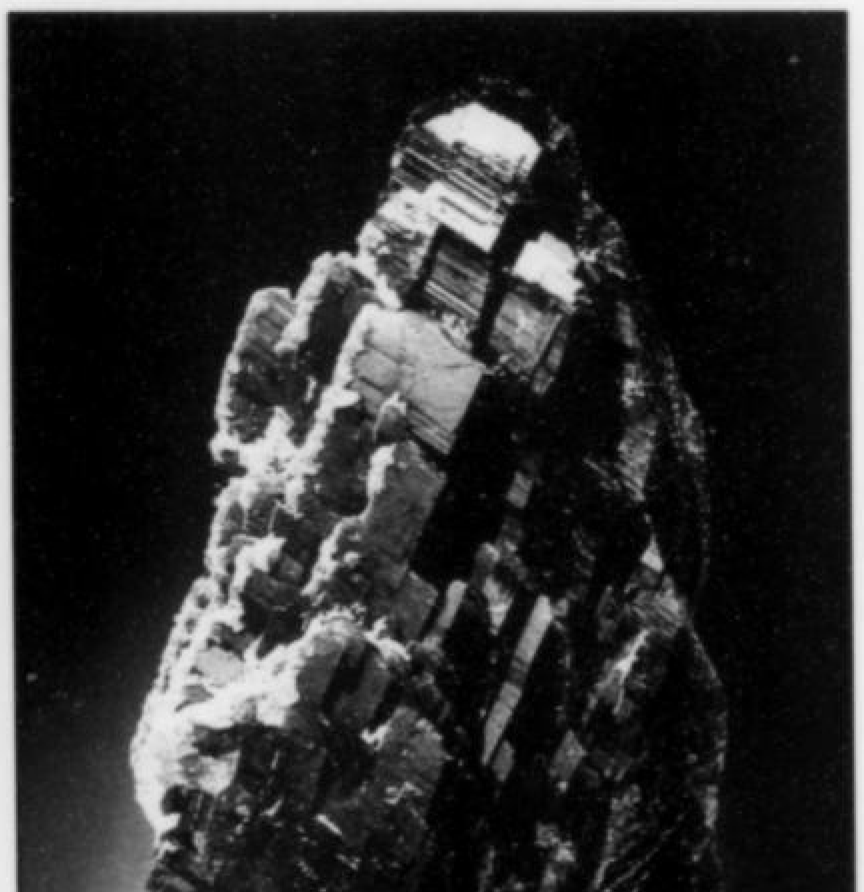

Figure 13. Large siderite crystal group, 16 cm across, from Tazna, Bolivia. John Attard specimen, Jeff Scovil photo.

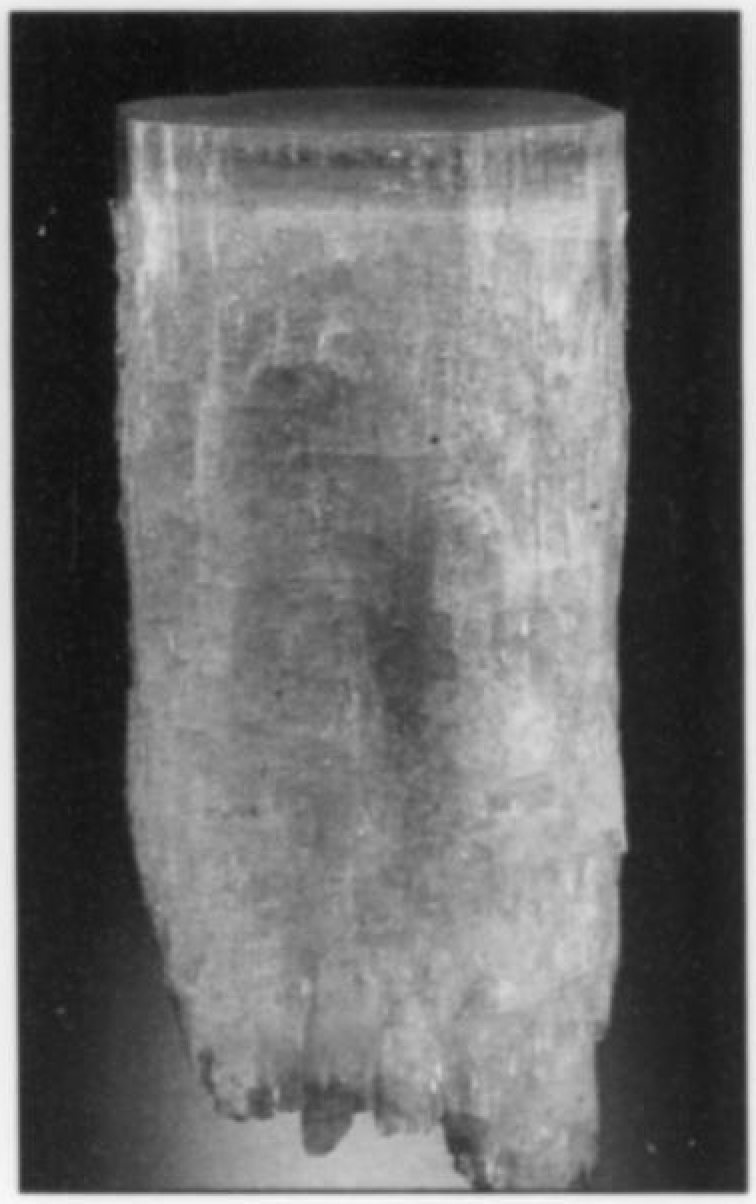

Figure 14. Milarite crystal, 4.3 cm, from the Jaguaraçu pegmatite, Minas Gerais, Brazil. *Collector's Edge* specimen, Jeff Scovil photo.

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Figure 15. Pink hureaulite crystals and rounded crystal clusters on quartz with dark brown-green reddingite, 10 cm across from the Joca mine near Galiliea, Minas Gerais, Brazil. Carlos Barbosa specimen, now in the Terry Szenics collection.

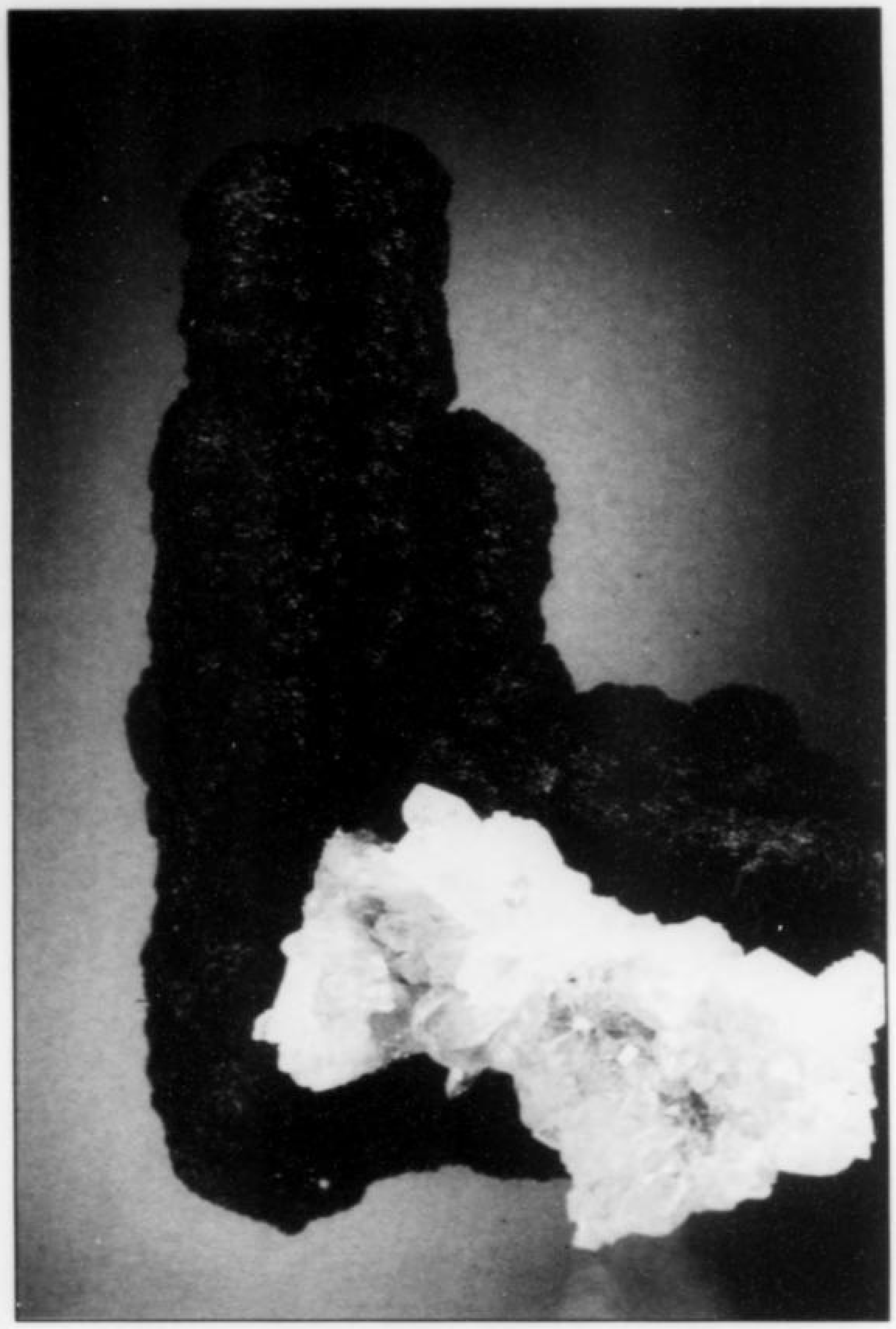

Figure 16. **Botryoidal/stalactitic schorl, 5.7 cm, from Santa Cruz, Sonora, Mexico. Blue Sky Mining specimen, Jeff Scovil photo.**

Carlos Barbosa had a few extremely fine cabinet specimens of **hureaulite** with **reddingite** from the Joca mine near Galileia, Minas Gerais, Brazil. These first began to surface a couple of years ago, as relatively small specimens, but the early birds in Carlos's room at the Executive Inn this year found these big ones (to 10 cm), which are probably the finest known examples of the species.

Scott Williams Mineral Company (P.O. Box 48, Oberlin, KS 67749) had an Executive Inn room tastefully furnished with plenty of fairly good **boracite** specimens from the Boulby mine, Loftus, England (see the article in Vol. 27, p. 163); better yet, there were also 25 specimens from a mid-1980's find of **ericaite** (which forms a series with boracite but is far rarer) in the Boulby. In a handful of thumbnails and small miniatures, the ericaite forms sharp, pale to dark brown, compound cubic crystals to 1 cm, some very lustrous, embedded in pink sylvite. The same dealership had perhaps 20 specimens, 5 cm to 12 cm across, of nice **dolomite** from the Auchenmore quarry, Sligo, Ireland. These have black shale matrix with solid coatings of very pale pink compound "saddled" rhombohedrons to 1.5 cm individually, some lightly sprinkled with tiny chalcopyrite crystals. They resemble Tri-State dolomite specimens except that the crystals are much more radically twisted, as if the saddles had been ridden, or left out in the rain, too long.

From Spain, Jordi Fabre had **allanite-(La)** (just verified as a new species) from the skarn zone of an old iron mine, now closed, at Nueva Vizcaya, Burguillos del Cerro, Badajoz. Found on the dumps in 1990, these specimens at first were simply called allanite, and indeed they look typical, with medium-lustrous black terminated prisms to 3 cm long associated with magnetite crystals. About 100 good-quality pieces were found, from thumbnails to several of large cabinet size. Jordi also had many specimens of the rare pyrite-group mineral **villamaninite**, in octahedral crystals to several millimeters from the type locality at Villamanin, Spain.

Sharing a small stand at the Main Show with the German magazine *Lapis* was a pleasant German surprise: about 20 excellent **pyromorphite** specimens from a locality new to me, the Vereinigter Bastenberg und Dörnberg mine, Ramsbeck, Sauerland, Nordrhein-Westfalen. The mine closed in 1973, but Reinhard Fricke of *Mineralien A. und R. Fricke* (In der Aue, 57a, 58640 Iserlohn, Germany) obtained this lot only three months ago. Unlike their famous brown Bad Ems *Brüdern,* these pyromorphite crystals are of a very bright yellow-green color, in hexagonal prisms to 1 cm, with a few of the larger ones showing slight hopper growth. Small thumbnail crystals are without matrix, but the larger specimens (up to 5 x 5 cm) consist of crystals nicely sprinkled or bunched on chunks of limonite/quartz gossan.

Talk about a good day in the field: in the summer of 1995, lucky (and undoubtedly skillful) Italian field collector Riccardo Prato found the best **gold** ever seen or imagined to come from an ancient prospect called Brusson, in the Aosta Valley, northwestern Italy. There were nine specimens in all; the two best are now in museums in Torino and Milano, but #3 is a 4 x 8-cm specimen, the bottom half of which is massive milky quartz, and the top half a branching, wormy mass of crystallized gold etched out of the quartz. The luster is very bright, the overall presentation dramatic, the price a more than reasonable $7000. Also in Tucson was a 6 x 10-cm quartz matrix with vivid branching gold covering a 3 x 5-cm area across the top. The dealership is *L. G. Gemme* (laboratorio via Speronari 5, 20123 Milano, Italy).

Alexander Dikov of *Intergeoresource Ltd.* (1404 Sofia Box 66, Bulgaria) had a few tantalizing specimens of brown Bulgarian **pyromorphite** in Tucson last year, but nothing like the quantities or qualities he had this time: about 100 cabinet specimens, and many many miniatures and thumbnails, all collected during this past year. The locality is the Zvezdel mine, East Rhodope Mountains, Bulgaria—a presently active lead-zinc mine *not* in the famous Madan district, but in mineralized volcanic rocks 100 kilometers away. The pyromorphite is pale to medium brown, with crystals in bright jumbled clusters on matrix of massive galena, sphalerite, tennantite, and drusy quartz, with sparse wire silver. A first generation of pyromorphite makes thin prismatic crystals; a later generation makes sharp hexagonal prisms to 1 x 2 cm on the larger matrix specimens. As this is a deeply oxidized zone in an active mine, more specimens may appear. Oh yes, and Dr. Dikov's room also harbored swarms of nice thumbnail and miniature-sized **orthoclase and sanidine** Carlsbad-twin floaters collected in 1996 from Osogovo Mountain, Kjustendil, Bulgaria; the orthoclase is pinkish, the sanidine gray-white.

There are two mineralogical flashes out of Morocco. At the Main Show, Ernesto Ossola (8, rue de Luxembourg, 30140 Anduze, France) was proudly showing some fine self-collected specimens of **nickeline** from Ait Ahmane and **gersdorffite** from Bou Azzer. The nickeline occurs as rough 1.5-cm platy crystals on massive sulfide matrixes, and there are sparkling metallic gray microcrystals on the crystal surfaces, so that his 4 x 6-cm specimen, for example, is rather attractive for the species. The gersdorffite comes as good, sharp, blocky, tin-white crystals to 5 mm on massive gersdorffite with green stains of annabergite. Seems that it's been awhile since any metallic minerals in such good crystals have come from these parts.

The second Moroccan flash might strike a special chord with readers of this publication . . . for this show saw the first marketing of specimens of **wendwilsonite**. This very rare species, named for our editor and publisher, was described in the *American Mineralogist* in 1987; Bou Azzer is one of the two type localities (the other: Franklin, New Jersey). The story goes that the late Howard Belsky returned from Morocco in 1978 with some hunks of ore having shallow open seams showing small crystals of a purplish red mineral thought to be roselite, then stored the hunks in his basement in Brooklyn. Last year, Josef Vajdak of *Pequa Rare Minerals*, Frantisek Veselovsky and Petr Ondrus of the Czech Geological Survey in Prague analyzed the specimens and found that eight out of twelve were actually the Mg-analog wendwilsonite. Only chemical analysis can tell the difference between the two species; they are visually indistinguishable and even have an identical X-ray pattern. Each individual specimen must be analyzed, and by far the vast majority of specimens checked in the past have proven to be roselite.

In his motel room at the E.I., Josef (*Pequa Rare Minerals*, 342 Forest Ave., Massapequa, NY 11758-5707) had several miniature-size to small cabinet-size wendwilsonite specimens and two good thumbnails with bright maroon crystals to 2 or 3 mm covering dolomite-magnesite. These are clearly the best known specimens of the species, and would be quite attractive even for roselite.

Last December the intrepid Alain Carion (92 rue St-Louis-en-L'Ile, 75004 Paris, France) returned to the White Desert, Egypt, where he'd collected the big mahogany-carved-looking pseudomorph groups of hematite after marcasite which I described last year. On this trip, near the Farafra Oasis, he hit more **hematite after marcasite** groups, but of strikingly different aspect: dark brown as before, less mahogany-lustrous, but even more appealing in form. They are arborescent spears (like those made sometimes by native silver), either floating singly or forming starbursts or (more rarely) grown symmetrically around an apparent 4-fold axis. These brown flower-like groups are mostly thumbnails and miniatures, plus a few larger ones.

There was more **tanzanite** (= blue zoisite) around this year, as the quarries at Merelani continue to produce specimens. Werner Radl and his partner H. Bocksrocker (*Bora Gems*, Ketterschwangerstr. 12, D-87668 Rieden, Germany) had a nice selection of crystals at the Executive Inn and at the Main Show. But if you wanted to enjoy the experience of having your socks blown off by a mineral specimen you had to go to Wayne Thompson's room at the Executive Inn. There, amidst rows of fabulous Red Cloud wulfenites and recently mined Bunker Hill pyromorphites, stood a single, sharp, gemmy tanzanite crystal almost as big as your fist. It was one of those truly rare specimens capable of making jaws drop from across the room. Jack Halpern was the lucky buyer to walk away with it, and will now have to install a special receptacle in his home to store all of the socks that will be blown off of visitors who come to see his collection. [Note to Jack: how about bringing it back next year to exhibit? Ed.]

Gilbert Gauthier had about eight flats of nice specimens of rare uranium secondaries from Skinkolobwe, Katanga, Zaire. The mostly-miniature array came at you in brilliant yellows, greens and oranges, with **torbernite**, **carnotite** in microcrystals, excellent flat-lying yellow-green sprays of **cuprosklodowskite**, sparkling deep green spherules of **vandenbrandeite**, microcrystallized **kasolite** and **curite**, and a host of others. This, Gilbert says, is from dump material gone over by locals a few years ago, and just coming out now. And perhaps you remember the lovely hematitic phantom **quartz** from "Katonta, Zaire" I reported on two years ago from Gilbert's stand at the Main Show, and coming mostly in thumbnails then . . . well, there are big ones this time, to 12 x 12 x 15 cm. The locality, Gilbert has learned, is not Katonta but *Luena, Katanga*, Zaire, where these beautiful groups are found in a gravel quarry. Just under the rhombohedral faces of some of the quartz crystals are tiny black specks which a loupe reveals as starbursts of acicular crystals—maybe goethite? Their exact identity is undetermined as yet.

Good segue here: there's a newly emerging hematitic **quartz** occurrence in Madagascar as well, specifically a prospect called Itremo, near the town of Antala. Jordi Fabre had about 50 cabinet-size clusters of clear quartz with red hematite dustings on the outside and just inside, in zones parallel to the terminal faces; small quartz crystals nestling between the large ones are dull black with goethite coatings.

One of the most intriguing new things I saw at this show was a small number of very fine, sharp floater crystals of **phenakite**, probably from Antsirabe, Madagascar, although some spoke or muttered of a pegmatite somewhere in Zambia. At a stand outside the Days Inn was a fellow with a little box full of these thumbnail phenakites, and in an Executive Inn room with much better ones (only about 10) were Jeff and Gloria Fast of *Jeff & Gloria's Minerals* (19 Oak Knoll Rd., East Hampton, CT 06424). The crystals are of the typical fat-tabular phenakite habit (as at Mt. Antero, Colorado), in sizes ranging from 1.5 to 2.5 cm, always single and never with matrix. What's interesting is that although the phenakite is transparent and colorless (lustrous too), most of the interiors of the crystals are cloudy with grayish green, fine-grained inclusions, and the outsides have rimmings of lustrous black schorl. This clearly is a locality—once we know with certainty *what* locality—to watch for.

Jeff & Gloria also had a few Russian specimens, including a brown, razor-sharp **zircon** dipyramid about 1.6 cm across, on matrix, from Mt. Vavnbed in the Lovozero Massif, Kola Peninsula.

One long-watched area so abundantly productive over the years as to risk incurring our jadedness is the zeolite-producing traprock area of the Deccan Plateau of India; by now, even the most spectacular **stilbite**, **apophyllite**, **heulandite**, **cavansite**, **calcite** etc. specimens from here have become mere "decorator" rocks in many minds. But Berthold Ottens of *Ottens Mineralien* (Klingenbrunn-Bahnhof 24, D-94518 Spiegelau, Germany) is here to remind us that *rare* species too may reach extraordinary beauty and specimen desirability in this vast region of quarries around Bombay/Poona. Specifically, Berthold had specimens of the very rare zeolite **yugawaralite** from the Malad quarry, Bombay, which are surely the best yet found in India or anywhere else—one of the major scoops of this show, to my taste. The transparent, colorless, bladed yugawaralite crystals can reach 4 cm long singly, but they generally occur in parallel bundles to 3 cm, some of these spotted with tiny dark spheres of gyrolite or black microcrystals of babingtonite. In the Ottens room in the Executive Inn, about 75 fine thumbnails of loose bladed groups cost about $40 each, and there were some major large pieces as well. In one 15 x 15-cm flat plate of basalt, the many 2-cm yugawaralite bundles rose from a rich mulchy bed of pale green prehnite spherules, 5-mm chalky white laumontite crystals, black babingtonite spots, and drusy quartz. The Malad quarry is an old one, now surrounded by houses, so that operations have had to cease; who knows when we'll see more yugawaralite specimens like these?

In India there can also be life after zeolites; just ask Dr. Arvind Bhale of *Earth Science International* (Yasham 166/1 + 2 + 3, Aundh-Gaon, Pune-411 007, Maharashtra, India). In his Executive Inn room, Dr. Bhale was offering some new **fluorite** from a 10-year-old mine in a carbonatite at Kadipani, Gujarat. The colors of some of the 3-cm cubes are zoned purple-blue-brown-yellow, but most are yellow, and the prettiest crystals are a vibrant, transparent golden orange. The cubes cluster tightly on brown matrix, in

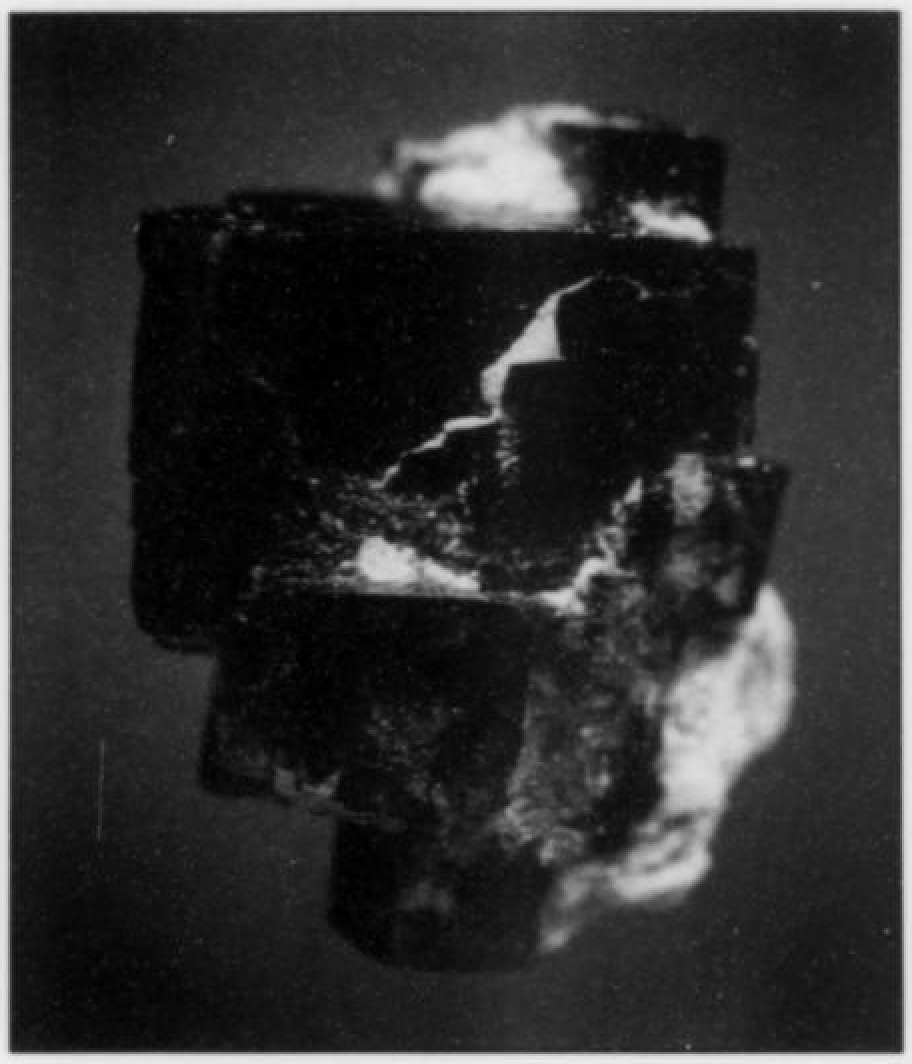

Figure 17. Ericaite crystals in parallel growth, 1.5 cm, from level 14 of the Boulby mine, Cleveland, England. *Scott Williams Minerals* specimen, Jeff Scovil photo.

Figure 18. Adamite crystal group, 7.2 cm, from a recent find at the Ojuela mine, Mapimi, Durango, Mexico. Ron Pellar collection, Jeff Scovil photo.

WEW

Figure 19. Pyromorphite crystal group, 3.2 cm, from the Vereinigter Bastenberg und Dörnberg mine, Ramsbeck, Sauerland, Nordrhein-Westfalen, Germany. Reinhard Fricke specimen.

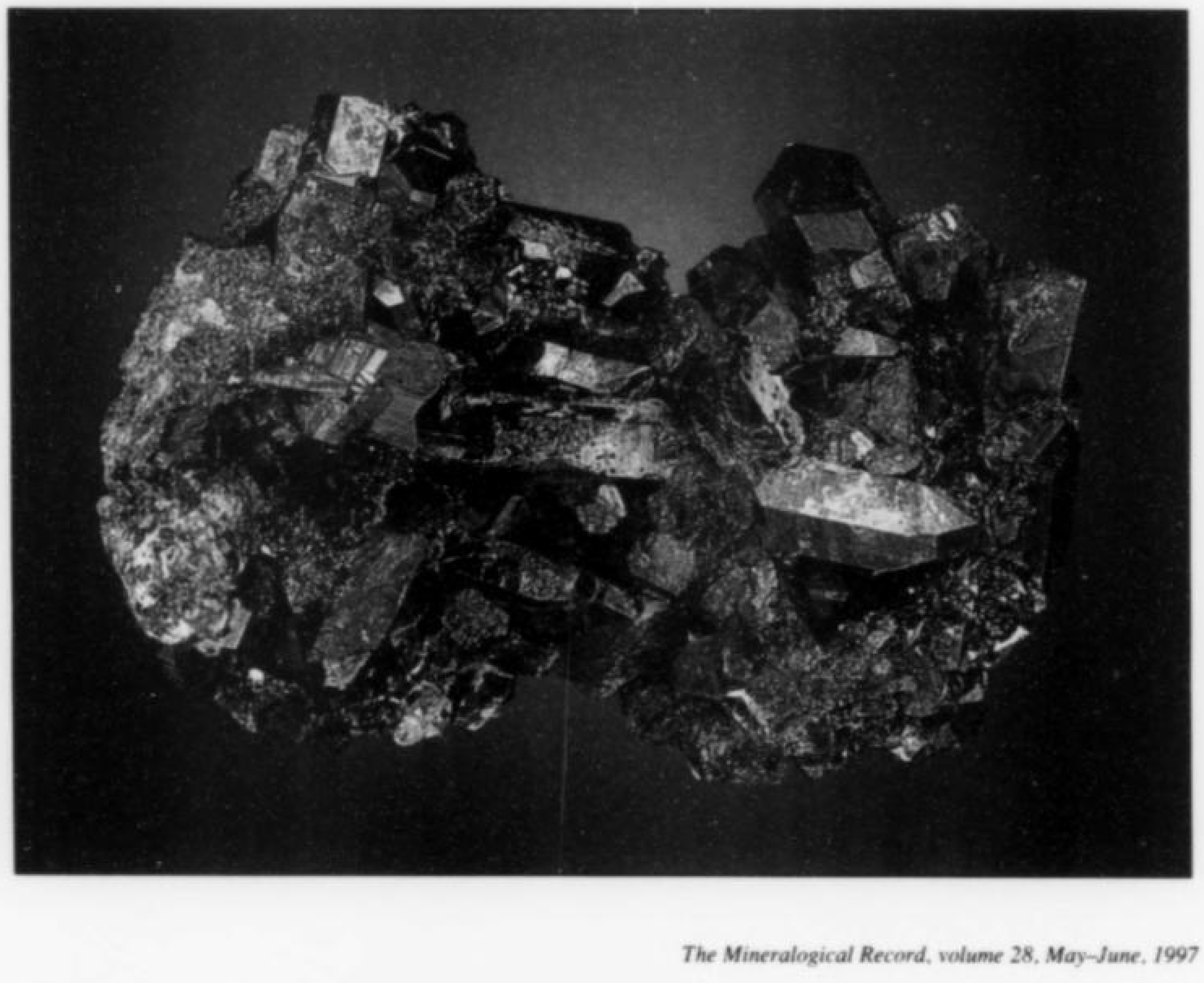

Figure 20. Allanite-(La) crystal group, 4 cm across, from Nueva Vizcaya Burguillos del Cerro, Badajoz, Spain. Jordi Fabre specimen, now in the Steve Smale collection, Jeff Scovil photo.

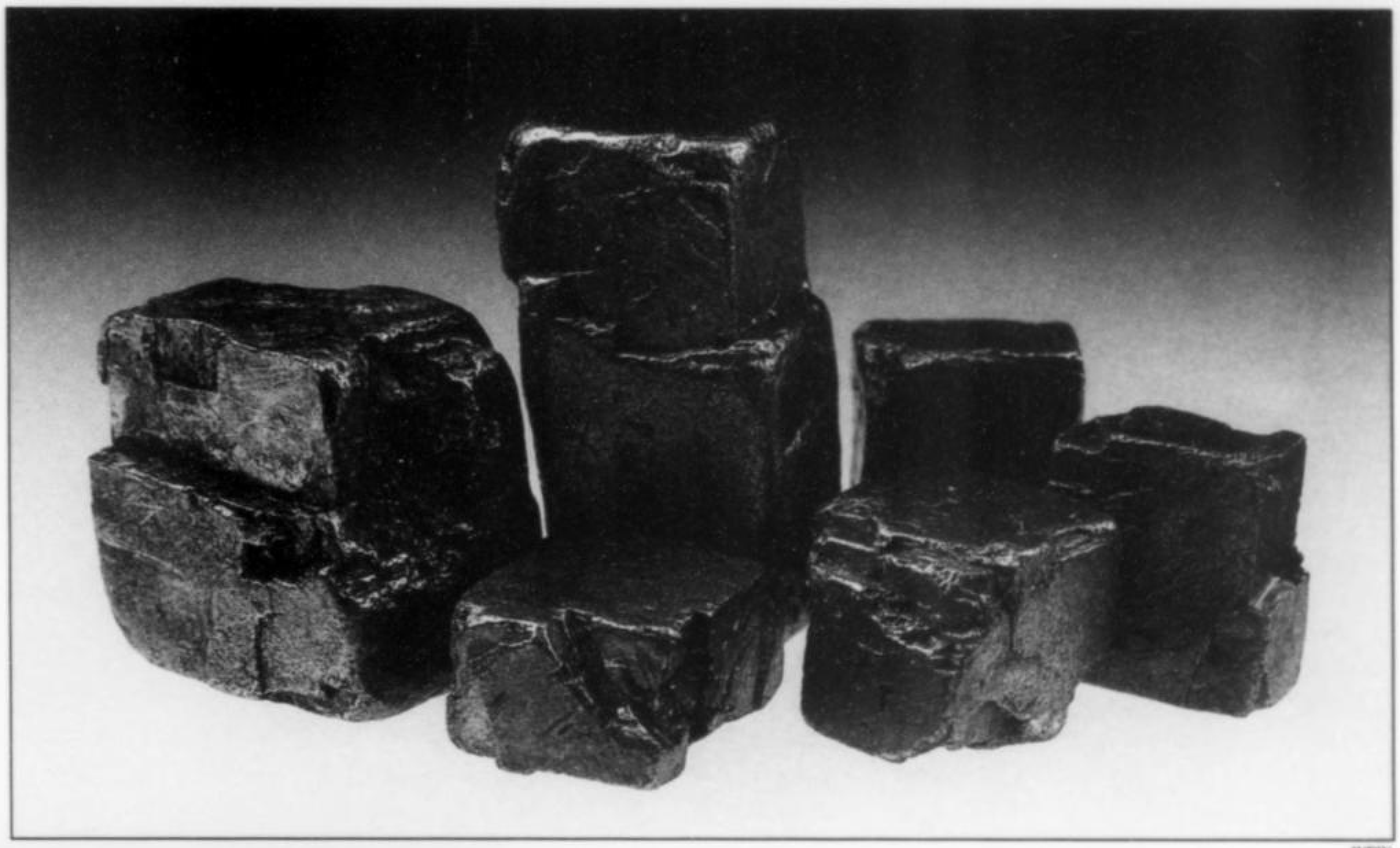

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Figure 21. Zvyagintsevite crystals to 1.1 cm from the Konder Massif, near Nel'kan, Russian Far East. *Heliodor* specimens.

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Figure 22. Zircon crystal, 1.6 cm, from Mt. Vavnbed in the Lovozero Massif, Kola Peninsula, Russia. *Jeff & Gloria's Minerals* specimen.

Figure 23. Wendwilsonite crystal cluster, 1.8 cm, from Bou Azzer, Morocco. Josef Vajdak specimen, *Pequa Rare Minerals*.

WEW

Figure 24. (left) Pinkish kovdorskite from the Zheleznyi mine, near Kovdor, Kola Peninsula, Russia. *Ausrox* specimen, Jeff Scovil photo.

Figure 25. (right) Villamaninite crystal, 2 mm, from the type locality, the La Providencia mine at Villamanin, Leon, Spain. Jordi Fabre specimen.

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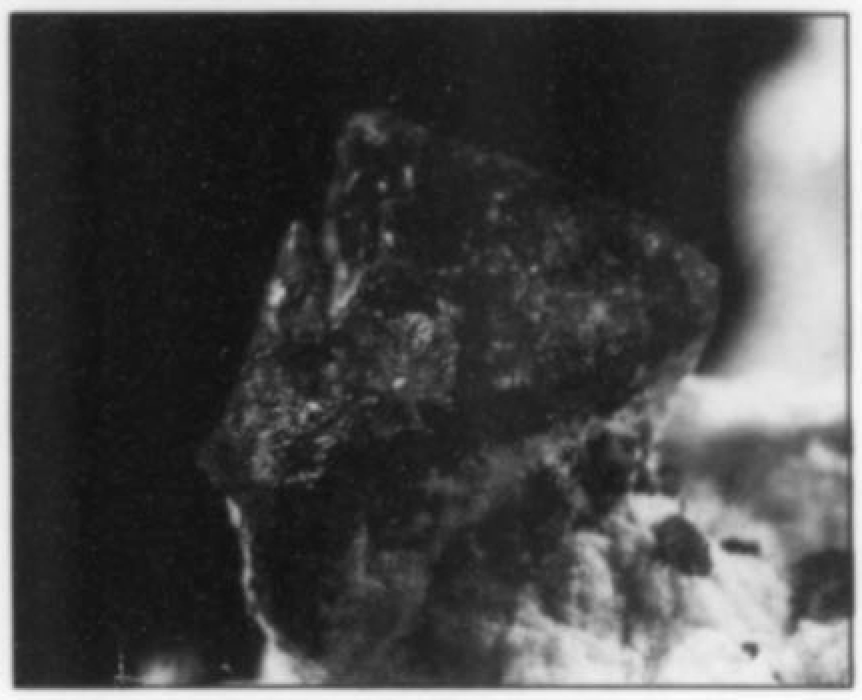


specimens from miniature through large-cabinet sizes. Also, from Karur, Tamilnader, in southern India, a pegmatite is producing sceptered **amethyst** crystals up to 20 cm tall, though the brightest and sharpest are thumbnail clusters with pale to medium purple zoning. There is also a single, strikingly beautiful 12 x 12-cm flattish rosette in which each 1-cm crystal is sharply sceptered, and all are very dark purple and gemmy at the scepter tips but tinted orange on the shafts by included rutile.

Dudley Blauwet of *Mountain Minerals International* brought to the Main Show a few find of **spinel/forsterite** specimens from near Embilipitiya, Uva Province, Sri Lanka. The spinel comes in low-lustered but very sharp, black to greenish black, simple octahedrons; these may get up to 3 cm on edge, and occur in clean stacks without associations, in miniatures to 5.5 cm long, and as similar stacks on a spongy brownish white matrix (how often does one see anything on matrix from Sri Lanka?). One 3 x 5-cm specimen consists mostly of medium-brown, fairly sharp forsterite crystals to 2 cm with 1-cm spinel octahedrons.

The Executive Inn show was heavily Russianized again this year—the "Russian" rooms occupied by a range of dealers, from westerners like the Van Scrivers of *Heliodor*, to the scientists of the *Fersman Museum* and other respectable institutions, to dour, English-challenged Russian citizens who kept setting out dense tablefulls of unlabeled specimens priced at maybe a few bucks apiece. In this last sort of room the fun is to get down hot-breath-close and try to score a highgrading coup, as (ahem) I did when I picked up a lovely thumbnail of green octahedral Dalnegorsk fluorite, with a 2-cm crystal on a bit of matrix, for only $2.

Indeed, Dalnegorsk is still far and away the most prolific Russian locality, so much so that the danger of jadedness looms again; I saw only one *new* Dalnegorsk item amid all the usual ones. It is said to be from the Second Soviet mine: **apophyllite**, in lustrous, fat, 1.5-cm bipyramids with fields of tiny ragged spikes where the small basal terminations should be. The crystals are strongly zoned, with gray-green inclusion-ridden areas sharply bounded by colorless transparent areas. They occur either as thumbnail groups without matrix, or clinging singly onto the faces of lustrous incomplete calcite scalenohedrons to 6 cm. A few nice apophyllite specimens of each type were being offered at the Main Show by Petr Korbel (Vysokoskolska 488/8, 165 00 Praha 6 - Suchdol, Czech Republic).

There is, besides, an interesting/oddball ex-Soviet Union miscellany which I'll try to highgrade in the rest of this portly paragraph. Brad and Star Van Scriver (*Heliodor*) had perhaps a couple of dozen crystals of the rare and surprising **zvyagintsevite** from the platinum deposits in the Konder Massif, Russian Far East (see the article in the previous issue). These had long been mistaken for untwinned platinum crystals, but are actually lead-palladium (Pd_3Pb). The crystals are plain cubes to about 1 cm, some of them flattened somewhat, with varying degrees of stream-rounding (like the associated platinum crystals). But they weren't out in the room; you had to ask to see them.

Michel Jouty (231 Route des Nants, 74400 Chamonix, France) had a one-of-a-kind thumbnail with black, submetallic, subhedral 2-cm cubes of **chevkinite**, from the pyrochlore/zircon locality at Veshnovogorsk, Middle Urals; chevkinite is a species never before seen in crystals anything like this large. Peter Lyckberg (Box 25147, S-40031 Goteborg, Sweden) had several little white specimen boxes holding short stacks of thin, loose prisms (2 to 5.5 cm long and all about 3 mm thick) of the new tourmaline-group species **fiotite**, found by Peter in November 1993 in a clay-filled pocket in the Kazionnitsa mine, Alabashka, Urals; these appear black, but when backlit have a nice dark orange-brown transparency. Stefan Stolte (*Mineralien und Fossilien Galerie*, Fahrgasse 88, 60311 Frankfurt/Main, Germany) had some miniatures with serpentine/magnetite matrix covered by thick crystal crusts of pale orange-brown, glassy, transparent **kovdorskite** from Kovdor, Kola Peninsula, with individual crystals to 1.5 cm high. Several dealers had nice specimens of the dark green **"prase" quartz** from Sinya Rechka, Primorskiy Kraj. The slightly rough prisms with steep terminations can reach 6 cm long, and are *not* from Dalnegorsk, as sometimes claimed; this Seriphos, Greece-like skarn is in fact 150 kilometers away from the Big D. There were no new waves of the **heliodor beryl** out of Zelatoya Vada, Rengkul, Murgab, Tajikistan, but Gilbert Gauthier had two loose yellow crystals, 3 and 4 cm in size, with included arsenopyrite crystals large and sharp enough (3 mm or so) to show clearly their crystal morphologies through the enclosing gemmy yellowness. Another heliodor crystal had included **monazite** and **manganotantalite** crystals, according to Steve Bringe, who did the determinations himself. Finally (as concerns the ex-U.S.S.R.), in the tent in the courtyard of the Executive Inn the *Heliodor* folks were selling hundreds of thumbnails (for $3 to $15 each) of sharp **amethyst** crystals of 1 or 2 cm, some of them compound and/or color-zoned, nicely perched alone or in two's or three's on a shaly brown rock, from Lake Balkhash, near Preozersk, Dzhezkazgan Oblast, SE Kazakhstan.

Mike Bergmann, Doug Parsons and sundry others had some spectacular cabinet specimens from a new **calcite** find in the "Lei Peing" mine (quotation marks indicate the usual uncertainty about at least the spelling), near Chenzhou, Hunan Province, China. Thin, tapered calcite scalenohedrons to 1.5 cm long, reddened by light hematite dustings, blanket the large dark brown matrix specimens, and on a few elite specimens, very sharp butterfly twins of calcite to 3 cm between the tips rise and stretch from the spiky beds.

Don (father of Doug) Parsons flashed me a few specimens of the first-rate **stannite** and **arsenopyrite** which come rarely from Chenzhou. The stannite crystals are rounded, subhedral and metallic gray, up to 3 cm in size, with arsenopyrite, 4-mm mica books and tiny white calcite crystals, the whole assemblage making handsome miniatures. On other miniatures and small cabinet pieces, the star of the show is arsenopyrite in brilliant cruciform twins to 3 cm protruding from massive quartz.

The high Himalayas of the Pakistan/Afghanistan border regions provide me yet again with material for a strong finish. François Lietard, Andreas Weerth, and Herb Obodda all had fist-sized specimens of single incomplete **petalite** crystals, found last autumn at Paprok, Afghanistan—the first really large crystals of this species yet found anywhere. They are milky white to translucent to transparent, glassy lumps with no matrix or associations: think of greatly enlarged versions of the incomplete loose crystals of beryllonite found long ago in the Maine and New Hampshire pegmatites. Anywhere from 20% to 60% of the surface areas consist of smooth crystal faces—although among the new acquisitions shown in the Sorbonne display case was a 15-cm petalite crystal with at least 80% of the faces present-and-accounted-for.

Many dealers had selections of the new Austrian-like **epidote with byssolite**, in sharp, pretty groups of long, flat, well terminated gemmy green/brown prisms, from Ashudi, Pakistan. François Lietard, for one, had a Main Show spread of perhaps 75 excellent miniatures of these, and winning thumbnails could be picked up in lots of places. Lietard and Peter Lyckberg share honors for a new "jack straw" **aquamarine** from Shigar, Baltistan, Pakistan. These are mostly thumbnail groups, without matrix, having pale-colored but clean and lustrous, part-gemmy, thin prisms growing in elegant jumbled stickpiles. Finally, Lietard (again!) had a few very small thumbnails of a brand-new yellow **apatite** from Tormiq, Pakistan. The crystals are sharp, complete hexagonal tablets with lustrous faces, and gemmy throughout their canary interiors; smaller specimens have three or four such crystals simply singing together, while larger ones ("full" thumbnails) have small white feldspar crystals adhering to 2-cm gem apatite tablets.

Hope you enjoyed the world tour—now let's look at some minerals we're never likely to own. By this I mean, of course, minerals in the **display cases** at the Main Show. These cases, these minerals, were quite overwhelming. I know I say this every time . . . but if the topics of *Calcite* last year and *Silver Species* in 1994 seemed very tough acts to follow, this year's *Copper Species* theme-cases nonetheless did the job. It seemed they were endless: all those magnificent fantasy-pieces (many of them individually famous) of azurite, chalcocite, cuprite, native copper, etc., etc. To begin someplace, consider the Arizona copper cases alone:

Overview selections of Arizona copper minerals were shown by Bill and Carol Smith; the Arizona-Sonora Desert Museum; and the University of Arizona Mineral Museum, this exhibitor with a *big* display featuring much clear text-with-drawings to help the visitor understand porphyry copper deposits. Arizona native copper was shown by Em's Gems Plus Three; Arizona malachite and azurite by Les and Paula Presmyk; copper minerals of the Morenci Mining District by Stan Esbenshade and Tony Potucek—bear in mind, as we move along, that in each case I name there were at least a couple of absolute knockout specimens. The great copper deposits and specimen lodes of Bisbee were the theme of *seven* separate exhibitors: Harvard, the Los Angeles County Museum, Pennsylvania State University, the Phelps-Dodge Corporation (2 cases), the Smithsonian, Richard and Monica Graeme, and the Royal Ontario Museum.

Colorado copper minerals were shown by the Colorado School of Mines; Michigan native copper flared at the visitor in fine cases by Stuart and Donna Wilensky and by Tom Rosemeyer, and in *five* cases by the A. E. Seaman Museum of Houghton, Michigan. One of these Seaman cases had "sculptural" specimens under the title Michigan Copper Natural Art, and another fascinating exhibit was called "The Many Forms of Copper Crystals," with wonderful specimens of large euhedral crystals of native copper matched with crystal drawings to explain the complex minglings of forms.

In the *general, worldwide* copper minerals department, there were Sharon Cisneros (thumbnails, including a Tsumeb olivenite and Tsumeb brochantite that fairly humiliated the onlooker); Terry Wallace (mostly miniatures, including a fabulous Bristol, Connecticut, chalcocite and a ditto Zaire carrollite); Evan Jones; David Spatz; Harold and Wilma Michel; Bob Massey (thumbnails again); the Smithsonian (with a matrix Onganja cuprite specimen with one sharp cuboctahedron 5.5 cm on edge); the Natural History Museum of Lisbon; the Houston Museum of Natural Science; and the American Museum of Natural History—with Clarence Bement specimens, including *the* famous 6-cm Bisbee paramelaconite crystal on matrix. Let's top off with the New Mexico Museum of Natural History's intelligent case on copper metallurgy, Gene Laberge's case on the Flambeau mine, Wisconsin (heavy on super chalcocite), and Kay Robertson's display of German copper species called "Yes, There is Copper in Germany." But no, not even the foregoing list is all-inclusive; at least a dozen more cases paid honor to copper mineralization.

A few other exhibits were notably terrific too. The National Geological Museum of China showed fine Chinese specimens, back-dropped by a picture of a Himalayan mountain vista. John Koivula and Art Grant created a "Quartz With Inclusions" case, with carved and polished pieces of clear quartz showing the familiar range of included species, but also showing quartz with inclusions of gersdorffite, stannite, bertrandite, sphalerite, lazulite, and others just as outrageous. Humboldt University of Berlin had a large case on Alexander von Humboldt's 1829 expedition to the Ural and Altai Mountains, with books, artifacts, and giant gold and platinum nuggets. And Gene Meiren coordinated a big double case on "Color in Beryl," along the lines of his earlier "Color in Tourmaline." Here, for the scientific-minded there was plenty of well crafted text on the behavior of chromophores in crystals, and for everybody there were beryl specimens for which the term *violently* dramatic comes to mind—especially that deepest green, utterly gemmy, 3 x 5-cm Colombian emerald crystal on matrix.

Three final cases were perhaps the stars even of *this* show. First, there was the David P. Wilber "Reunion" case, coordinated by Jim Bleess, who borrowed from their current owners many great and famous pieces once owned by Wilber (who hovered about, enjoyably chatting with people). You've seen pictures of many of these amazing things, e.g., the enormous cluster of North Carolina emerald crystals, and the world's best specimen (just a thumbnail) of a zincite crystal in matrix from Franklin, both of these shown in Peter Bancroft's *Gem and Crystal Treasures*. Another great ex-Wilber specimen, also shown in Bancroft, is what some call *THE* Bolivian phosphophyllite: an enormous, twinned, gemmy blue-green crystal rising from a matrix of cassiterite, from Potosí. This legendary specimen, for lighting reasons, was not with its fellow alumni in the Reunion case, but shared a case with the best rhodochrosite extracted by Bryan Lees from last September's "Butterfly Pocket" at the Sweet Home mine. This rhodochrosite matrix specimen is about a foot across, and the phosphophyllite matrix nearly as large, and which of the two upstaged the other is of course a matter of taste—best not consult the person I heard ask a friend, "Do you think they came from the same quarry?"

Former Wilber Specimens Sought

The great success of the "David P. Wilber Reunion" exhibit at this year's Tucson Gem and Mineral Show left everyone hungry for more . . . and scratching their heads over the current locations of other fine former Wilber specimens. Dave was a major force in modern mineral connoisseurship, and the beautiful specimens that passed through his personal collection are important today as milestones in the history of late 20th century mineral collecting. We want to see more!

Jim Bleess of the TGMS, who organized the Wilber Reunion case, has agreed to do it again two years from now (February 1999), with a new selection of former Wilber pieces if they can be found. **Do you own a specimen once exhibited as part of Dave Wilber's personal collection?** If you do, and would be willing to loan it for exhibit, please contact Jim Bleess c/o The Tucson Gem & Mineral Show, P.O. Box 42543, Tucson, AZ 85733.

Finally, the University of Arizona Mineral Museum's case called "Mexico's Mineral Heritage" had a bittersweet feel, as it was also a eulogy for the late Dr. Miguel Romero, who died of cancer on January 8, 1997—just a month ago—and whose energetic, kind, influential life was described in abundant text in the case, beside a giant map of Mexico. The University of Arizona Mineral Museum now has his collection, which contains, among other extraordinary pieces on view here, the world's best paradamite (Ojuela mine, Durango); an incredible miniature of purple creedite (El Potosi mine, Chihuahua); the only major *wire* silver specimen ever recovered from the Nevada mine (Batopilas, Chihuahua); and the Arizpe (Sonora) acanthite and Fresnillo (Zacatecas) pyrargyrite which were as awesome here as they'd been in Dr. Romero's "Silver Minerals" case of three years ago.

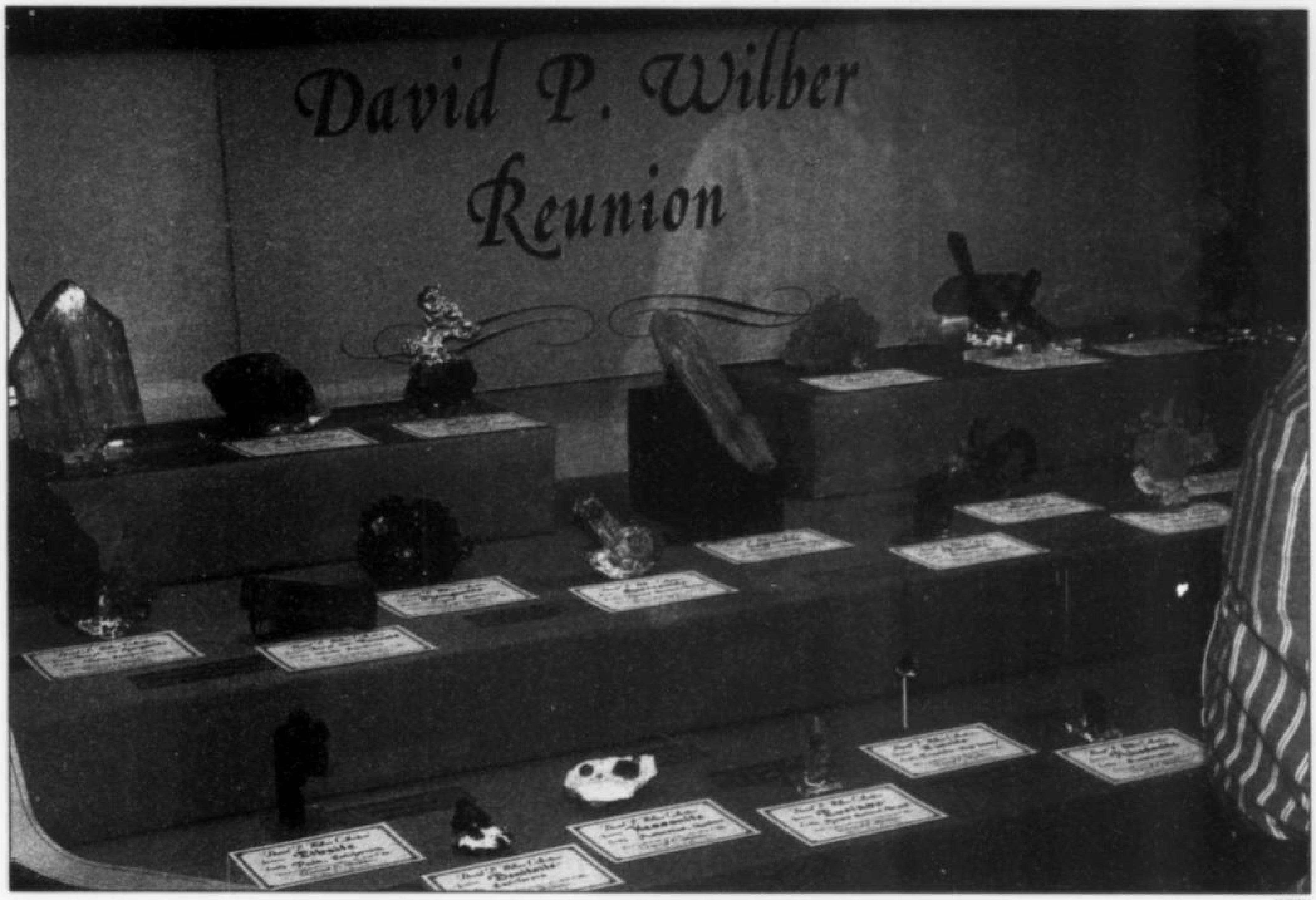
WEW

WEW

Figure 26. (above and left) **Part of the "Color in Beryl" exhibit of specimens on loan from important collections, organized by Gene Meieran for the TGMS Show.**

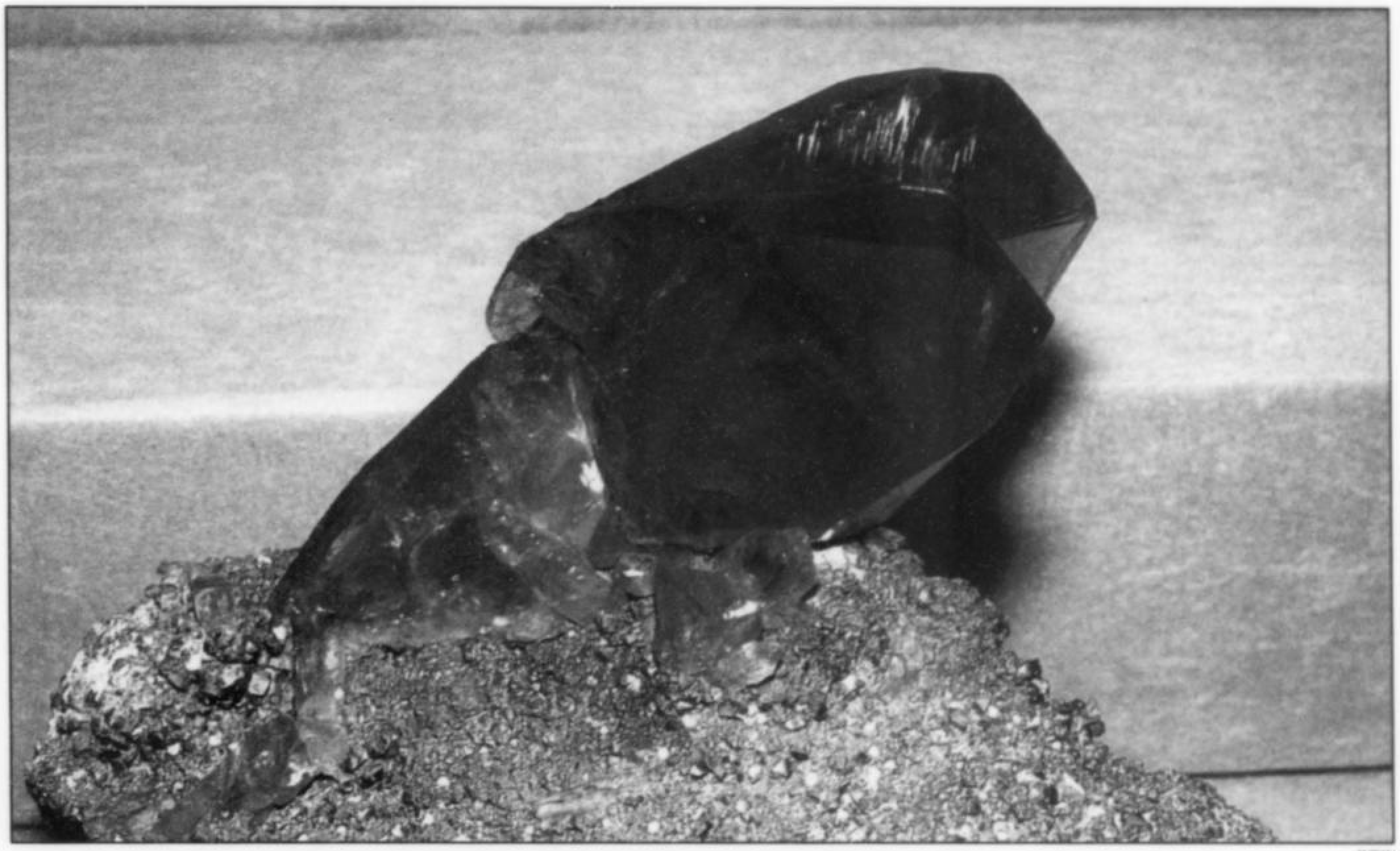
WEW

Figure 27. **Part of the "Mexico's Mineral Heritage" case of specimens from the collection of the late Miguel Romero and now owned by the University of Arizona Mineral Museum.**



WEW

Figure 28. **Part of the "David P. Wilber Reunion" case of specimens once owned by Dave Wilber and now on loan from several important collections, organized by Jim Bleess for the TGMS Show.**



WEW

Figure 29. **The "Great Phosphophyllite," from the Unificada mine, Potosí, Bolivia, on display in conjunction with the "David P. Wilber Reunion" exhibit. The twinned crystal measures about 18 cm.**

In fact, the Friends of Mineralogy will award a new trophy in Miguel Romero's name each year from now on, for the show's best Mexican specimen on exhibit; this year's winner of the **Romero Award** was Kerith Graeber for her boleite specimen. Otherwise the big winner at the awards ceremony was Bill Moller, who swept the **Desautels Trophy** for best case in the show, the **Lidstrom Trophy** for best single specimen in competition (his California neptunite), *and* the award for the best single specimen of an Arizona copper mineral. The FOM also judged that the best *Mineralogical Record* article of the past year was "The Hyalophane Occurrence in Bosnia-Herzegovina," by Mirjan Žorž. And finally, the *Carnegie Mineralogical Award* for 1996 was presented to Dr. Cornelis Klein.

So another out-of-this-world tour through Tucson's Mineral Heaven now ends. If you're already into serious planning for next year, well, you are like Marty Zinn, who plans to set up his motel(s) show next time in the Quality Inn as well as (still) in the Executive Inn and Ramada. Bear in mind that some mineral dealers will follow his flag from the EI into this third outpost. Check it out—which is *my* check-out line.

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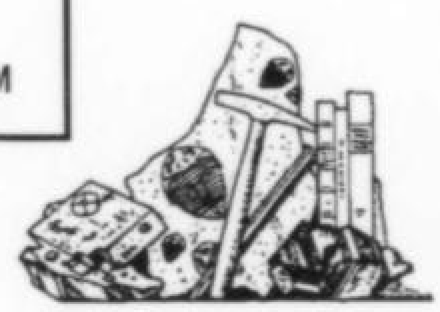

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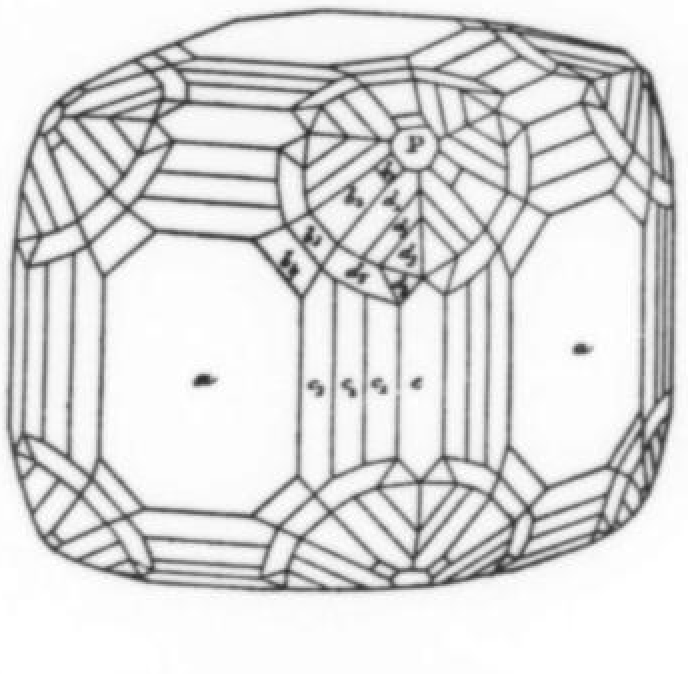
ABSTRACTS OF NEW MINERAL DESCRIPTIONS



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Babkinite — Hexagonal (trigonal)

$Pb_2Bi_2(S,Se)_3$

Locality: The Nevskoye deposit in northeastern Russia, 400 km northwest of Magadan, 25 km northwest of Omsukchan and 35 km southwest of the Dukat gold-silver deposit.

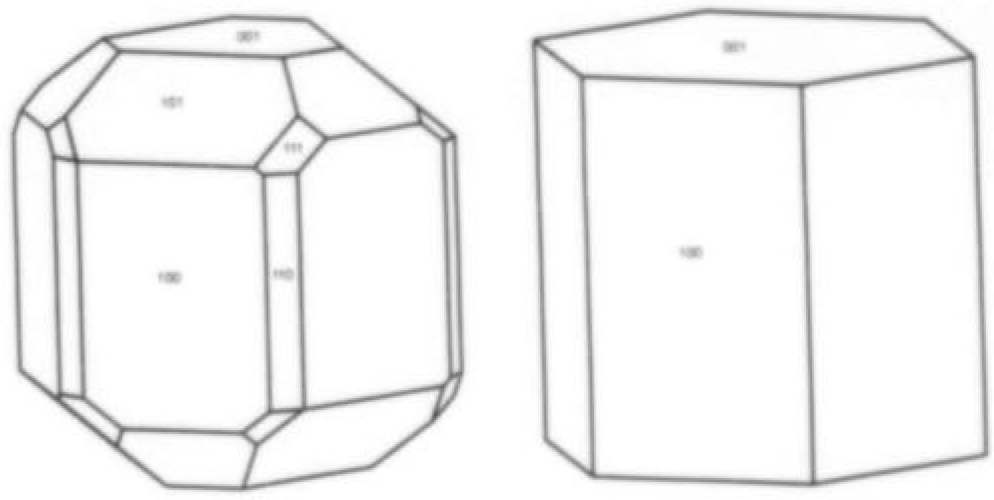
Occurrence: Associated minerals are: wolframite series, cassiterite, arsenopyrite, stannite, tetrahedrite, wittite, laitakarite, and selenian cosalite.

General appearance: Aggregates (up to 2 mm across) of platy grains.

Physical, chemical and crystallographic properties: *Luster:* metallic. *Diaphaneity:* opaque. *Color:* silver-grey. *Streak:* grey. *Hardness:* VHN_{10} 82 kg/mm^2 perpendicular to cleavage and 100 kg/mm^2 parallel to cleavage, Mohs about 2. *Tenacity:* not given. *Cleavage:* {001} perfect. *Fracture:* not given. *Density:* could not be determined, 8.10 g/cm^3 (calc.). ***Crystallography:*** Hexagonal (trigonal), probably $P\bar{3}$ or $P\bar{3}m$, a 4.191, c 39.60 Å, V 602.4 Å^3, Z 3, c:a = 9.4488. Morphology: forms, only {001} observed. Twinning: none mentioned. ***X-ray powder diffraction data:*** 3.42 (5), 3.04 (10), 2.096 (8), 1.806 (6), 1.725 (5), 1.298 (7), 1.233 (6). ***Optical data:*** In reflected light: yellowish-white, distinct anisotropism, bireflectance almost absent, weakly pleochroic in bluish brown tints. R_O & R_E: (49.7, 48.5 %) 470nm, (48.4, 47.4 %) 546nm, (47.9, 46.8 %) 589nm, (47.9, 46.2 %) 650nm. ***Chemical analytical data:*** Means of twenty-three sets of electron microprobe data: Pb 42.58, Ag 0.13, Bi 42.02, Sb 0.08, Se 10.60, S 5.80, Total 101.21 wt.%. Empirical formula: $(Pb_{1.99}Ag_{0.01})_{\Sigma 2.00}(Bi_{1.95}Sb_{0.01})_{\Sigma 1.96}(S_{1.75}Se_{1.30})_{\Sigma 3.05}$. ***Relationship to other species:*** It is chemically similar to a number of lead-bismuth sulfides such as cosalite, cannizzarite, wittite, poubaite, aleksite, ikunolite, laitakarite, and joseite-A.

Name: For P. V. Babkin (1929–1977), noted Russian geologist and the first investigator of the Nevskoye deposit. ***Comments:*** IMA No. 94-030.

BRYZGALOV, I. A., SPIRIDONOV, E. M., PETROVA, I. V., and SAKHAROVA, M. S. (1996) Babkinite $Pb_2Bi_2(S,Se)_3$—a new mineral. *Doklady Akademia Nauk* **346(5)**, 656–659.



Belovite-(La)

Belovite-(La) — Hexagonal (trigonal)

$Sr_3Na(La,Ce)(PO_4)_3(F,OH)$

Locality: Mount Kukisvumchorr and Mount Eveslogchorr, Khibina alkaline massif, Kola Peninsula, Russia. Most of the data given here are for material from Mount Kukisvumchorr.

Occurrence: In the natrolite zone of hyperagpaitic pegmatites. Associated minerals are: (for Kukisvumchorr) natrolite, microcline, aegirine, lamprophyllite, pectolite, gaidonnayite, gerasimovskite, epistolite, sphalerite, galena, molybdenite, and apophyllite; (for Eveslogchorr) natrolite, analcime, murmanite, and safflorite.

General appearance: Prismatic crystals (up to 30 x 8 mm) and isolated grains (2 to 20 mm across).

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* bright yellow to greenish yellow. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* VHN_{30} 450 kg/mm^2, Mohs 4½ to 5. *Tenacity:* very brittle. *Cleavage:* none. *Fracture:* conchoidal. *Density:* 4.19 g/cm^3 (meas.), 4.23 g/cm^3 (calc.). ***Crystallography:*** Hexagonal (trigonal), $P\bar{3}$, a 9.647, c 7.170 Å, V 577.9 Å^3, Z 2, c:a = 0.7432. Morphology: forms, {100}, {110}, {101}, {$10\bar{1}$}, {111}, {$11\bar{1}$}, {001}. Twinning: none observed. ***X-ray powder diffraction data:*** 3.59 (87), 3.30 (65), 2.897 (100), 2.884 (100), 2.790 (54), 1.910 (36), 1.796 (36). ***Optical data:*** Uniaxial (-), ω 1.653, ε 1.635, nonpleochroic. ***Chemical analytical data:*** Means of six sets of electron microprobe data: Na_2O 4.09, CaO 0.50, SrO 40.09, BaO 2.35, La_2O_3 13.08, Ce_2O_3 8.15, Pr_2O_3 0.30, Nd_2O_3 0.30, Sm_2O_3 0.03, Gd_2O_3 0.01, Y_2O_3 0.01, SiO_2 0.24, ThO_2 0.43, P_2O_5 28.30, SO_3 0.03, H_2O 0.22, F 2.04, sum 100.17, less O = F 0.86, Total 99.31 wt.%. A similar set of data are given for material from Mount Eveslogchorr. Empirical formula: $(Sr_{2.87}Ba_{0.11}Ca_{0.07})_{\Sigma 3.05}Na_{0.98}(La_{0.60}Ce_{0.37}Pr_{0.01}Nd_{0.01}Th_{0.01})_{\Sigma 1.00}[(P_{2.96}Si_{0.03})_{\Sigma 2.99}O_{12.02}][F_{0.80}(OH)_{0.18}]_{\Sigma 0.98}$. ***Relationship to other species:*** It is the

La-dominant analogue of belovite-(Ce), which is now defined as $Sr_3Na(Ce,La)(PO_4)_3(F,OH)$.

Name: For the relationship to belovite-(Ce), formerly belovite. ***Comments:*** IMA No. 95-023. The authors place this mineral, with space group $P\bar{3}$, in the apatite group in which most of the species have space group $P6_3/m$.

PEKOV, I. V., KULIKOVA, I. M., KABALOV, Yu. K., ELETSKAYA, O. V., CHUKANOV, N. V., MENSHIKOV, Yu. P., and KHOMYAKOV, A. P. (1996) Belovite-(La) $Sr_3Na(La,Ce)[PO_4]_3(F,OH)$—a new rare earth mineral in the apatite group. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(3)**, 101–109.

Calcioaravaipaite twin

Calcioaravaipaite — Monoclinic

$PbCa_2Al(F,OH)_9$

Locality: The Grand Reef mine in Laurel Canyon, about 6 km northeast of Klondyke, Aravaipa mining district, Graham County, Arizona, U.S.A.

Occurrence: In a small epithermal lead-copper-silver deposit in a silicified breccia. Associated minerals are: anglesite, artroeite, quartz, fluorite, galena, linarite, and muscovite.

General appearance: Euhedral crystals (up to 0.05 x 0.3 x 0.7 mm); also as a dense massive substrate of later-formed crystals with artroeite and as tabular inclusions in artroeite (up to 10 µm long).

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* colorless. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* about 2½. *Tenacity:* brittle. *Cleavage:* {100} good. *Fracture:* conchoidal. *Density:* 4.85 g/cm^3 (meas.), 4.71 g/cm^3 (calc.). ***Crystallography:*** Monoclinic, A2, A2/m or Am, a 23.906, b 7.516, c 7.699 Å, β 92.25°, V 1382.2 Å^3, Z 8, a:b:c = 3.1807:1:1.0243. Morphology: forms, {100}, {011} for crystal class 2/m. For class 2, {0$\bar{1}\bar{1}$} must be present also; for class m, {$\bar{1}$00} and {01$\bar{1}$} must be present also. Twinning: ubiquitous on {100}. ***X-ray powder diffraction data:*** 11.9 (100), 3.71 (70), 3.51 (85), 2.981 (60), 2.943 (60), 2.028 (60), 1.971 (60). ***Optical data:*** Biaxial (-), α 1.510, β 1.528, γ 1.531, 2V(meas.) 36°, 2V(calc.) 44°; dispersion r > v, strong; nonpleochroic; Y = b, Z ∧ c = 73° (in obtuse angle β). ***Chemical analytical data:*** Means of five sets of electron microprobe data: CaO 23.5, PbO 46.4, Al_2O_3 10.8, F 30.9, H_2O (1.4), sum 113.0, less O = F 13.0, Total (100.0) wt.%. H_2O calculated by difference. Empirical formula: $Pb_{1.02}Ca_{2.05}Al_{1.04}[F_{7.97}(OH)_{0.76}O_{0.27}]_{\Sigma 9.00}$. ***Relationship to other species:*** It is a high calcium, monoclinic analogue of aravaipaite, $Pb_3Al(F,OH)_9$.

Name: For the relationship with aravaipaite. ***Comments:*** IMA No. 94-018. The crystal drawing given in the paper is stated to be an orthographic projection of a twinned crystal, but it appears to be a clinographic projection. It has been drawn for this abstract as well.

KAMPF, A. R. and FOORD, E. E. (1996) Calcioaravaipaite a new mineral and associated lead fluoride minerals from the Grand Reef mine, Graham County, Arizona. *Mineralogical Record* **27**, 293–300.

Clerite — Orthorhombic

$MnSb_2S_4$

Locality: The Vorontsovskoye gold deposit, in the Ural Mountains near Serov about 300 km north of Ekaterinburg, Russia.

Occurrence: In pyrite-realgar ore. Associated minerals are: realgar, alabandite, sphalerite, aktashite, and routhierite.

General appearance: Aggregates (0.1 to 1.0 mm) of anhedral grains (0.01 to 0.2 mm).

Physical, chemical and crystallographic properties: *Luster:* submetallic. *Diaphaneity:* opaque. *Color:* black. *Streak:* brown. *Hardness:* VHN_{15} 252 kg/mm^2. *Tenacity:* brittle. *Cleavage:* absent. *Fracture:* uneven. *Density:* could not be determined, 4.39 g/cm^3 (calc.). ***Crystallography:*** Orthorhombic, Pnam, a 11.47, b 14.36, c 3.81 Å, V 627.54 Å^3, Z 4, a:b:c = 0.7987:1:0.2653. Morphology: no forms were observed. Twinning: none observed. ***X-ray powder diffraction data:*** 4.46 (40), 3.69 (90), 3.23 (70), 3.05 (40), 2.90 (80), 2.65 (100), 2.18 (40), 1.906 (40), 1.813 (50). ***Optical data:*** In reflected light: light grey, strong anisotropism, distinct bireflectance, nonpleochroic. $R_{max.}$ & $R_{min.}$: (35.0, 24.0 %) 470nm, (36.1, 23.9 %) 546nm, (36.9, 24.9 %) 589nm, (35.6, 25.7 %) 650nm. ***Chemical analytical data:*** Means of five sets of electron microprobe data: Mn 13.1, Sb 51.2, As 4.4, S 30.8, Total 99.5 wt.%. Empirical formula: $Mn_{0.99}(Sb_{1.75}As_{0.24})_{\Sigma 1.99}S_{4.01}$. ***Relationship to other species:*** It is the manganese-dominant analogue of berthierite.

Name: For Onisim Yegorovitch Kler (1845–1920), Honorary Member of the Russian Mineralogical Society. ***Comments:*** IMA No. 95-029.

MURZIN, V. V., BUSHMAKIN, A. F., SUSTAVOV, S. G., and SHCHERBACHOV, D. K. (1996) Clerite $MnSb_2S_4$—a new mineral from Vorontsovskoye gold deposit in the Urals. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(3)**, 95–101.

Dusmatovite — Hexagonal

$K(K,Na,\square)(Mn^{2+},Y,Zr)_2(Zn,Li)_3Si_{12}O_{30}$

Locality: The Dara-i-Pioz alkaline massif, Tien Shan, Tajikistan.

Occurrence: In a pegmatite boulder in a glacial moraine. Associated minerals are: quartz, microcline, aegirine, "tadzhikite-(Y)" (see comments), cesium-kupletskite, hyalotekite, betafite, and polylithionite.

General appearance: Aggregates (up to 40 x 50 mm).

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* translucent. *Color:* dark blue, dirty blue, violet brown. *Streak:* light blue. *Luminescence:* non-fluorescent. *Hardness:* VHN_{100} 423 kg/mm^2, Mohs 4½. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* uneven. *Density:* 2.96 g/cm^3 (meas.), 2.98 g/cm^3 (calc.). ***Crystallography:*** Hexagonal, P6/mcc, a 10.196, c 14.284 Å, V 1286 Å^3, Z 2, c:a = 1.4009 (see comments). Morphology: no forms were observed. Twinning: none observed. ***X-ray powder diffraction data:*** 7.13 (30), 4.15 (45), 3.75 (50), 3.25 (100), 2.924 (39), 2.777 (32), 2.548 (52). ***Optical data:*** Uniaxial (-), ω 1.590, ε 1.586, strong pleochroism O = light violet, E = light blue. ***Chemical analytical data:*** Means of sixteen sets of electron microprobe data: Li_2O 1.10, Na_2O 0.61, K_2O 6.16, MnO 8.78, FeO 0.45, ZnO 15.51, Mn_2O_3 1.13, Yb_2O_3 0.54, Y_2O_3 1.51, SiO_2 64.40, ZrO_2 1.55, Total

101.74 wt.%. Li by flame photometry and Mn^{2+}/Mn^{3+} from the crystal structure analysis. Empirical formula: $K_{1.00}(K_{0.48}Na_{0.22}\square_{0.30})_{\Sigma 1.00}(Mn^{2+}_{1.40}Mn^{3+}_{0.16}Y_{0.15}Zr_{0.14}Fe_{0.07}Yb_{0.03})_{\Sigma 1.95}(Zn_{2.16}Li_{0.83})_{\Sigma 2.99}Si_{12.15}O_{30.00}$. ***Relationship to other species:*** A member of the milarite group.

Name: For Vyacheslav Djuraevitch Dusmatov (1936–), mineralogist and geologist who has done much work at the locality. ***Comments:*** IMA No. 94-010. The mineral "tadzhikite-(Y)" listed above has never been approved by the Commission on New Minerals and Mineral Names of the International Mineralogical Association, so it has no validity. The crystal structure paper by Sokolova and Pautov (1995) gives a 10.218, c 14.292 Å, V 1292.6 Å^3.

PAUTOV, L. A., AGAKHANOV, A. A., SOKOLOVA, E. V., and IGNATENKO, K. I. (1996) Dusmatovite—a new mineral of the milarite group. *Vestnik Moscow University* **Series 4 Geology (2)**, 54–60. SOKOLOVA, E. V. and PAUTOV, L. A. (1995) The crystal structure of dusmatovite. *Doklady Akademia Nauk* **344 (5)**, 607–610.

Hyttsjöite — Hexagonal (trigonal)

$Pb_{18}Ba_2Ca_5Mn^{2+}_2Fe^{3+}_2Si_{30}O_{90}Cl\cdot 6H_2O$

Locality: The Långban mines, Filipstad district, Värmland, Sweden.

Occurrence: In manganese-rich skarn. Associated minerals are: andradite, hedyphane, aegirine, rhodonite, melanotekite, calcite, quartz, potassium feldspar, pectolite, and barite.

General appearance: Subequant to skeletal grains (0.1 to 0.6 mm across).

Physical, chemical and crystallographic properties: *Luster:* adamantine. *Diaphaneity:* transparent. *Color:* colorless. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* could not be determined. *Tenacity:* not given. *Cleavage:* {001} good. *Fracture:* not observed. *Density:* could not be determined, 5.09 g/cm^3 (calc.). ***Crystallography:*** Hexagonal (trigonal), $R\bar{3}$, a 9.865, c 79.45 Å, V 6695 Å^3, Z 3, c:a = 8.0537. Morphology: forms, none observed. Twinning: none observed. ***X-ray powder diffraction data:*** 13.4 (50), 4.43 (30), 3.98 (30), 3.32 (100), 3.11 (40), 2.969 (40), 2.671 (80). ***Optical data:*** Uniaxial (-), ω 1.845, ε 1.815, nonpleochroic. ***Chemical analytical data:*** Means of six sets of electron microprobe data: CaO 4.35, MnO 2.00, BaO 4.65, PbO 58.13, Al_2O_3 0.02, Fe_2O_3 2.77, SiO_2 26.38, H_2O 1.58, Cl 0.65, sum 100.53, less O = Cl 0.15, Total 100.38 wt.%. Empirical formula: $Pb_{17.74}Ba_{2.07}Ca_{5.28}Mn^{2+}_{1.92}(Fe^{3+}_{2.36}Al_{0.03})_{\Sigma 2.39}Si_{29.91}O_{89.78}Cl_{1.25}\cdot 5.97H_2O$. ***Relationship to other species:*** None apparent.

Name: For Hytssjön, a lake west of the Långban mines. ***Comments:*** IMA No. 93-056. The authors point out that the ideal formula is not balanced; there are 180 plus-charges vs 181 negative-charges. It is possible that one OH replaces one oxygen or half of the manganese may have a valence of 3+ rather than 2+. Neither possibility is supported by direct evidence.

GREW, E. S., PEACOR, D. R., ROUSE, R. C., YATES, M. G., SU, S.-C., and MARQUEZ, N. (1996) Hyttsjöite, a new, complex layered plumbosilicate with unique tetrahedral sheets from Långban, Sweden. *American Mineralogist* **81**, 743–753.

Intersilite — Monoclinic

$Na_6Mn^{2+}Ti[Si_{10}O_{24}(OH)](OH)_3\cdot 4H_2O$

Locality: Mount Alluaiv in the northwestern part of the Lovozero alkaline massif, Kola Peninsula, Russia.

Occurrence: In hyperagpaitic pegmatites. Associated minerals are: ussingite, makatite, villiaumite, aegirine, lomonosovite, serandite, steenstrupine, mangan-neptunite, and a zakharovite-like mineral.

General appearance: Anhedral grains (1 to 2 mm) and aggregates (up to 3 mm).

Physical, chemical and crystallographic properties: *Luster:* vitreous to greasy. *Diaphaneity:* translucent to transparent. *Color:* yellow, pinkish-yellow, pink. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* 3 to 4. *Tenacity:* brittle. *Cleavage:* {100} perfect. *Fracture:* step-like. *Density:* 2.42 g/cm^3 (meas.), 2.43 g/cm^3 (calc.). ***Crystallography:*** Monoclinic, I2/m, a 12.939, b 18.675, c 12.184 Å, β 99.28°, V 2906 Å^3, Z 4, a:b:c = 0.6929:1:0.6524. Morphology: no forms were observed. Twinning: none observed. ***X-ray powder diffraction data:*** 10.56 (100), 6.38 (50), 5.55 (45), 4.78 (40), 4.253 (40), 3.196 (80), 2.608 (50). ***Optical data:*** Biaxial (-), α 1.536, β 1.545, γ 1.553, 2V(meas.) 87°, 2V(calc.) 86°; dispersion r < v, strong; pleochroism X = colorless, Y = yellowish, Z = honey yellow; X ∧ c = 40° (in acute angle β), Z = b. ***Chemical analytical data:*** Means of seven sets of electron microprobe data: Na_2O 16.91, K_2O 1.85, CaO 0.10, MnO 6.23, FeO 0.30, SiO_2 56.10, TiO_2 5.59, Nb_2O_5 3.02, H_2O 10.40, Total 100.50 wt.%. Empirical formula: $(Na_{5.77}K_{0.42})_{\Sigma 6.19}(Mn_{0.93}Fe_{0.04}Ca_{0.02})_{\Sigma 0.99}(Ti_{0.74}Nb_{0.24})_{\Sigma 0.98}Si_{9.87}[O_{23.80}(OH)_{4.20}]_{\Sigma 28.00}\cdot 4.00H_2O$. ***Relationship to other species:*** Its structure is intermediate between those of the layered and banded silicates.

Name: In allusion to the mineral's intermediate position between the layered and banded silicates. ***Comments:*** IMA No. 95-033. The paper gives the results of the crystal structure analysis with slightly different unit cell parameters.

KHOMYAKOV, A. P., ROBERTS, A., NECHELYUSTOV, G. N., YAMNOVA, N. A., and PUSHCHAROVSKY, D. Yu. (1996) Intersilite $Na_6Mn^{2+}Ti[Si_{10}O_{24}(OH)](OH)_3\cdot 4H_2O$—a new mineral with a new type of band-layered silicon-oxygen radical. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(4)**, 79–85.

Krasnovite — Orthorhombic

$Ba(Al,Mg)(PO_4,CO_3)(OH)_2\cdot H_2O$

Locality: The Kovdor apatite-magnetite deposit in the Kovdor alkaline ultramafic massif, Kola Peninsula, Russia.

Occurrence: In a dolomite carbonatite specimen. Associated minerals are: dolomite, manasseite, barite, crandallite, and "carbonate-apatite."

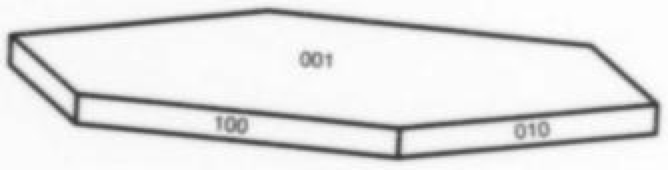
General appearance: Spherulites (up to 3 mm in diameter) of fibres (up to 0.1 x 0.1 x 2.0 mm).

Physical, chemical and crystallographic properties: *Luster:* silky. *Diaphaneity:* translucent. *Color:* pale blue. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* 2. *Tenacity:* non-brittle. *Cleavage:* two perfect directions parallel to [010]. *Fracture:* fibrous. *Density:* 3.70 g/cm^3 (meas.), 3.71 g/cm^3 (calc.). ***Crystallography:*** Orthorhombic, Pnna or Pnnn, a 8.939, b 5.669, c 11.073 Å, V 561 Å^3, Z 4, a:b:c = 1.5768:1:1.9533. Morphology: forms, none observed. Twinning: none observed. ***X-ray powder diffraction data:*** 5.54 (79), 3.479 (82), 3.345 (59), 2.768 (100), 2.543 (61), 2.354 (32), 2.072 (41). ***Optical data:*** Biaxial (-), α 1.616, β 1.629, γ 1.640, 2V(meas.) 70° to 90°, 2V(calc.) 85°; dispersion r > v, weak; nonpleochroic; orientation, Y = b. ***Chemical analytical data:*** Means of three sets of electron microprobe data: K_2O 0.05, MgO 1.7, FeO 0.3, SrO 0.7, BaO 49.1, Al_2O_3 14.3, CO_2 (3.55), P_2O_5 19.8, H_2O 10.5, Total

(100.00) wt.%. CO_2 was detected by IR spectroscopy and calculated by difference. Empirical formula: $(Ba_{1.00}Sr_{0.02})_{\Sigma 1.02}$-$(Al_{0.88}Mg_{0.13}Fe_{0.01})_{\Sigma 1.02}(PO_4)_{0.87}(CO_3)_{0.25}(OH)_{1.85}\cdot 0.90H_2O$. ***Relationship to other species:*** It is chemically similar to gorceixite, jagowerite, penikisite, and foggite.

Name: For N. I. Krasnova (1941–), mineralogist at St. Petersburg University. ***Comments:*** IMA No. 91-020.

BRITVIN, S. N., PAKHOMOVSKII, Ya. A., and BOGDANOVA, A. N. (1996) Krasnovite $Ba(Al,Mg)(PO_4,CO_3)(OH)_2\cdot H_2O$—a new mineral. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(3)**, 110–112.



Leisingite

Leisingite — Hexagonal (trigonal)

$Cu(Mg,Cu,Fe,Zn)_2Te^{6+}O_6\cdot 6H_2O$

Locality: The dumps of the Centennial Eureka mine, Tintic District, Juab County, Utah, U.S.A. (Lat. 39° 56′38″ N, Long. 112° 07′18″ W).

Occurrence: From the secondary alteration zone. Associated minerals are: quartz, jensenite, cesbronite, and hematite.

General appearance: Isolated, or rarely as clusters of hexagonal-shaped, platy crystals (up to 0.2 mm; most are less than 0.1 mm in diameter).

Physical, chemical and crystallographic properties: *Luster:* given as vitreous, but the indices of refraction indicate it should be adamantine. *Diaphaneity:* transparent. *Color:* pale yellow to pale orange-yellow. *Streak:* pale yellow. *Luminescence:* non-fluorescent. *Hardness:* estimated as 3 to 4. *Tenacity:* brittle to somewhat flexible. *Cleavage:* {001} perfect. *Fracture:* uneven. *Density:* could not be determined, 3.41 g/cm³ (calc.). ***Crystallography:*** Hexagonal (trigonal), P3, a 5.305, c 9.693 Å, V 236.2 Å³, Z 1, c:a = 1.8271. Morphology: forms, {001}, {00$\bar{1}$}, {100}, {010} (see comments). Twinning: none observed. ***X-ray powder diffraction data:*** 9.70 (100), 4.834 (80), 4.604 (60), 2.655 (60), 2.556 (70), 2.326 (70), 1.789 (40). ***Optical data:*** Uniaxial (-), ω 1.803, ε 1.581 (calculated from the Gladstone-Dale relationship), pleochroism not mentioned, but probably nonpleochroic. ***Chemical analytical data:*** Means of three sets of electron microprobe data: MgO 6.19, FeO 6.86, CuO 24.71, ZnO 0.45, TeO_3 36.94, H_2O (21.55), Total (96.70) wt.%. H_2O was calculated from the crystal structure analysis to give $6H_2O$. Empirical formula: $Cu_{1.00}(Mg_{0.77}Cu_{0.56}Fe_{0.48}Zn_{0.03})_{\Sigma 1.84}Te^{6+}_{1.06}O_{6.02}\cdot 6H_2O$. ***Relationship to other species:*** None apparent.

Name: For Mr. Joseph F. Leising (1949–), geologist and mineral collector of Reno, Nevada, U.S.A. ***Comments:*** IMA No. 95-011. The forms given in the paper are {001}, {100}, and {110}; the latter two are both trigonal prisms, but do not result in an hexagonal shape. The form {110} probably should be {010}. Also, the form {00$\bar{1}$} must be present in this crystal class. The crystal drawing produced for this abstract incorporates these changes and has been approved by Mr. Roberts.

ROBERTS, A. C., GROAT, L. A., GRICE, J. D., GAULT, R. A., JENSEN, M. C., MOFFATT, E. A., and STIRLING, J. A. R. (1996) Leisingite, $Cu(Mg,Cu,Fe,Zn)_2Te^{6+}O_6\cdot 6H_2O$, a new mineral species from the Centennial Eureka mine, Juab County, Utah. *Mineralogical Magazine* **60**, 653–657.

Natroxalate — Monoclinic

$Na_2C_2O_4$

Locality: Mount Alluaiv in the northwestern part of the Lovozero alkaline massif, Kola Peninsula, Russia.

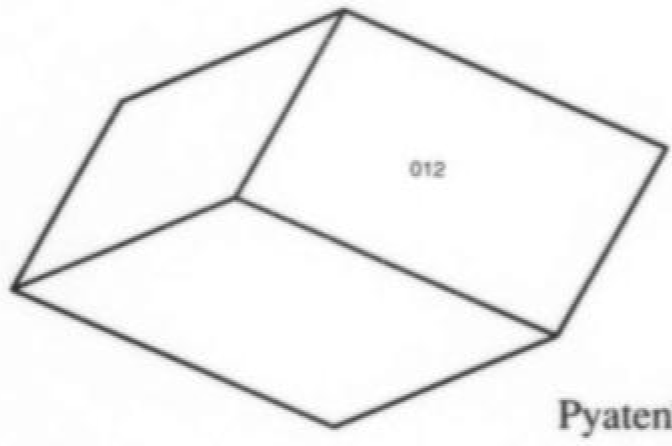
Occurrence: In hyperagpaitic pegmatites and hydrothermalites. Associated minerals are: aegirine, albite, elpidite, sphalerite, nenadkevichite, taeniolite, pyrite, galena, and natron.

General appearance: Fine-grained nodules (1 to 2 cm in diameter), vein-like segregations, columnar crystals (up to 3 x 5 mm long and 1 mm thick), and radiating aggregates.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* pale yellow with a pink or greenish tint, creamy in aggregates. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* 3. *Tenacity:* brittle. *Cleavage:* {100} perfect and {001} distinct. *Fracture:* step-like. *Density:* 2.32 g/cm³ (meas.), 2.34 g/cm³ (calc.). ***Crystallography:*** Monoclinic, $P2_1/a$, a 10.426, b 5.255, c 3.479 Å, β 93.14°, V 190.3 Å³, Z 2, a:b:c = 1.9840:1:0.6620. Morphology: forms, {110}, {001}, {010}, {100}, {221}. Twinning: on (110). ***X-ray powder diffraction data:*** 5.203 (13), 2.898 (27), 2.826 (100), 2.602 (56), 2.334 (33), 2.177 (13), 2.041 (14), 1.660 (12). ***Optical data:*** Biaxial (-), α 1.415, β 1.524, γ 1.592, 2V(meas.) 72°, 2V(calc.) 72°; dispersion r < v, moderate; nonpleochroic; X ∧ c = 20° (in obtuse angle β), Z = b. ***Chemical analytical data:*** A wet chemical analysis gave Na^{1+} 34.29, K^{1+} < 0.015, Ca^{2+} < 0.015, $C_2O_4^{2-}$ 65.63, Total 99.92 wt.%. These data have been recalculated here to: Na_2O 46.24, K_2O < 0.02, CaO < 0.02, C_2O_3 53.70, Total 99.94 wt.%. Empirical formula: $Na_{2.00}C_{2.00}O_{4.00}$. ***Relationship to other species:*** The natural analogue of synthetic sodium oxalate.

Name: For the chemical composition. ***Comments:*** IMA No. 94-053.

KHOMYAKOV, A. P. (199) Natroxalate $Na_2C_2O_4$—a new mineral. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(1)**, 126–132.



Pyatenkoite-(Y)

Pyatenkoite-(Y) — Hexagonal (trigonal)

$Na_5(Y,Dy,Gd)TiSi_6O_{18}\cdot 6H_2O$

Locality: Mount Alluaiv in the northwestern part of the Lovozero alkaline massif, Kola Peninsula, Russia.

Occurrence: In hyperagpaitic pegmatites. Associated minerals are: albite, natrolite, tetranatrolite, aegirine, lomonosovite, neptunite, and fluorite.

General appearance: Rhombohedral crystals (0.2 to 0.5 mm across) and clusters of such crystals.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent to cloudy. *Color:* colorless. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* 4 to 5. *Tenacity:* brittle. *Cleavage:* {102} moderate. *Fracture:* step-like. *Density:* 2.68 g/cm³ (meas.), 2.70 g/cm³ (calc.). ***Crystallography:*** Hexagonal (trigonal), R32, a 10.696, c 15.728 Å, V 1558 Å³, Z 3, c:a = 1.4705. Morphology: forms, only {012} was observed. Twinning: none observed. ***X-ray powder diffraction data:*** 5.99 (60), 3.21 (100), 3.093 (40), 2.990 (85), 2.661 (40), 1.998 (55), 1.481 (44 diff.). ***Optical data:*** Uniaxial (-), ω 1.612, ε 1.607, nonpleochroic. ***Chemical analytical data:*** Means of six sets of electron microprobe data: Na_2O 17.25, K_2O 0.14, Y_2O_3 6.64, La_2O_3 0.10, Ce_2O_3 0.34, Nd_2O_3 0.60, Sm_2O_3 1.14, Eu_2O_3 0.54, Gd_2O_3 1.78, Tb_2O_3 0.40, Dy_2O_3 2.39, Ho_2O_3 0.24, Er_2O_3 0.94, Tm_2O_3 0.08, Yb_2O_3 0.14, SiO_2 42.96, TiO_2 8.16, ThO_2 0.36, ZrO_2 0.38, Nb_2O_5 2.68, H_2O 12.82, Total 100.08 wt.%. H_2O calculated from the crystal structure analysis. Empirical formula: $(Na_{4.70}K_{0.03})_{\Sigma 4.73}(Y_{0.50}Dy_{0.11}Gd_{0.08}Sm_{0.06}Er_{0.04}$-$Nd_{0.03}Eu_{0.03}Tb_{0.02}Ce_{0.02}Ho_{0.01}Yb_{0.01}La_{0.01})_{\Sigma 0.92}(Ti_{0.86}Nb_{0.17}Zr_{0.03}Th_{0.01})_{\Sigma 1.07}$-$Si_{6.03}O_{18.00}\cdot 6.00H_2O$. ***Relationship to other species:*** The titanium-dominant analogue of sazykinaite-(Y).

Name: For Yu. A. Pyatenko (1928–), prominent Russian crystal chemist. ***Comments:*** IMA No. 95-034. The paper gives details of the crystal structure. No crystal drawing is given by the authors, but the drawing for this abstract was produced from the data given in the paper.

KHOMYAKOV, A. P., NECHELYUSTOV, G. N., and RASTSVETAEVA, R. K. (1996) Pyatenkoite-(Y) $Na_5(Y,Dy,Gd)TiSi_6O_{18}\cdot 6H_2O$—a new mineral. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(4)**, 72–79.

Shkatulkalite — Monoclinic

$Na_{10}Mn^{2+}Ti_3Nb_3(Si_2O_7)_6(OH)_2F\cdot 12H_2O$

Locality: Mount Alluaiv in the northwestern part of the Lovozero alkaline massif, Kola Peninsula, Russia.

Occurrence: In hyperagpaitic pegmatites. Associated minerals are: ussingite, microcline, aegirine, riebeckite, vuonnemite, bornemanite, lomonosovite, steentrupine, belovite, sidorenkite, eudialyte, terskite, lovozerite, chkalovite, tugtupite, polylithionite, serandite, gmelinite, chabazite, makatite and sphalerite.

General appearance: Rectangular lamellae and tabular grains (0.5 to 1.0 mm), mica-like aggregates (1 to 3 cm), and cryptocrystalline porcelain-like masses partially replacing vuonnemite lamellae.

Physical, chemical and crystallographic properties: *Luster:* waxy on fractures, pearly on cleavages. *Diaphaneity:* transparent to translucent. *Color:* colorless, silvery white, pale pink. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* 3. *Tenacity:* brittle. *Cleavage:* {001} highly perfect and {100} perfect. *Fracture:* step-like. *Density:* 2.70 g/cm³ (meas.), 2.72 g/cm³ (calc.). ***Crystallography:*** Monoclinic, Pm, P2 or P2/m, a 5.468, b 7.18, c 31.1 Å, β 94.0°, V 1218 Å³, Z 1, a:b:c = 0.7616:1:4.3315. Morphology: forms, only {001} was observed. Twinning: none observed. ***X-ray powder diffraction data:*** 15.56 (9), 5.16 (6), 3.11 (10), 2.850 (7), 2.665 (7), 2.627 (7), 2.217 (6), 1.795 (6). ***Optical data:*** Biaxial (+), α 1.608, β 1.630, γ 1.660, 2V(meas.) 82°, 2V(calc.) 83°; dispersion r < v, moderate; nonpleochroic; Y = b, Z ∧ a = 7° (in obtuse angle β). ***Chemical analytical data:*** Means of three sets of electron microprobe data: Na_2O 16.14, CaO 0.44, MnO 1.70, SrO 0.46, Al_2O_3 0.24, Fe_2O_3 0.07, SiO_2 35.70, TiO_2 11.12, Nb_2O_5 21.93, H_2O (11.66), F 0.94, sum 100.40, less O = F 0.40, Total (100.00) wt.%. H_2O by difference. Empirical formula: $Na_{10.39}(Mn_{0.48}Ca_{0.16}Sr_{0.09})_{\Sigma 0.73}Ti_{2.78}Nb_{3.29}(Si_{11.86}Al_{0.09}Fe_{0.02})_{\Sigma 11.97}O_{42.20}$-$(OH)_{1.80}F_{0.99}\cdot 12.02H_2O$. ***Relationship to other species:*** It is chemically similar to epistolite and murmanite.

Name: For the Shkatulka vein in which the mineral was found (Shkatulka means small jewel box in Russian). ***Comments:*** IMA No. 93-058. The list of associated minerals given in this abstract was taken from the original IMA proposal.

MENSHIKOV, Yu. P., KHOMYAKOV, A. P., POLEZHAEVA, L. I., and RASTSVETAEVA, R. K. (1996) Shkatulkalite $Na_{10}Mn^{2+}Ti_3Nb_3(Si_2O_7)_6(OH)_2F\cdot 12H_2O$—a new mineral. *Zapiski Vserossuskogo mineralogicheskogo obshchestva* **125(1)**, 120–126.

Sigismundite — Monoclinic

$(Ba,K,Pb)Na_3(Ca,Sr)(Fe^{2+},Mg,Mn)_{14}Al(OH)_2(PO_4)_{12}$

Locality: Near Madesimo, Spluga Valley, Central Alps, Italy.

Occurrence: In a phengitic quartzite. Associated minerals are: quartz, phengitic mica, albite, "apatite," ferrous carbonates, K-feldspar, rutile, schorl, barite, celestine, lazulite, woodhouseite, goyazite, pyrophyllite, crandallite, kaolinite, mitridatite, diaspore, svanbergite, hematite, and vanadinite.

General appearance: A small (4 cm) lump made up of imperfect crystals (up to 1 cm across).

Physical, chemical and crystallographic properties: *Luster:* greasy. *Diaphaneity:* translucent. *Color:* greyish green. *Streak:* white. *Luminescence:* non-fluorescent at 254 and 366 nm. *Hardness:* could not be determined. *Tenacity:* brittle. *Cleavage:* two directions at about 110°, one more distinct than the other. *Fracture:* present, but not identified. *Density:* could not be determined, 3.56 g/cm³ (calc.). ***Crystallography:*** Monoclinic, C2/c, a 16.394, b 9.932, c 24.437 Å, β 105.78°, V 3828 Å³, Z 4, a:b:c = 1.6506:1:2.4604. Morphology: no forms were observed. Twinning: none observed. ***X-ray powder diffraction data:*** 4.519 (23), 3.368 (20), 3.178 (51), 3.010 (100), 2.819 (20), 2.805 (25), 2.775 (21), 2.741 (21), 2.732 (21), 2.678 (42), 2.523 (27). ***Optical data:*** Only an average index of refraction of 1.65 could be obtained; no appreciable pleochroism. ***Chemical analytical data:*** Means of ten sets of electron microprobe data: Na_2O 4.44, K_2O 0.26, MgO 10.85, CaO 2.09, MnO 0.70, FeO 27.64, SrO 1.09, BaO 5.68, PbO 0.76, Al_2O_3 2.45, SiO_2 0.02, P_2O_5 40.50, H_2O (0.86), Total 97.34 wt.%. Empirical formula: $(Ba_{0.78}K_{0.12}Pb_{0.07}Sr_{0.02})_{\Sigma 0.99}Na_{3.02}(Ca_{0.79}Sr_{0.20})_{\Sigma 0.99}(Fe_{8.10}Mg_{5.67}$-$Mn_{0.21})_{\Sigma 13.98}Al_{1.01}Si_{0.01}(PO_4)_{12.02}(OH)_{2.01}$. H_2O was deduced from the crystal structure. ***Relationship to other species:*** A member of the arrojadite-dickinsonite series, specifically the barium-dominant analogue of arrojadite.

Name: For Pietro Sigismund (1874–1962), a well-known collector of minerals from Valtellina, especially Val Malenco. ***Comments:*** IMA No. 94-033.

DEMARTIN, F., GRAMACCIOLI, C. M., PILATI, T., and SCIESA, E. (1996) Sigismundite, $(Ba,K,Pb)Na_3(Ca,Sr)(Fe^{2+},Mg,Mn)_{14}$-$Al(OH)_2(PO_4)_{12}$, a new Ba-rich member of the arrojadite group from Spluga Valley, Italy. *Canadian Mineralogist* **34**, 827–834.

Sphaerobismoite — Tetragonal

Bi_2O_3

Locality: Neubulach and Wittichen, Black Forest, Germany.

Occurrence: In the secondary oxidation zone. Associated minerals are: quartz, barite, chalcopyrite, emplectite, malachite, bismutite, and mixite.

General appearance: Spherulitic aggregates (up to 0.5 mm in diameter) of minute tabular crystals.

Physical, chemical and crystallographic properties: *Luster:* adamantine. *Diaphaneity:* translucent. *Color:* green, yellowish, grey. *Streak:* white. *Luminescence:* non-fluorescent. *Hardness:* 4. *Tenacity:* brittle. *Cleavage:* none discernible. *Fracture:* conchoidal. *Density:* could not be determined, 7.17 g/cm³ (calc.). ***Crystallography:*** Tetragonal, $P4_2/n$ or $P4_22_12$, a 8.08, c 6.46 Å, V 421.7 Å^3, Z 4, c:a = 0.7995. Morphology: forms, none observed. Twinning: none mentioned. ***X-ray powder diffraction data:*** 5.73 (7), 3.44 (5), 3.16 (10), 3.01 (4), 2.56 (4 diff.), 2.02 (5), 1.902 (6). ***Optical data:*** Uniaxial (+), ω 2.13, ε 2.18, nonpleochroic. ***Chemical analytical data:*** Means of four and six sets of electron microprobe data: Bi_2O_3 98.40 (4 analyses), As_2O_3 1.78 (6 analyses), Total 100.18 wt.%. Empirical formula: $(Bi_{1.92}As_{0.08})_{\Sigma 2.00}O_{3.00}$. ***Relationship to other species:*** It is a tetragonal polymorph of bismite.

Name: For the form of the aggregates and the composition. ***Comments:*** IMA No. 93-009.

WALENTA, K. (1995) Sphaerobismoit, ein neues Mineral der Zusammensetzung Bi_2O_3 aus dem Schwarzwald. *Der Aufschluss* **46**, 245–248.

Viaeneite — Monoclinic

$(Fe,Pb)_4S_8O$

Locality: La Mallieue lead-zinc deposit, Engis, about 40 km southwest of Liege, Belgium.

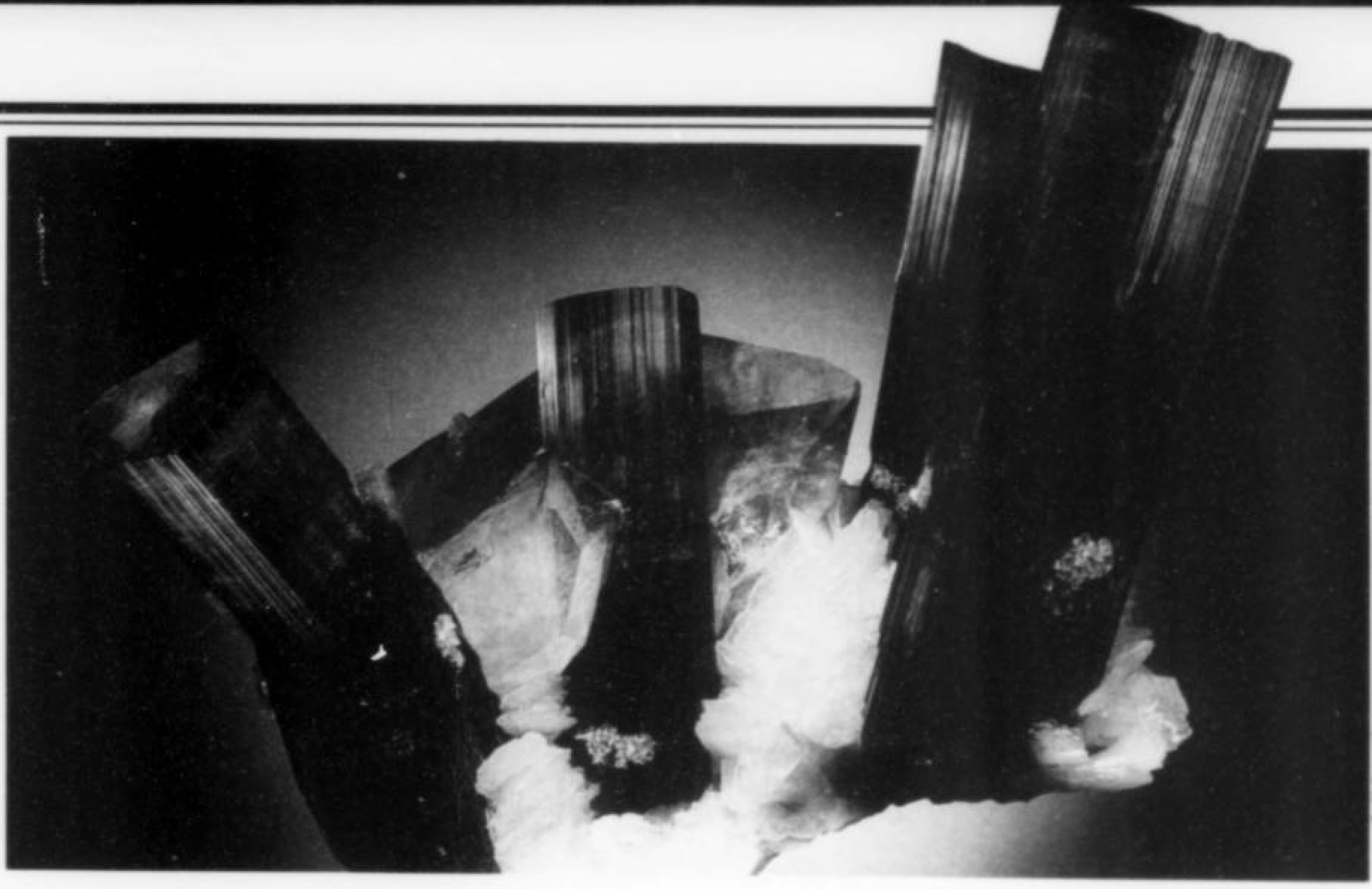
Occurrence: In a carbonate-hosted deposit. Associated minerals are: sphalerite, pyrite, marcasite, galena, goethite, zincian siderite, smithsonite, dolomite, ferroan dolomite, quartz, cerussite, anglesite, and "various Fe-Pb compounds with double sulphur valencies."

General appearance: Oval-shaped intergrown aggregates (from 0.05 to 0.5 mm, exceptionally up to 4 mm) of minute crystals (from a few mμ to 30 mμ, exceptionally up to 80 mμ).

Physical, chemical and crystallographic properties: *Luster:* metallic. *Diaphaneity:* opaque. *Color:* yellow. *Streak:* black. *Hardness:* VHN_{200} 252 kg/mm^2, Mohs 3. *Tenacity:* not given. *Cleavage:* {110}, perfection not stated. *Fracture:* not given. *Density:* 3.8 g/cm^3 (meas.), 3.65 g/cm^3 (calc.). ***Crystallography:*** Monoclinic, space group unknown, but the cell is probably primitive, a 9.717, b 7.280, c 6.559 Å, β 95.00°, V 462.2 Å^3, Z 2, a:b:c = 1.3348:1:0.9010. Morphology: forms, none observed. Twinning: none observed. ***X-ray powder diffraction data:*** 2.709 (10), 2.419 (8), 2.323 (7), 1.925 (6), 1.758 (8), 0.9605 (6), 0.9576 (7). ***Optical data:*** In reflected light: yellow with a brassy hue; very strong anisotropism in orange, yellow-orange, grey with green hue; distinct bireflectance; distinct pleochroism, greyish-brown, orange, yellow-orange. R_{min}, R_{max}; $^{im}R_{min}$, $^{im}R_{max}$: (19.5, 32.9; 11.7, 17.6 %) 470nm, (23.8, 36.8; 14.8, 21.6 %) 550nm, (24.6, 37.4; 15.3, 21.9 %) 590nm, (25.1, 37.3; 14.9, 20.6 %) 650nm. ***Chemical analytical data:*** Means of three sets of electron microprobe data: Fe 42.37, Pb 4.02, Ni 0.20, Zn 0.05, As 0.17, S 49.74, O 3.69, Total 100.24 wt.%. Empirical formula: $(Fe_{3.84}Pb_{0.10}Ni_{0.02})_{\Sigma 3.96}(S_{7.86}As_{0.01})_{\Sigma 7.87}O_{1.17}$. ***Relationship to other species:*** None apparent.

Name: For Prof. Willy Viaene (1943–), Katholieke Universiteit Leuven, Belgium, for his important contributions to the development of geological sciences in Belgium. ***Comments:*** IMA No. 93-051. The sulfur in this mineral is present in two valency combinations: disulfide, S_2^{2-}, and thiosulfate, $S_2O_3^{2-}$, in the ratio of 11:1.

KUCHA, H., OSUCH, W., and ELSEN, J. (1996) Viaeneite, $(Fe,Pb)_4S_8O$, a new mineral with mixed sulphur valencies from Engis, Belgium. *European Journal of Mineralogy* **8**, 93–102. KUCHA, H., OSUCH, W., and ELSEN, J. (1995) Calculation and refinement of cell parameters of vianeite from electron diffraction patterns. *Neues Jahrbuch für Mineralogie, Monatshefte* **1995**, 433–443.



Jeff Scovil

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Support organization:
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Website: http://nhm.org/~gmc

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E-Mail:
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Department of Geology
University of Delaware
Newark, DE 19716
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Specialty: Worldwide minerals

Carnegie Museum of Natural History
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Geology Dept., 4th floor
Adrien-Pouliot Building
Québec, Que., Canada G1K 7P4
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Museum of Geology
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New Mexico Bureau of Mines & Mineral Resources— Mineral Museum
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E-Mail: vwlueth@nmt.edu
Fax: (505) 835-6333
Assistant Curator: Lynn Heizler
Tel: (505) 835-5166
New Mexico Tech
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Socorro, NM 87801
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Penn State Earth & Mineral Sciences Museum
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E-mail: touret@musee.ensmp.fr
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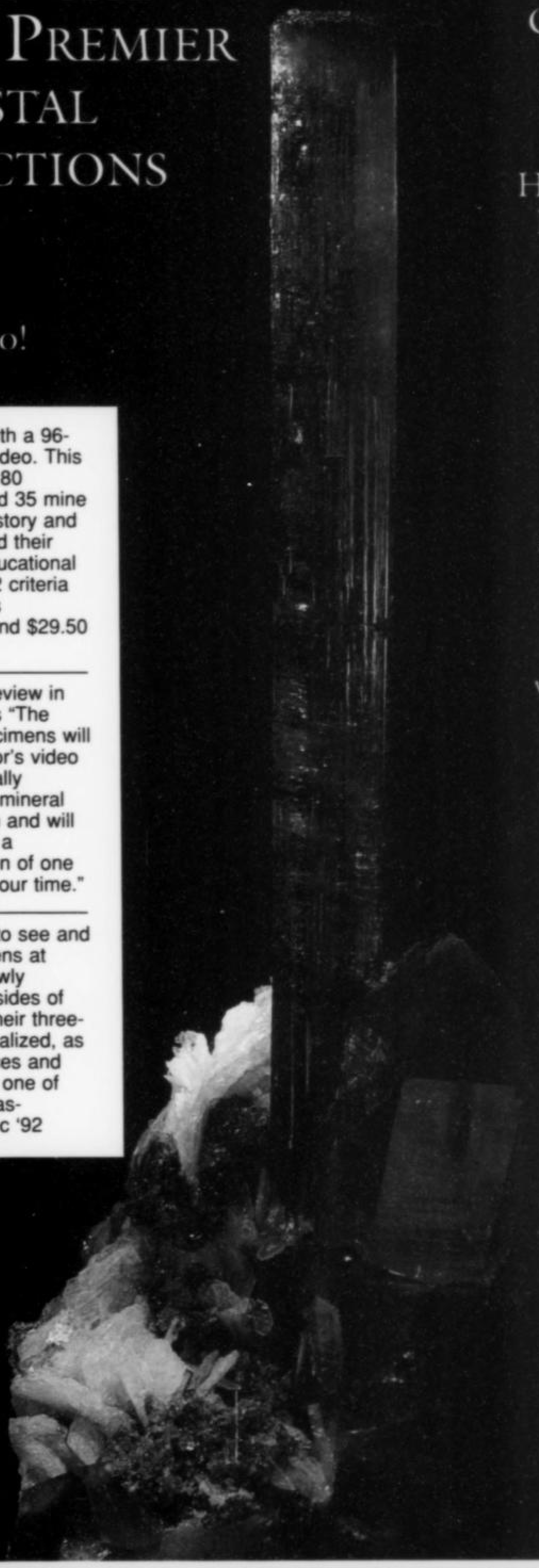

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